Curtin School of Allied Health

A Dynamic and Temporal Analysis of Team Resilience within the Australian Defence Force

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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Human Ethics The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007) – updated March 2014. The proposed research study received human research ethics approval from the Curtin University Human Research Ethics Committee (EC00262), Approval Number #LD 03-18. Curtin University HREC reciprocal ethics approval number: HRE2018-0305

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Abstract

Events that threaten the functioning of collective systems are becoming more pervasive and demanding across organisations (Mathieu et al., 2008). The maintenance or quick recovery of a collective's functioning in response to adverse or stressful events resembles the construct resilience. In response to the growing academic and applied attention of collective resilience (Edson, 2012; Galli, 2016; Morgan et al., 2013), there is a need to consolidate current understanding and extend the conceptual knowledge that surrounds team resilience. The overarching purpose of this thesis was to advance conceptual and empirical knowledge of resilience within team and multi-team systems. This aim is realised through four main approaches.

First, I conducted a scoping review the literature on team resilience to gain insight into current thinking regarding its definition and conceptualisation, and to identify how researchers have operationalised and measured this concept. Using a 5-phase approach proposed by Arksey and O'Malley (2005), I highlighted several key findings regarding the literature on team resilience: (i) definitions varied in terms of content (e.g., input or process), breadth (e.g., unidimensional versus multidimensional), and quality (e.g., essential and necessary attributes of key components); (ii) there was a predominance of single-level conceptualisations of team resilience; and (iii) there has been a reliance on cross-sectional research designs in empirical studies, which is incongruent with the dynamic nature of this concept. A key conclusion from this scoping review was the need to advance the definitional quality of team resilience, develop an overarching theoretical framework to integrate existing research with future work, and to use methodological approaches that are commensurate with the multilevel, dynamic nature of team resilience.

Second, I conducted a narrative review to critically appraise key considerations for understanding team functioning when adverse events occur and offer a foundation to guide

future work. I first explored the ways in which adversity is experienced by individuals and collectives. The nature of adverse experiences provides an important foundation for our consideration of team functioning following adversity. I concluded this chapter by examining how experiences of adversity may enhance the collective functioning. This narrative review exposed the unique nature of adversity experiences across individuals and collectives as well as the potential modalities of observing such experiences at both the individual (e.g., biological indicators) and team levels (e.g., shared cognitive and affective states). Such experiences may influence potential trajectories of team functioning (e.g., growth, drop-off) and the mechanisms (e.g., social identification, benefit finding) that foster emergent outcomes following shared adverse experiences. This narrative demonstration of the varying and complex nature of adversity provides an important platform to inform the interpretations of future empirical findings of studies exploring collective experiences of adversity.

Third, I conducted a longitudinal qualitative exploration of elite military personnel's experiences and perspectives of team resilience emergence to enhance the richness of conceptual viewpoints regarding the multilevel dynamics of team resilience emergence in recent years. I conducted focus groups within the context of an 18-month high-stakes training course where personnel are required to operate in small tactical teams for extended periods. Five key themes were actively constructed from the data: (i) adversity is an enduring, shared experience of an event; (ii) individuals recognise adversity through physiological or behavioural states; (iii) social resources bind together individual self-regulatory capacities when confronted with adversity to support team functioning; (iv) shared experiences of adversity and collective structures strengthen social bonds and mental models needed for resilience emergence; and (v) behavioural processes and shared states are how individual and team capacities are translated into performance under adversity. These findings provide initial support for a theoretical exposition of team resilience emergence, resulting in a

characterisation of the contextual richness of team resilience emergence within newly formed teams, and insights into the salience of time upon the nature of emergence.

Fourth, I extended the nature of our analysis of collective resilience by conducting a case study to explore perceptions regarding the emergence of resilience within a multiteam system (MTS). Within the context of an armoured cavalry squadron, focus groups and individual interviews were conducted with members across levels of the organisation (i.e., military squadron). Informed by a reflexive thematic analysis, we interpreted findings to include: (i) clustering, location, and shared interpretations of events characterise threats to MTS functioning; (ii) event meaning optimises the affective states of troop members and adaptive processes; and (iii) interpersonal trust fosters behavioural coordination and affective synergies between members. These findings provide an important foundational contribution to the theoretical picture of emergent resilience within MTSs and offer a platform for further conceptual refinements and elaboration.

Taken together, this thesis critically assesses and consolidates the conceptual and empirical knowledge of collective resilience to provide a foundation for qualitative expositions of resilience within both small teams and MTSs. This thesis extends past work by providing a detailed depiction of the nature of shared experiences that threaten collective functioning and thus trigger resilience emergence, and elaborates upon the theoretical makeup of collective resilience by identifying insights into the ‘what’ (i.e., potential focal factors and processes that facilitate resilient functioning) and ‘how’ (providing richness around the mechanisms by which these factors and processes foster resilience) of this construct. These findings provide important implications for theory development, and future empirical approaches that aim to assess or develop collective resilience. Additionally, these findings offer insight to general strategies that may be leveraged to develop team resilience across organisational settings.

Chapter 1: General Introduction

The cooperative capacity of the human species exceeds all others and resembles an important evolutionary advantage. This advantage is ultimately based on our advanced communication structure, a greater magnitude of culture or shared beliefs that structure interactions, and our tendency toward 'other-regarding' intentions (i.e., preferences to help others) that surpass the scope of other species (Brosnan & Bshary, 2010). These underpinning factors have led to the natural formation of collective structures to achieve beneficial outcomes. For example, cooperative behaviour was crucial to hunting success for Homo sapiens, whereas nowadays groups naturally form to create a collective capacity in contexts such as the arts, politics, and sport. Within modern society, organisations have increasingly relied on collectives to achieve meaningful outcomes. For example, surgical teams are formed to conduct complex medical procedures, product development teams are formed to produce novel technology, and disaster response teams are quickly composed to respond to natural disasters. In essence, whereas once just an evolutionary advantage, the capacity of individuals to work collectively has meant that teams have become a well-recognised means by which organisations can achieve a greater magnitude or complexity of outcomes at fewer expense (i.e., a greater economy of resources).

The ability to maximise human capital through collectives, coupled with a rise in the professionalisation of organisations has led to a growth in scholarly focus in optimising team functioning, especially within the field of organisational psychology (Mathieu et al., 2008). Broadly, this work can be framed within an input, mediator, output, input or IMOI model (Ilgen et al., 2005), whereby key team outcomes (e.g., productivity, efficiency and quality of performance) emerge from individual, team, or organisational level inputs (e.g., trust, situation awareness) via interdependent behavioural activities or shared states (e.g., shared mental models, collective efficacy) and processes (e.g., information sharing, planning and

reflection). For example, past work has commonly explored structural features (e.g., task complexity, member interdependence), compositional features (e.g., demographics, member ability, turnover), and mediating mechanisms (e.g., motivation, action/transition processes, cohesion) in an endeavour to shed light on factors that optimise team outcomes (Mathieu et al., 2017). In essence, the drive to advance our understanding of teams to meet the demands of applied stakeholders has resulted in a significant range of constructs being proposed to foster team outcomes. One consideration so far that has received minimal empirical attention or considered implicitly in past work is the influence of stressors and adversity upon team functioning.

Teams frequently experience events within their lifecycle that may disrupt homeostasis and optimal functioning, yet detailed explorations of such experiences are limited. Broadly speaking, teams may be susceptible to events that emanate from the (i) organisation (e.g., time pressure, Maruping et al., 2015; workload, Rafferty & Jimmieson, 2010), external environment (e.g., natural disaster, Coetzee et al., 2016; global financial crisis Jüttner & Maklan, 2011), or from the group specifically (e.g., intragroup conflict; de Wit et al., 2012). Characteristics such as novelty, predictability, and an uncertainty of outcome have been proposed to underline events that threaten or harm functioning (i.e., stressors; Lazarus & Folkman, 1984). Moving forwards, these event characteristics are likely to become more prevalent as a result of dynamic work environments (e.g., novel technologies, redesign of job responsibilities; Benishek & Lazzara, 2019) and growing complexity of team structures (e.g., virtual teams; Lurey & Raisinghani, 2001). Collectively, these environmental events that may destabilise teams provide a backdrop upon which to understand a specific facet of team effectiveness, namely team resilience.

The study of stress experiences has received considerable attention in the human sciences (e.g., biological, psychological), yet it is only in recent years that researchers have

acknowledged the complex nature of this field of study (Bliese et al., 2017). Developments in our understanding of group dynamics have been drawn out from General Systems Theory (von Bertalanffy, 1968), and later Complex Adaptive Systems Theory (Holland, 1992) in which teams are conceptualised as dynamic and adaptive systems that demonstrate emergence via their multilevel structure (Kozlowski & Ilgen, 2006). This emergence refers to the processes by which lower level features of teams (e.g., individual skills) interact to coalesce or diverge into collective higher level team features such as trust or collective efficacy (Kozlowski et al., 2013). Characterised as complex adaptive systems (Edson, 2012), teams fluctuate with regards to the nature of their context (e.g., task type, nature of environmental events) and time (e.g., point in lifecycle), whereas the adaptive characteristic of teams denotes the recursive nature between team outputs and subsequent team inputs and mediators (Cronin et al., 2011). Collectives are multi-layered in structure, comprising micro- (i.e., individuals), meso- (i.e., team), and potentially macro- (i.e., multiteam) levels that are nested within each other (Kozlowski & Chao, 2018) and underpin their multilevel and emergent nature. In sum, it is important for explorations of team resilience to embrace the complexity of teams by adopting approaches that observe the associations between multiple levels of the system and consider the influence of time and a team's contextual domain (e.g., the nature of stressors). Without doing so would hinder the explanative ability and generalisability of findings.

The unique features of complex adaptive systems give rise to important implications regarding study approach within empirical thesis chapters. First, linear representations of the effects of system inputs (e.g., interventions) on system outcomes (e.g., performance) insufficiently capture the full spectrum of possibilities. Non-linearity occurs as a product of the interdependent and unique nature of system members (e.g., star performers, Volmer & Sonnentag, 2011), and the influence of feedback loops within the system (e.g., team

performance at time-point 1 influences team attributes at time-point 2, Ilgen et al., 2005). This feature dictates that even small inputs (e.g., adjusting an individual's role) can effect large differences in team functioning (i.e., tipping points), whereas other significant changes to a system (e.g., change in task-performance) might have marginal effects (i.e., robustness). Thus, unique or seemingly minor findings may offer important insights for team resilience understanding. Second, path dependence outlines that past states of the system influence the current state of the system. This feature is a product of the 'memory' of a system and dictates that a teams' experience is influenced by when it happens and what happened to that system before the 'system jolt' (Cronin et al., 2011). For example, adding an experienced performer to a newly formed team may have a stronger positive effect upon team performance than if applied to an established, highly cohesive team who are adapting to the loss of valued team member. Together, these features demonstrate the value of conducting detailed and rich examinations of both the team (e.g., past experience, member strengths and weaknesses) and the environment (e.g., performance context) when exploring team resilience.

Military settings offer unique advantages for the examination of the complex nature of team resilience. First, teams are at the core of military organisational structures and act as the primary mechanism in the pursuit of operational success. Second, the uncertainty, dynamic, and often dangerous nature of military performance settings in training, warfare, and humanitarian operations mean that teams are likely to experience naturalistic stressors routinely that underpin team resilience. Finally, military organisations encompass a range of sub-systems with unique functionalities (e.g., combat, reconnaissance, medical support) that are embedded across the organisation to fulfil unique roles. As a result of these unique functions, military contexts offer ample opportunities to explore collective resilience across a range of team typologies (e.g., newly formed teams, multiteam systems). In Australia, the relevance of team resilience to military settings is further epitomised in its alignment with the

Army's current human performance research priorities (Commonwealth of Australia, 2016). As one example of this research priority, the primary funding for this PhD thesis was obtained as part of an Army funded project (Defence Science and Technology Group, 2016) that sought to develop knowledge regarding team resilience development and support Army's goal of sustaining a force that is more capable, agile, and potent against threats to national security. Given this background, this research represents an area for important scientific advancement and one that holds a significant organisational demand.

Thesis Aims

The overarching aim of this thesis was to advance conceptual and empirical knowledge of resilience for collective systems. I aim to review the current state of team resilience literature broadly and then extend empirical work to examine or extend or the soundness of current team resilience theory. In so doing, I adopted a theoretical elaboration approach to the execution of the work reported in this thesis via conceptual and empirical interrogations of the resilience concept for collectives within the context of Army in the Australian Defence Force where stress and adversity experiences are ripe in training and performance (Fisher & Aguinis, 2017). The work is presented across five chapters in the following way. First, I conducted a systematic scoping review of the literature to gather knowledge on existing definitions, conceptualisations, and methodological approaches to the science of team resilience. Second, I narratively reviewed the literature on adversity experiences for teams with the view to critically appraise important considerations for understanding team functioning when adverse events occur and offer a foundation to guide future work. This narrative review built upon the systematic scoping review by examining in detail a key boundary condition of resilience (i.e., adversity) and, taken together, these chapters informed my interpretations of empirical studies. Third, I examined perceptions of team resilience emergence within elite military members of newly formed teams to understand patterns of

shared meaning relating to the nature of adversity experiences, key resilience factors and processes fostering team functioning, and patterns of theme development across time. Fourth, I extended the empirical analysis of team resilience to the examination of collective resilience to multiteam systems, where I adopted a case study approach to examine the perceptions of key organisational stakeholders surrounding the nature of adversity and resilience emergence within the context of three to five-team military troops undergoing an intense 12-month training cycle. Finally, I draw together the overarching findings from the two narrative reviews and two empirical studies to explicate the conceptual implications of this work for future studies of resilience within collective systems

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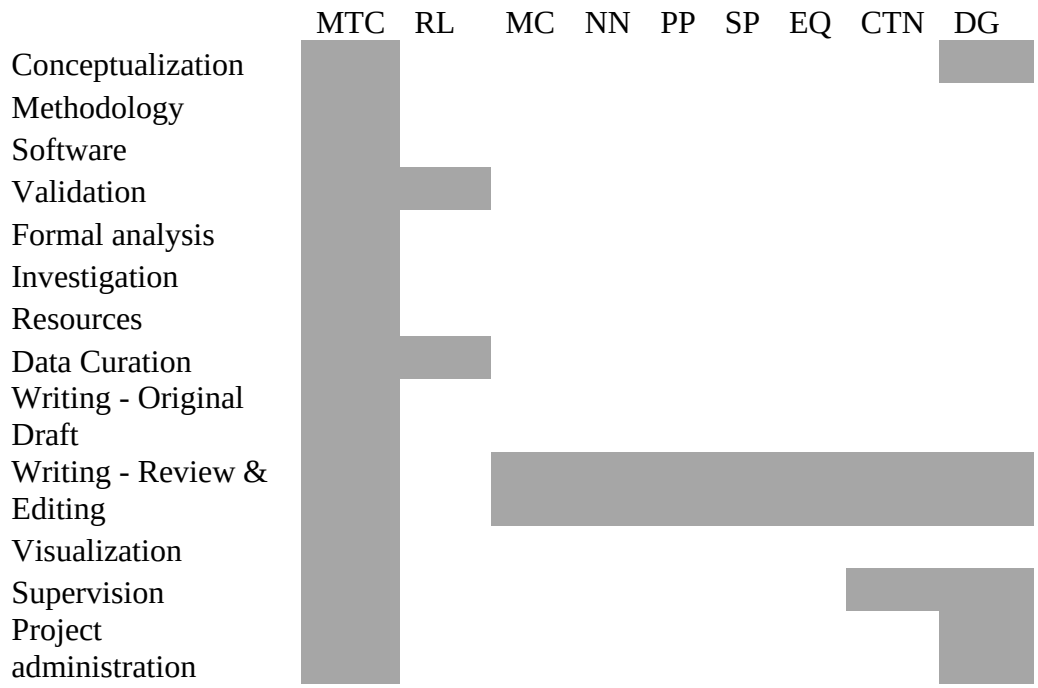
Chapter 2



Chapter 2: Team Resilience: A Scoping Review of Conceptual and Empirical Work

2.1. Introduction

Adversity is inherent within most – if not all – occupational contexts in which the performance of individuals and teams is crucial for organisational effectiveness. Adversity encompasses major assaults that can impede human functioning, which can be acute (e.g., equipment malfunction) or chronic (e.g., workplace bullying) in nature (Bonanno, 2004). With its central focus on what enables people to resist, bounce back, or recover from adverse events that threaten their functioning, viability, or development (Masten, 2014), it is unsurprising that the concept of resilience has garnered a substantial and rich body of work over the past 40 years. The majority of this past work has focused on resilience among individuals (e.g., Kossek & Perrigino, 2016; Pangallo et al., 2015). Yet in most occupational (e.g., workplace) or achievement settings (e.g., sport, education), individuals complete tasks within teams of two or more individuals who work interdependently for a specified timeframe to achieve a common and valued outcome or objective (Sundstrom et al., 1990). To this end, goal achievement is dependent on the capacity of individual team members as a collective to resist, bounce back, or recover from adversity. Therefore, the notion that collective functioning is optimal within complex, dynamic, and uncertain environments when teams are resilient has intuitive and practical appeal. However, the concept of team resilience has received much less scholarly attention than the rich literature on individual resilience. In what follows, we first provide a brief review of resilience research focusing on the various waves of scientific work that have emerged over the past 40 years. We then overview key work on team resilience to shed light on the rationale and need for the current study.

2.1.1 Resilience: A brief historical overview

The scientific study of resilience dates back to the 1970s when scholars sought to understand the development and prevention of psychopathology among individuals at high risk due to a range of adverse events and issues such as poverty, trauma or disaster (e.g., Garmezy, 1985; Rutter, 1979). Of particular interest in this first wave of research were definitional, conceptual, and measurement issues (Masten, 2007). Given the lifetime prevalence of adverse events among most people (Bonanno, 2004), and the potentially maladaptive psychological and physiological outcomes of these experiences (McVicar, 2003), the notion of adversity was common to all definitions and conceptualisations of resilience. Defined as "disturbances to the function or viability of a system" (Wright et al., 2013, p. 17), where a system can range from cellular level to societal or cultural levels, adverse events have been categorised broadly into either acute (e.g., natural disaster) or chronic (e.g., workplace bullying) forms to capture the temporal component of the adversity experience (Cosco et al., 2016). Researchers observed the effects of adversity to vary across individuals; essentially, the outcomes of adversity experiences could range from inconsequential to significant for their functioning, and the enduring nature of maladaptive effects could be short-lived or long-lasting (Iversen et al., 2007; Linley & Joseph, 2004; Van Kessel, 2013). Those individuals who displayed the absence of maladaptive outcomes, or bounced back quickly after deteriorations in their functioning, were subsequently classified as 'resilient' and ignited an interest in the concept. Recent work has underscored the plausibility of nonlinear effects of adversity, in the form of a U-shaped curves where some (moderate) exposure to adversity is better than little or no exposure or very high levels of adversity exposure (for a review, see Seery & Quinton, 2016). Other work also highlighted the potential for particular stressors types that are appraised as advantageous (i.e., challenge stressor, Lepine et al., 2005) to enhance resilience downstream (Crane & Searle, 2016). As such, this first wave of research focused on identifying and understanding the individual, family, and

environmental characteristics to develop a concise yet relatively robust list of protective resources (e.g., self-esteem; Masten, 2007), neurobiological dimensions (e.g., autonomic reactivity; Murphy, 1962), and psychosocial factors (e.g., quality of relationships with caregivers; Gottesman, 1974) of resilient individuals (Masten, 2014). Ecological resilience was also being explored around this period, though independent of the work on understanding resilience at the individual level (Holling, 1973).

In the mid-1980s, the focus on protective factors broadened to explore those aspects 'external' to the individual resulting in the formation of three areas of protective factors, namely; attributes of the individual (as studied in the first wave of research), aspects of their families, and characteristics of the broader social environment (Masten & Garmezy, 1985; Rutter, 1985). This descriptive assessment of protective factors paved the way for the exploration of processes underpinning resilience development, thereby signifying the emergence of a second wave of resilience research. In this wave of research, the focus shifted from the examination of 'what' resilience is, towards understanding the process of 'how' resilience develops within individuals. Of particular relevance was the salience of social, temporal, contextual and cultural factors identified as shaping this development, and thus the complex nature of resilience was established (Masten, 2013).

The third wave of inquiry, originating around the late-1990's onwards, encompassed the exploration of a range of multifaceted interventions to build individual resilience in order to prevent or ameliorate the maladaptive outcomes associated with experiences of adversity (for reviews, see Leppin et al., 2014; Macedo et al., 2014). A key focus within this wave of research was to test mechanisms and outcome variables of resilience hypothesised within earlier waves. For example, Forgatch and Degarmo (1999) evaluated the effectiveness of a parental training program consisting of child behaviour management techniques (e.g., non- coercive discipline, contingent encouragement) and

personal skills (e.g., emotion regulation) on resilience within young children. In contrast, Hawkins et al. (1999) approached the development of resilience within this same demographic through a school-based intervention. This school-based approach comprised teacher training (i.e., fostering proactive class management, interactive teaching and cooperative learning), with children and parents receiving training to develop social skills and prosocial behaviour reinforcement skills respectively.

The fourth and most recent wave expanded the study of individual resilience to take into account cross-level interactions among developmental systems such as biological, neurological, and social ecological (Masten, 2014; Masten & Cicchetti, 2016). For example, researchers have examined the roles of genetic structure (Meaney, 2010) and neural function (Karatoreos & McEwen, 2013) within multilevel models of resilience. One important consequence of this fourth wave has been a progression in the definition of resilience. Early definitions focused primarily on coping with adverse events. Contemporary work, however, aligns with the prevailing acceptance of systems theory within developmental science (Zelazo, 2013), such that there is general agreement among researchers of resilience as the "capacity of a dynamic system to adapt successfully to disturbances that threaten its function, viability, or development" (Masten, 2014, p. 10). Thus, the capacity of a system to adapt is typically inferred from salient indicators within and across each of the multiple levels of analysis for that system (e.g., biological, psychological). Also inherent within a systems conceptualisation is the interdependence among individuals, the ecological context within which they operate (i.e., environment, time, culture), and other levels of analysis (e.g., from genes to sociocultural context) (Bronfenbrenner, 1979; Wright et al., 2013). For example, resilience within the dynamic system of a young child could be seen to be a context-specific capacity emerging from the interaction of past experience, socio-psychological resources, and genetic make-up. A further strength of the systems definition

is that it can be generalised across different systems or levels within a specific system. With regard to humans, for example, one can hone in on resilience within specific systems (e.g., immune, cardiovascular) or the person as a whole (e.g., resilience in response to failing an important educational test). The integration of two or more humans extends to the resilience of dyads (Thomson & Holland, 2003), families (Walsh, 2016), and communities (Berkes & Ross, 2013). Finally, a systems perspective of resilience provides relevance for non-human systems such as ecosystems, economics, and animals (Angelini et al., 2016; Ellsworth et al., 2016; Kim & Marcouiller, 2015).

2.1.2 From Individual to Team Resilience

Teams have been defined as "interdependent collections of individuals who share responsibility for specified outcomes" (Sundstrom et al., 1990, p. 120). The pervasiveness of team systems within occupational settings reflects the importance of optimising such collaborative and interdependent groupings of individuals. Functional interactions between interdependent personnel can provide a critical enhancement over the capabilities of individuals when performing within complex and dynamic environments. For example, the demands associated with preparing for and responding to natural (e.g., floods) and technological (e.g., traffic accidents) disasters necessitates the prevalence of highly proficient disaster management teams (e.g., firefighters, police, medics) to protect wider society (Phillips, 2015). Teams are also essential in contexts where a range of skill-sets are necessary for the execution of complex procedures (e.g., surgical operations within medical settings; Dobbins et al., 2016).

Coupled with this potential for enhanced performance capabilities is the paradoxical awareness that dysfunctional team processes may contribute to decrements in organisational outcomes (e.g., increases in patient harm events within the medical industry; Hughes et al., 2016). With this recognition in mind, certain industries are

predisposed to encountering potential external disruptions to such functioning. Teams within the armed forces, for example, are often susceptible to unanticipated attacks from enemy forces when conducting military operations (Shuffler et al., 2012), whereas aircrew teams on a flight deck may experience malfunctions in computer equipment or severe weather conditions that place extreme demands on their performance (Kanki, 1996). Growing economic, professional and practical demands upon such teams across occupational settings (Mccray et al., 2016), as well as an increasing commonality of shared accountability between group members (Hudson, 2007), illustrates the need for a team to be able to recognise and adapt collaboratively to emerging adversities. The ability to do so presents potentially unique opportunities to gain both a performance advantage within certain contexts (e.g., military, business) and, equally, prevent disastrous outcomes within others (e.g., medicine, aviation).

Research on teams has flourished over the past three decades (for reviews, see Kozlowski et al., 2015; Maloney et al., 2016; Mathieu et al., 2017). This work has substantially enhanced understanding of team-level constructs such as coordination and dynamics (Gorman, 2014), cognition (Grand et al., 2016), and adaptation (Maynard et al., 2015), just to name a few. Conceptually, team resilience is a product of certain comparative constructs (e.g., team leadership, cohesion etc.). In particular team adaptation refers to adjustments in team processes (Maynard et al., 2015) whereas resilience is characterised by the outcome of team processes in response to challenging events (Gucciardi et al., 2018). In contrast to the body of work on related constructs, research on team resilience is still in its infancy, with systematic efforts to investigate and understand this construct produced only in the past decade (e.g., Alliger et al., 2015; Blatt, 2009; Edson, 2012). Building on this emerging body of work, this paper offers several important contributions to the literature on team resilience. Firstly, there has been no attempt to date to systematically scope the body

of peer-reviewed research on team resilience with the view to uncover what is currently known about team resilience and how researchers have studied this concept. Secondly, as existing reviews or perspectives of team resilience have focussed upon a specific context including sport (Galli, 2016; Morgan et al., 2017), organisations (Flint-Taylor & Cooper, 2017; Rodríguez-Sánchez & Vera Perea, 2015), and the armed forces, emergency services, and first responders (Zaccaro et al., 2011), there is a need to scope the literature across all occupational settings. Addressing this need will demonstrate patterns of similarities and differences across contexts, and inform progression toward a universal theory of team resilience. Finally, we focus on both conceptual *and* methodological characteristics of past work, thereby shedding light on how researchers have operationalised team resilience through measurement and intervention.

2.2 Aims of This Study

Against this backdrop of past work on resilience, the overarching aim of this study is to review published work on team resilience to synthesise what is currently known about this concept. Given the broad nature of this study objective, we adopted a scoping review methodology. Scoping reviews are used to assess the extent, range and nature of research on a given topic; they differ from a systematic review or meta-analysis in that the question is much broader and is therefore useful for developing conceptual clarity and/or identifying gaps in knowledge (Arksey & O'Malley, 2005). A scoping review was preferred for the purposes of the present study because systematic reviews and meta-analyses require much greater clarity about a concept than currently exists with respect to team resilience. The systematic approach to the identification of relevant articles, and analysis of retrieved studies with regard to the aims of a study provides an important distinction between narrative and scoping reviews (Levac et al., 2010), and as mentioned previously, provides an important extension upon past reviews of the literature. In this case, a scoping review is

timely because there is a need to consider the scope and nature of research and theory on team resilience, with the view to summarise commonalities and discrepancies in substantive and methodological issues. Enriching our understanding of current approaches to conceptualising and operationalising team resilience will shed light on strengths and weaknesses of such work and highlight unique or unchartered avenues that may help shape the next frontier of the science of team resilience.

2.3 Methods

This scoping review adhered to the 5-step approach proposed by Arksey and O'Malley (2005) and incorporated the enhancements to scoping reviews recommended by Levac et al. (2010), such as selecting team members with expertise in team resilience and related concepts, systematic reviews, and the inclusion of diverse research methodologies.

2.3.1 Stage 1: Identifying the Research Question

Consistent with the broad nature of scoping reviews (Arksey & O'Malley, 2005), we aimed to map the peer-reviewed literature on team resilience, with a particular focus on (i) definitional, (ii) theoretical, and (iii) methodological factors, to inform an understanding of the extent, range, and nature of research on this concept. The focus on peer-reviewed literature was deemed necessary as research areas within the early stages of development are often driven by such work. Although imperfect in some respects, the peer-review process maximises the scientific community's confidence in the quality and credibility of work that has been subjected to scrutiny by academic peers (Bornmann, 2011; Brustad, 1999). Within the context of this overarching research focus, we honed our mapping of the literature on (i) conceptual and (ii) methodological factors to inform an understanding of the extent, range and nature of research on team resilience.

2.3.2 Stage 2: Identifying Relevant Studies

Search procedure. An electronic search was performed on January 4th 2017 of papers published anytime up until December 31st 2016 using seven databases: (i) Web of Science (core collection), (ii) Scopus, (iii) Embase, (iv) Medline, (R), (v) PsycInfo, (vi) CINHAL Plus, and (vii) Business Source Complete. Search filters were chosen based on common terminology identified in published literature known to the authors: (i) "team resilien*" OR (ii) "resilient team*". Depending on the features of each database, we applied these terms to search topics, abstracts, titles, and/or full texts (see Appendix A for full details of the search process). We also conducted a citation search of papers that were deemed eligible for data extraction (see processes detailed in Stage 3) using Google Scholar to maximise the reach of our search (e.g., to capture papers that were 'in press').

Inclusion and exclusion criteria. We considered papers for inclusion if they were written in English, published in a peer-reviewed outlet, and aimed to explore (e.g., conceptual analysis) and/or directly assessed team resilience (e.g., surveys, interviews). Papers were deemed ineligible if they were a conference abstract, book, thesis, book chapter, or popular press article (e.g., magazine, newspaper); excluded humans as part of the team make-up (e.g., computer systems only); were written in languages other than English; and if the full text was unavailable via our University library subscriptions.

2.3.3 Stage 3: Study Selection

Papers identified in Stage 2 as potentially relevant for this scoping review were screened independently by two reviewers (DG and RL) using a two-step process. First, the reviewers screened the titles and abstracts of studies using the inclusion and exclusion criteria detailed in Stage 2. When it was unclear whether a study was eligible for inclusion based on the information presented in the title or abstract, the paper was retained for further analysis.

Second, the assessors screened full texts of papers that passed the initial review using the inclusion and exclusion criteria detailed in Stage 2. Disagreements (N = 5) were clarified through discussion of the rationale for each analysts' choice to include or exclude an article.

2.3.4 Stage 4: Charting the Data

We created an electronic data form to extract key information (e.g., definition of team resilience, research setting; see Appendix A) from full-text records that passed the two-step screening process outlined in Stage 3 (see Appendix A). To maximise reliable interpretation of key information, we transposed raw data as described in the original record. DG and RL conducted the data extraction process of all eligible papers independently; discrepancies (N = 2) were resolved to a consensus through discussion and re-examination of the raw data.

2.3.5 Stage 5: Collating, Summarising, and Reporting Results

We conducted an analysis of the methodological and conceptual features of extracted data. The methodological analysis focused on providing a descriptive account of the types of papers (e.g., conceptual, empirical with new data), occupational settings (e.g., crisis response, sport), geographical distribution, participant characteristics, and methodological features (e.g., design) of eligible studies. With regard to the conceptual analysis, we focused on examining common and unique themes among definitions of team resilience and their operationalisation, as well as primary research findings as they pertained to team resilience.

2.4 Results

2.4.1 Overview of Article Search, Retrieval Process and Retrieved Studies

A visual depiction of the full search process is provided in Appendix A. In total, 275 papers were identified at the initial stage of the search process. After duplicates were removed (n = 73), screening of the titles and abstracts of 202 papers assessed against the

inclusion and exclusion criteria excluded 164 papers. A total of 38 full-texts were assessed of which 21 were deemed ineligible against the exclusion criteria. Finally, we conducted a citation search on the 17 retained papers, which resulted in the identification of an additional 10 papers. Reasons for these additional papers escaping our initial search procedure included: (i) papers being 'in press' at the time of the search process (n = 3), (ii) authors using unique terms for the target concept within the title or abstract (e.g., resilience in entrepreneurial teams; Blatt, 2009; top management team condensed to TMT; Carmeli et al., 2013) (n = 6), and (iii) papers published within journals that were not indexed within the seven databases of our primary search (n = 1).

The 27 papers identified from the search process were published across an 8 year period (2009-2017), with a total of 81% (n = 22) being empirical in nature and the remaining 19% (n = 5) providing conceptual reviews of team resilience. With reference to the empirical or conceptual context, team resilience was examined within business (n = 9), education (n = 4), sport (n = 3), information technology (n = 3), natural and nuclear power industries (n =3), military (n = 2), health and social care (n = 1), music (n = 1), and space exploration (n = 1) contexts. In terms of geographical location among the empirical work, studies were conducted across three continents, namely: North America (United States, n = 7), Europe (UK, n = 3; Netherlands, n = 3; Spain, n = 2; Belgium, n = 1; Norway, n = 1; Finland, n = 1; Portugal, n = 1) and Asia (Israel, n = 2; India, n = 1). The majority of empirical studies utilised cross-sectional surveys (n = 9, 41%), interventions designed to foster team resilience among participants (n = 5, 23%, of which 3 studies drew from the same intervention and produced multiple papers), and interview-based approaches (n = 2, 9%). Other designs included a longitudinal survey with two time points, archival analysis, case study, laboratory- and field-based experiments, and a mixed methods approach (i.e., interviews combined with archival data from manuals, websites, and published articles).

2.4.2 Conceptual Analysis

Defining team resilience. The definitions of team resilience among the included body of work are detailed in Table 1. An examination of the range of definitions adopted within the scope of studies indicates the absence of a widely accepted definition within the literature. The definition formulated by West et al. (2009) was the most prevalent among the included studies (19%, *n* = 5); they defined team resilience as "the capacity to bounce back from failure, setbacks, conflicts, or any other threat to well-being that they may experience" (p. 253). The second most prevalent (15%, *n* = 4) definition was that of Morgan and colleagues (Morgan et al., 2013), who defined team resilience as "a dynamic, psychosocial process which protects a group of individuals from the potential negative effect of stressors they collectively encounter. It comprises of processes whereby team members use their individual and collective resources to positively adapt when experiencing adversity" (p. 552). Of the 27 studies included in the analysis, 9 (33%) papers excluded a formal definition of the concept.

Closer inspection of the definitions reveals several commonalities and unique features of how scholars have defined team resilience. First, an examination of the specific attributes within the 11 definitions reveals all but one (Edson, 2012) to encompass the presence of stressors, setbacks, pressure, challenge or adversity. From this finding, we can see that there is shared agreement that team resilience involves addressing disturbances of some sort.

Inherent within the majority of definitions was the notion that such disturbances can originate from external or internal factors; however, the definition adopted by Glowinski et al. (2016) explicitly acknowledges the external nature of these perturbations. Second, the majority of definitions spoke to the nature of team functioning in the midst of such demands. Team functioning was operationalised predominantly through references to the

maintenance of team performance, either explicitly or inferred through notions such as to 'overcome crisis', 'positively adapt', 'increase reliability' and display 'minimum decrement of team performance'. The exact nature of such team performance remained unclear, with only one definition specifically citing the ability to 'successfully perform particular tasks' (Amaral et al., 2015, p. 1184). Further inspection reveals alternate conceptualisations including a more holistic perspective, such as well-being, longevity and thriving to be indicative of team functioning (Amaral et al., 2015; Kennedy et al., 2016; West et al., 2009). Third, inferences regarding the overarching nature of the concept within these definitions predominantly suggest team resilience to be either an ability or capacity, thus referencing the inputs into the system that exist prior to experiencing stress or adversity. However, there were exceptions to this general finding; Kennedy et al. (2016) likened team resilience to a shared belief, whereas Morgan et al. (2013) expressed the nature of team resilience as a psychosocial process.

There were several unique findings within these definitions of team resilience. Only one definition within these results made explicit reference to the temporal nature of team resilience, albeit with minimal specificity as to the temporal boundaries. Van der Klij et al., (2011, p. 2158) defined team resilience as an "ability of teams to respond to sudden, unanticipated demands for performance *quickly*". This unique definition speaks to a general conceptual assumption within past work, that is, the temporal nature of team resilience is conceptualised implicitly rather than explicitly in available definitions. Several examples of this implicit recognition include the notion of 'bouncing back' inferring an immediate or short-term return to optimal functioning, whereas 'recovery' and 'growth' were also cited, inferring an extended or continued period until such a point is realised.

Table 1. *Overview of Definitions and Quality Indicators.*

Source	Primary definition	Secondary citations of primary definition	Measures of definition quality					
			PE	EA	DM	S	N	D
Alliger et al. (2015, p. 177).	"The capacity of a team to withstand and overcome stressors in a manner that enables sustained performance; it helps teams handle and bounce back from challenges that can endanger their cohesiveness and performance."	None	✓	?	X	X	✓	X
Amaral et al. (2015 p. 1184)	"The team's ability to deal with problems, overcome obstacles, or resist the pressure of adverse situations (e.g. the early leaving of a team member), without entering into rupture, and allowing a positive adjustment to successfully perform particular tasks, increase reliability, longevity and the overall performance."	None	✓	✓	X	X	✓	X
Carmeli, A., Friedmand, Y., & Tishler, A. (2013. p. 149)	"A team's belief that it can absorb and cope with strain, as well as a team's capacity to cope, recover and adjust positively to difficulties."	None	✓	X	X	X	X	X
Edson (2010, p. 2)*	"Ability of a system (team/organisation) to adapt its structure while maintaining its function which often entails emergence of new processes (behaviours, norms and hierarchical structures)."	Cited in Edson (2012, p. 501)	✓	?	X	X	X	X
Hollnagel et al., (2011)*.	"The ability of a system to adapt to external perturbations and anticipate future events."	Cited in Glowinski et al. (2016, p. 2)	✓	X	X	X	X	X
Kennedy et al. (2016, p. 468)	"Shared belief held by the team that it can respond to disruptive and challenging events, recover from setbacks, and thrive as a team under these conditions."	None	✓	✓	X	X	X	✓
Morgan, Fletcher, Sarkar (2013, p. 552)	"A dynamic, psychosocial process which protects a group of individuals from the potential negative effect of stressors they collectively encounter. It comprises of processes whereby team members use their individual and collective resources to positively adapt when experiencing adversity."	Cited in; Morgan, Fletcher, Sarkar (2015, p. 92); Sharma & Sharma (2016, p. 38);	✓	✓	✓	✓	✓	X

		Decroos et al. (2017, p. 4)						
Rodriguez-Sanchez & Perea (2015, p. 30)	"A capacity that teams have in order to overcome crisis and difficulties."	None	✓	X	X	X	X	X
Sutcliffe & Vogus, (2003)*	"The ability of individuals, groups, and organisations to absorb the stress that arises from these challenges and to not only recover functioning back to a "normal" level but also learn and grow from the adversity to emerge stronger than before."	Cited in Stephens et al. (2013, p. 15)	✓	✓	X	X	X	X
Van der Klij et al. (2011, p. 4)	"Ability of teams to respond to sudden, unanticipated demands for performance quickly and with minimum decrement of performance."	None	✓	X	X	X	X	X
West et al., 2009, p. 253).	"Provides teams with the capacity to bounce back from failure, setbacks, conflicts, or any other threat to wellbeing that they may experience."	Cited in; McCray et al. (2016, p. 1134); Meneghel, Martinez, Salanova (2016, p. 507); Meneghel, Salanova, Martinez (2016, p. 241); Lawrence & Maitlis (2009, p. 655)	✓	?	X	?	✓	X
N/A	No definition explicitly stated	Bennett et al. (2010); Broome et al. (2011); Petree et al. (2016); Van der Breek & Schragen (2015); Blatt (2009); Gorman et al. (2016); Savioja et al. (2014); Siegel & Schragen (2017).	N/A	N/A	N/A	N/A	N/A	N/A

Note. PE = property and entity; EA = essential and unique attributes; DM = dimensionality; S = stability over time/context; N = nomological network; D = differentiation from similar constructs. *Primary definition cited but not included in the scoping review process

Quality assessment of definitions of team resilience. The criteria set out by Podsakoff, et al. (2016) for the development of high quality concept definitions were used to assess the quality of the definitions included in this review, namely: (i) identify the essential *property* or nature of the concept and the *entity* to which it applies; (ii) detail the necessary (i.e., essential that all exemplars must possess) and sufficient (i.e., unique features of the exemplars) attributes; (iii) specify the dimensional properties (i.e., unidimensional or multidimensional); (iv) stipulate the robustness of the concept in terms of temporal (i.e., stability over time) and contextual (i.e., generalises across situations, contexts, cases, etc.) factors; and (v) delineate how the conceptual features of the construct differ from related concepts, and if possible, provide an initial description of the nomological network (e.g., antecedents, outcomes). An overview of our assessment of the definitions provided within the retained studies against these criteria is detailed in Table 1. Below we provide a narrative assessment of the two most commonly utilised definitions against these criteria. Overall, none of the existing definitions completely satisfied all criteria for high quality definitions, as proposed by Podsakoff et al. (2016).

The most commonly occurring conceptualisation of team resilience (see table 1) reported within the studies identified in this scoping review, that of West et al. (2009), partially satisfies the criteria for high-quality concept definition proposed by Podsakoff et al. (2016). Strengths of this definition include the specification of the essential *property* or nature of the concept (i.e., "a capacity" or input into the system) and the *entity* to which it applies (i.e., "team"). There is also reference to the essential attributes of team resilience within this definition, namely the capacities that foster the ability of teams to either thrive, improvise, adapt or recover from significant change or stress. However, this definition is silent on those attributes unique to this concept within these contexts. Key limitations of this definition and conceptualisation of team resilience include: (i) the absence of critical

differentiation from similar concepts; (ii) limited justification for the integration of team resilience within a nomological network of related constructs, and the exclusion of others; (iii) absence of information regarding the contextual stability of team resilience, though brief mention is made of the temporal dimensions (i.e., "emerge …[sic] as teams develop"; West et al., 2009, p. 262); and (iv) no formal specification of the dimensionality of team resilience.

Morgan and colleagues' (2013) definition of team resilience represented an advancement in terms of satisfying Podsakoff et al.'s (2016) definitional criteria. The strengths of their definition include: (i) explicit reference to the essential property of team resilience as a 'psychosocial process' and 'a group of individuals' as the entity to which it applies; (ii) establishment of the concept as 'dynamic' in nature (i.e., temporally and contextually specific); and (iii) the provision of four distinct dimensions (i.e., mastery approaches, social capital, collective efficacy and group structure) that capture the multidimensionality of the concept. However, there was ambiguity regarding why or how the four essential attributes of group structure, mastery approaches, social capital, collective efficacy are unique to team resilience. In other words, as the four attributes are established concepts each backed by their own theory and research, it is unclear why these dimensions and not others coalesce to characterise team resilience. Two further weaknesses can also be found in this definition; first, the ambiguity as to the specific dynamics between team resilience and other concepts (e.g., team adaptation, collective efficacy) within the nomological network discussed (i.e., sub-dimensions of model); and second, the absence of critical differentiation of team resilience from these conceptually similar constructs.

Conceptual models of team resilience. Alliger et al. (2015) acknowledged three behavioural strategies to underpin a team's capacity to deal with pressure, stressors or difficult situations. *Minimising* actions were proactive in nature and said to involve

processes of pre-empting challenges, contingency planning, and continual self-assessment of readiness. *Managing* actions were described as reflexive and included strategies to assess and address stressors within 'real-time' situations, whereas *mending* strategies included differing reflection strategies adopted to facilitate recovery and thus a reactive element of the model.

Alliger and colleagues further proposed five markers of team resilience, namely: challenge resolution (i.e., addressing problems quickly and effectively), health (i.e., maintain function in a way that facilitates team spirit, and mood), resources (i.e., maintain social emotional resources during challenge resolution), recovery (i.e., ability to 'bounce back' to previous levels) and on-going viability (i.e., maintain ability to meet future challenges optimally).

Glowinksi et al. (2016) proposed a multidimensional model made up of four temporally defined features. These included *monitoring* ongoing situations and the existence of internal or external perturbations to team functioning; *responding* to variations in the levels of disturbances to functioning; *learning* from experiences of perturbations to functioning; and *anticipating* changes and demands within future situations. Combinations of the magnitude of perturbations, and levels of cognitive efforts (i.e., automaticity) and team coordination (i.e., individual or team centred) were proposed to predict collectively whether or not a team was enacting either of the four features and consequently its level of team resilience.

Kennedy et al. (2016) conceptualised team resilience as an emergent state rather than a capacity or ability of a team, identifying temporal dynamics in the form of team life-cycle as a key factor. Represented across cognitive, motivational, and affective states, Kennedy and colleagues highlighted the importance of a multilevel perspective, emphasising the need to consider the nature of triggers (i.e., team- or task-based) and

adaptive outcomes (i.e., maintenance, meritorious or maladaptive) of team resilience. Finally, they noted team resilience to be distinct from, but a demonstration of, team adaptability and to potentially hold a reciprocal relation with this concept.

Within their review, Rodrigues-Sanchez and Perea (2015) adopted a multidimensional perspective of team resilience highlighting it as a capacity that is malleable in nature. Adopting a psycho-behavioural perspective, key determinants of team resilience encompassed collective efficacy, transformational leadership, teamwork at the team level, and organisational practices at the organisational level. Lawrence and Maitlis (2012) proposed three sets of beliefs engendered within caring narrative practices to underpin the development of a team resilience capacity. *Potency* or a collective belief arising from positive past experiences purportedly facilitated development through reinforcing team goals and increasing team persistence; *contextualising people's struggles* fostered a sense of agency and enhanced team responses to problems; and *transcendent hope* maximised team resilience through energising team members and providing belief of positive future experiences.

Operationalisations of team resilience. It is important to consider how researchers have translated theoretical definitions of team resilience into measurable concepts using different empirical methods and approaches. Of particular relevance here are those studies that assessed team resilience through surveys (n = 10, 37%), observations (n = 3, 11%), and intervention (n = 5, 19%). Differences in the dimensionality of team resilience were observed within survey methods; for example, five studies assessed team resilience as a unidimensional concept, whereas five others adopted a multidimensional perspective. A variety of characteristics or hypothesised protective factors were also assessed within the multidimensional approach to survey assessments. West and colleagues (2009) adapted items from the PsyCap questionnaire

(Luthans et al., 2007) using a referent- shift approach (i.e., adapted items from the individual to the collective level; Chan, 1998) to capture resilience at the team level; they reported adequate internal reliability evidence (α =.76), yet no factor analysis was conducted to assess the structural properties of the scale in their sample. Decroos et al. (2017) and Sharma and Sharma (2016) both leveraged findings from Morgan et al. (2013) to create items that assess four dimensions of mastery approaches, social capital, collective efficacy and group structure via a lower-order measurement model. Through a series of factor analyses, Decroos et al. reduced the item pool into two broad dimensions related to a team's ability to display resilient characteristics and vulnerabilities under pressure, and reported excellent internal reliability evidence at the within-team (ω =.90) and between-team levels (ω = .99). Sharma and Sharma (2016) conducted an exploratory factor analysis, which supported a 10-factor model for the 50 items, and which demonstrated adequate internal reliability evidence for each factor (α > .72). Carmeli, et al. (Carmeli et al., 2013) constructed six questions and conducted exploratory factor analysis to support the two dimensions of efficacious beliefs (α = .82) and resilience as adaptive capacity (α =.86) to operationalise team resilience. Finally, Van der Beek and Schraagen (2015) developed a scale for analysing and developing adaptability and performance in teams to enhance resilience (ADAPTER). Factor analysis support six-factors consisting of items characteristic of responding, learning, anticipating, monitoring, cooperation with departments, and shared leadership; internal reliability evidence was mixed, with Cronbach's alpha ranging between .49 and .94.

With regard to unidimensional survey approaches, three studies adapted measures utilised in previous research. Blatt (2009) utilised a referent shift approach (Chan, 1998) to modify two items from the Safety Organising Survey (Vogus & Sutcliffe, 2007) and four from the Brief Resilient Coping Scale (Sinclair & Wallston, 2004) in order to measure

reactions and preparedness for ‘challenges’; however, neither internal reliability estimates nor factor analyses results were reported. In contrast, Meneghel, Martínez et al. (2016) and Mengehel, Salanova et al. (2016) adapted seven items from Mallak’s (1998) principles of organisational resilience, including perceptions of experiences, tolerance for uncertainty and ability to perform adaptive behaviours. They did not report a factor analysis of the structural properties of the scale, yet reported adequate internal reliability evidence for the unidimensional factors (α =.83). Finally, two unidimensional surveys assessed team resilience via bespoke scales. Stephens et al. (2013) constructed three items to assess a team’s capacity to bounce back from challenges (α =.92) and confirmed the unidimensional structure via exploratory factor analysis, whereas Amaral, et al. (2015) assessed perceptions of the usefulness of 48 predefined actions (α = .96) in developing team resilience.

In terms of observational work, Savioja et al. (2014) assessed habitual behaviours within a ‘perception-action’ cycle (i.e., the flow of information that takes place between an organism and its environment) as interpretative (e.g., attending to processes of a situation), confirmative (e.g., double checking) or reactive (e.g., lagging behind events). In an alternative approach, Furniss et al. (2011) developed a framework of markers based upon the extent to which they generalise across situational domains, within which four key elements (resilience repertoire, mode of operation, resources and enabling conditions and vulnerabilities and opportunities) were used to assess team resilience. Finally, an inspection of the content of intervention programs provided insight into the hypothesised features or antecedents of team resilience: an awareness of potential sources of disruption (Bennett et al., 2010; Broome & Bennett, 2011; Petree et al., 2012), confidence (Bennett et al., 2010; Broome & Bennett, 2011; Petree et al., 2012; Van der Kleij et al., 2011), communication (Siegel & Schraagen, 2017; Van der Kleij et al., 2011), and leadership style (Van der Kleij et al., 2011). These psychosocial factors were targeted using a range of techniques (e.g.,

group discussion, group reflection), strategies (e.g., behavioural training, role playing), and skills (e.g., centring, communication skills).

2.5 Discussion

The aim of this scoping review was to examine the existing literature on team resilience to identify and assess the available evidence in terms of definitional, conceptual, and methodological issues. Of particular relevance was to assess the scope and nature of conceptual and empirical work on team resilience, with the view to summarise commonalties, unique perspectives, and discrepancies in substantive and methodological issues. Three key observations can be made of the existing literature on team resilience on the basis of the findings of this scoping review. First, our critical assessment of existing definitions of team resilience revealed a broad array of strengths and weaknesses, yet in most cases the limitations outweighed the positive features. In particular, although early definitions have provided an important basis for future efforts, ambiguity surrounding the essential property and key attributes of resilience undermine their utility. Second, methodological approaches to operationalise and measure team resilience varied, and often relied on cross-sectional snapshots of teams that are inadequate for the study of team resilience due to its dynamic nature. Third, team resilience has been conceptualised in diverse ways such as an *input* to the system, a *process* by which individuals interact with each other, and an *outcome* of dynamic interactions among team members. Such conceptualisations often exclude direct reference to the multilevel nature of this concept (e.g., individuals embedded within a team, bottom-up and top-down processes).

Assessing existing definitions and conceptual models is an important first step for any effort designed to clarify the substantive features of team resilience. Although the definitions proposed by West et al. (2009) and Morgan et al. (2013) were among the most commonly adopted, there was an absence of a universally recognised definition of team

resilience within organisational literature, with researchers often proposing bespoke definitions within the context of their study.

Unsurprisingly, the majority of definitions referred directly to the 'team' as the specific entity to which team resilience relates; however, some variation existed in the specific classification with two definitions seemingly vague on the entity (i.e., a system) (Edson, 2010; Hollnagel et al., 2011), and another generalising the definition to multiple systems including individuals, teams and organisations (Sutcliffe & Vogus, 2003, cited in Stephens et al., 2013). Existing definitions of team resilience can be understood within the context of the input, processes and output model (I-P-O; Ilgen et al., 2005) of systems within organisational settings. Predominantly, definitions of team resilience encapsulated the concept as an input, specifically in the form of a predefined capacity or ability of the team (e.g., Alliger et al., 2015; West et al., 2009). In contrast, Morgan et al. (2013) defined team resilience as a psychosocial 'process', whereas Kennedy et al. (2016) described it as an output in the form of a shared belief among team members (Kennedy et al., 2016). Finally, Carmeli et al. (2013, p. 149) defined team resilience as encompassing multiple elements, namely an input ("capacity to cope, recover and adjust") and output (a "team's belief"). Collectively, these results indicate that there are discrepancies in terms of the defining features of team resilience, and therefore efforts are required to work towards consensual agreement on the unique nature of this concept in future work. These discrepancies and opportunities for advancement in definitional quality may be addressed through divergent methods to those currently adopted within the literature on team resilience. For example, a Delphi study of academic experts may be required to fast-track the evolution and consensus surrounding a definition of team resilience (Okoli et al., 2004).

Podsakoff et al. (2016) described problems at two levels that arise from poor conceptual definitions. At the first level, poor concept definitions may impede the ability

to compare and discriminate accurately the focal concept with similar and related concepts. Although headway has been made to uncover key aspects of the nomological network of team resilience (Meneghel, Martínez, et al., 2016; Stephens et al., 2013), conceptual ambiguity may impede the understanding of related concepts within this network and also the specific nature of these associations (i.e., antecedents, consequences or correlates of team resilience). At the second level, issues could potentially ensue including deficient (i.e., failure to articulate all essential properties) or contaminated (i.e., lacking precision resulting in other construct elements being involved) characteristics of subsequent operationalisations of team resilience. With few exceptions (Kennedy et al., 2016), researchers offered little insight into the overlap and distinction between team resilience and related concepts with the absence of attention paid to construct validity of team resilience further highlighting this point. This omission is particularly important for conceptual clarity, as several definitions of team resilience shared similarities with the related concepts of team adaptation and adaptability (for reviews, see Christian et al., 2017; Maynard et al., 2015). Clarification of the overlap and distinctions between team resilience, team adaptation, and other concepts (e.g., collective efficacy, team effectiveness) is necessary to prevent the occurrence of construct proliferation or the jangle (i.e., the use of several names to describe conceptually overlapping constructs) and jingle fallacies (i.e., the use of the same term with differing meanings to refer to divergent constructs, Block, 2000) and, ultimately, to establish the discriminant validity of the concept. In addition tothe clarification of the necessary and sufficient conditions of the concept, expositions of how and why team resilience is distinct from related concepts also represents a priority for future work, that is, to conceptually and empirically disentangle team resilience from related concepts, and clarify the relevance and usefulness of this concept. Taking into consideration these substantive issues, Gucciardi et al. (2018, p. 742)

recently defined team resilience as "as an emergent outcome characterizes the trajectory of a team's functioning, following adversity exposure, as one that is largely unaffected or returns to normal levels after some degree of deterioration in functioning" (p. 7).

Conceptual models of team resilience also varied with reference to the I-P-O framework (Ilgen et al., 2005). Some researchers have focused their efforts on conceptualising team resilience as an input (Rodríguez-Sánchez & Vera Perea, 2015) or process (Glowinski et al., 2016), however, predominant among conceptual models is the conceptualisation of team resilience in terms of key outputs or characteristics (e.g., Alliger et al., 2015; Lawrence & Maitlis, 2012; Morgan et al., 2013). Absent from these models is an explicit recognition of how team resilience as an outcome emerges from the dynamic interactions among individual members. For example, Glowinski et al. (2016) and Morgan et al. (2013) attributed broad dimensions of monitoring situations and group structure as higher level properties of resilient teams, respectively, without delineating the processes underpinning their emergence. An exception to this finding is the work of Kennedy et al. (2016), who paid homage to the emergent nature of team resilience; however, specific detail regarding the dynamics of this emergence was absent within their article. It is generally accepted that teams are best viewed as complex and dynamic in nature (McGrath et al., 2000); therefore, the predominance of single level approaches within the conceptual models of team resilience is incongruent with this perspective and highlights a key limitation of existing literature. Future work is required to articulate the conceptual details of these multilevel dynamics, including bottom-up (i.e., how lower-level processes facilitate the emergence of team resilience at a higher level, such as the team) and top-down (i.e., how higher-level factors influence lower-level attributes) processes (Kozlowski et al., 2013).

Concept definitions and conceptual models are important because they inform the operationalisation of constructs through measures and study designs. Of particular relevance is congruence between definition and operationalisation. For example, if defined as a capacity or input into the system, the assessment of team resilience requires indicators that capture these elements at the appropriate level of the system (e.g., individual or team level factors). This congruence was evident among the majority of work reviewed, primarily with regard to conceptualisations of team resilience as a capacity or input (e.g., Meneghel, Martínez, et al., 2016; West et al., 2009). Nevertheless, there were instances of incongruence between definition and operationalisation. For example, Morgan et al. (2013) defined team resilience as a psychosocial process, yet their findings provided clarity on four key characteristics or inputs of this concept rather than the processes by which teams are protected from the potentially detrimental effects of stressors. Stress and adversity and the capacity of teams and processes by which they overcome these potentially detrimental circumstances are also central to most definitions of team resilience. However, with few exceptions (Savioja et al., 2014), researchers assumed rather than tested directly the resilience enhancing nature of inputs and processes. To observe directly the influence of inputs and processes on the emergence of team resilience requires longitudinal or experimental designs in which the temporal dynamics of team resilience can be examined and understood within the context of stress and adversity. The reliance on cross-sectional designs to date is likely a reflection of the limited attention paid to temporal aspects within definitions and conceptual models of team resilience. Bonanno et al. (2015) described the importance of paying close attention to the temporal elements of resilience. Specifically, they described the necessity of defining and integrating four essential components within any study of resilience: (i) system functioning prior to the onset of an adverse experience (i.e., baseline measurement); (ii) the specific nature of the adverse experience; (iii) system

functioning post-adversity; and (iv) the determinants of functioning during the course of this sequence. With reference to the analysis of methodologies adopted within the studies of this review, the specific characteristics of the adverse experience at play were often absent from the methodological detail and, therefore, offered little insight into key information regarding the central question of 'resilience to what'. As an exception to this general finding, Savioja et al. (2014) provided details on the simulated accident scenario in their investigation of team resilience among nuclear power plant operators. In terms of details regarding the adverse event, Bonanno and colleagues also underscored the importance of understanding its severity (i.e., adverse event is chronic or acute), level of exposure (i.e., individual differences in response to adversity) and trajectory of impact (i.e., immediate or longer term). It is therefore important that future work on team resilience provide this degree of clarity when contextualising adverse experiences.

Central to the operationalisation of resilience for any type of system (e.g., individual, team, family) is clarity regarding the nature of functioning and its trajectory over time within the context of adverse events (Bonanno et al., 2015). With regard to individual resilience, for example, health (e.g., mental, physical) and well-being have been proposed as exemplars of functioning (Kalisch et al., 2017). Primary indicators of functioning for social resilience, in contrast, are concerned with meaningful relationships with others or a sense of connectedness (Cacioppo et al., 2011). Clarity on this critical aspect of the conceptualisation of team resilience was absent within the work we identified in this review. Teams are often formed with the purpose of achieving a common objective or shared goal (Sundstrom et al., 1990) that involve performing tasks outside the capability of individuals (Dobbins et al., 2016). For this reason, it seems appropriate that the extent to which shared and valued objectives are met (e.g., efficiency, quantity and quality) represents the defining indicator by which to assess functioning for the purposes of team resilience. In contrast, a focus on individual level

performance may result in erroneous inferences regarding the demonstration of team resilience. For example, situations may occur where the functioning of one or two individual members deteriorates after exposure to adversity, yet appropriate contingencies from other individuals (e.g., another teammate takes on an increased workload) may offset the potential ramifications of these individual member reductions in functioning for the accomplishment of team objectives. Assessment of functioning at the team level therefore represents an important feature for future research on team resilience.

Past work on resilience suggests that there are three broad possible trajectories of functioning for a system following some type of adversity (e.g., Bonanno et al., 2011; Layne et al., 2007; Norris et al., 2009). Systems may (i) *withstand or resist* the effects of adversity in that functioning is minimally affected, (ii) *bounce back* quickly to normal or healthy levels of functioning after a significant deterioration, or (iii) *recover* to competent functioning gradually over an extended period of time. Such trajectories allow resilience to be distinguished from related yet different concepts, such as post traumatic growth where enhanced functioning is expected post- adversity (for a review, see Zoellner & Maercker, 2006).

Contextual and team type factors represent important issues for team resilience, yet they have received little attention among the work reviewed here. Most notably, team size, team composition (e.g., gender, personality makeup), the level of task interdependence (i.e., the amount individuals rely upon others for team performance), skill differentiation (i.e., who does what), team lifespan, virtuality (i.e., proportion a team is face-to-face or remotely connected), and authority differentiation (i.e., the degree to which decision making is distributed across members) are important considerations (Salas et al., 2018). For example, recovering to competent functioning after several hours may be indicative of resilience for a top management team of an investment firm acquiring another firm, yet would not be the

case for a surgical team conducting an operation on a patient with a life- threating ailment**.** This example further illustrates divergence in the nature (e.g., type or magnitude) of adversities experienced across team type and the need to consider the adversity when comparing resilience trajectories across teams of those experiences that would be considered normative and those that would likely cause significant perturbation to the system. Future empirical work on team resilience would do well to take into consideration these contextual and team type factors.

Several of the findings reported in this review of the team resilience literature parallel other areas of resilience inquiry. In particular, definitional and conceptual disharmony is prevalent in past work on resilience within individuals, communities, and ecologies, such that it is often the case that there is a mismatch between definition and operationalisation (Kalisch et al., 2017). Within the context of community resilience, for example, some scholars define it as an *ability* to adapt (Norris et al., 2008), and others as an *outcome* or quality (Manyena, 2006). Such definitional inconsistencies are also observed within the domains of engineering (Hosseini et al., 2016) and ecological systems (Angelini et al., 2016). There are also parallels noticed between proposed protective processes within team resilience literature and other systems. For example, although unique processes of team resilience have been uncovered (e.g., transformational leadership, Morgan et al., 2015; emotional carrying capacity, Stephens et al., 2013), many protective processes identified (e.g., hope, positive emotions, leadership and collective efficacy) mirror those prevalent within the family (Black & Lobo, 2008) and individual resilience domains (Pangallo et al., 2015). These parallels among the various areas of resilience research are likely representative of the complexities and challenges associated with conceptualising and measuring dynamic systems and emergent concepts. Given the relatively early stage of theory and research on team resilience, there is an opportunity for scholars to foster

consistency between definition and operationalisation in future work in ways that could inspire scholars who study resilience in other systems.

2.6 Strengths and Limitations

A key strength of this scoping review included a systematic approach to the search method and data extraction, including multiple databases and strategies (e.g., citation search of included articles). Nevertheless, it is important to acknowledge two key limitations of this scoping review when considering the conclusions drawn from the reviewed body of work. First, as is often the case with scoping reviews where the primary focus is on collating evidence regarding a broad topic of interest (Levac et al., 2010), we did not assess the methodological quality or rigour of studies identified via our search strategy. This limitation especially places a boundary on the utility of conceptual findings for practical recommendations (Pham et al., 2014). Second, only articles published within peer reviewed academic journals were included within the current review. As a result, unpublished research (e.g., dissertations, conference abstracts, book chapters) was excluded, thereby representing a potential source of bias (Rosenthal, 1979). Finally, the exclusion of non-English documents could be seen to skew the findings towards a narrow cultural perspective of team resilience.

2.7 Conclusion

Through a systematic scoping review of the published literature on team resilience, we uncovered what is currently known about this concept and how researchers have gone about generating this information. These findings have the potential to inform future work on team resilience in several ways. First, there is a need for enhanced conceptual clarity of team resilience through the development of definitional consensus using recommendations for high quality definitions (Podsakoff et al., 2016), specifically with regard to the essential and unique characteristics. Enhanced conceptual clarity is likely to optimise the means by

which team resilience is observed and operationalised within subsequent studies as well as foster the distinction and comparison of team resilience from related concepts (e.g., team adaptation). Second, the diverse range of research methods is a strength of the current literature, yet there is a need for an overarching theoretical framework that fosters integration of such findings. Specifically, the development of a conceptual framework may look to align with the generally agreed upon systems perspective and would provide a reference for the systematic testing of individual and team level factors and processes important to the successful trajectory of functioning following adversity. Third, there is a need to balance the current wealth of cross-sectional approaches with longitudinal and experimental studies to disentangle information regarding the temporal nature of team resilience. Of particular relevance in this regard is the examination post-adversity functioning relative to functioning prior to the onset of adversity and characterisation of the specific context of such adverse experiences (e.g., positive/negative valence, chronicity, severity etc.). Future work should also look at how resilience develops or declines over time (i.e., across multiple adverse experiences) to understand the mechanisms that underpin team resilience emergence. Finally, it is important that investigations into the dynamic nature of team resilience draw from multilevel theory (Kozlowski et al., 2013) in which researchers clarify the inputs, bottom-up and top-down processes, as well as the outcomes of the emergence of team resilience. There is also a need for multidisciplinary integration across relevant cognate areas such as psychology (e.g., stress appraisals), sociology (e.g., social, economic, and political pressures), organisational behaviour (e.g., work design factors), biological systems (e.g., physiological indices of stress exposure), and computation (e.g., virtual simulations and experiments). This multilevel and integrative perspective is consistent with the fourth wave of resilience research that works towards understanding cross-level interactions among developmental systems.

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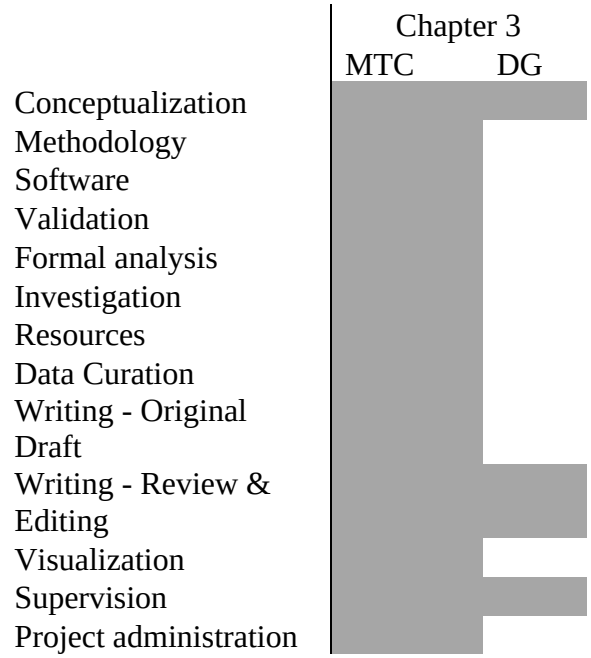

Chapter 3: Can Adversity Promote Team Functioning In Sport? A Narrative Review

3.1 Introduction

Sport teams across all competitive levels are likely to experience adversity at some point within the performance cycle. For sporting teams, adversities can be characterised as events that have the potential to derail the collective functioning of the group, such as the loss of a key team member through major injury, the sudden change in management personnel (e.g., coach being fired), or an unexpected loss to a much lower ranked side. Typically, adversities are characterised negatively in light of the potentially deleterious effects for team functioning and ultimately destabilisation of performance. For example, as a result of the ball tampering scandal in 2018, the Australian cricket team lost three key members midway through a test series against South Africa, and subsequently suffered their second largest defeat in history in the following match and went on to lose their following two test series. However, teams can also withstand potentially deleterious effects or even develop positively following the experience of adverse events (e.g., enhanced focus and motivation following the feeling of injustice from an erroneous refereeing decision). Regardless of the immediate outcomes of such experiences, one important consideration for theory and practice is the implications of collective experiences of adversity for the future functioning of the team. In other words, can collective experiences of adversity promote the future functioning of a sporting team? Given the paucity of empirical work that has addressed this proposition, our goal in this chapter is to consider several key questions that might inspire others and guide efforts to study this proposition empirically.

3.2 Literature Review

3.2.1 What is Adversity?

The use of the term adversity is widespread across the literature within areas such as resilience, post-traumatic growth, and coping (Linley & Joseph, 2004). The ubiquity of this term and implicit assumptions regarding its definition has caused discrepancies in the operationalisation of adversity. For example, some scholars have defined adversity as "life circumstances that are known to be statistically associated with adjustment difficulties" (Luthar & Cicchetti, 2000, p. 858) whereas others have defined the term as a "state of hardship or suffering" (Jackson et al., 2007, p. 3). Within the biological literature, adversity is defined as a level within the environment that may vary in magnitude depending upon qualities such as resources, physical structure, climate, and competitors (Andras et al., 2007). Despite dissimilarities within the literature, and the observed conceptual proliferation with terms such as stressor and traumatic events, certain salient observations can be drawn from those definitions available across systems. For example, characteristics considered jointly necessary to differentiate adversity from related terms (i.e., trauma, stressor) have included the event to be external to the perceiver (Andras et al., 2007; Gucciardi et al., 2018), contextually meaningful to the perceiver (Fletcher, 2018), statistically associated with changes to the functioning of a system (Luthar & Cicchetti, 2000), and low to moderate in probability of occurrence (Gucciardi et al., 2018). Applicable to the domain of sporting teams, we define adversity as a "temporally bound, low-to-moderate probability event external to the perceiver that represents a major assault on the functioning of a system" (Gucciardi et al., 2018, p. 742).

3.2.2 How Do Individuals Experience Adversity?

As team experiences are borne out of individual perspectives, we briefly consider individuals' experiences of adversity across cognitive, emotional, behavioral, and biological domains. The biopsychosocial model of challenge and threat (BPM; Blascovich, 2013) provides a useful framework for appreciating individuals' experiences of stress and adversity occurring within contexts where people are motivated to perform, that is, when striving to attain a personally relevant and meaningful goal. Within the context of the BPM, individuals experience psychological states of challenge or threat that are characterised by patterns of physiological responses. As these physiological responses occur rapidly, often within the matter of seconds, and can be assessed non-invasively, they can be used to make inferences about two key psychological states that represent opposite ends of a bipolar continuum. Specifically, individuals experience a state of challenge if they appraise their personal resources outweigh the demands of the situations, or a state of threat when they appraise the demands of the situations outweigh their personal resources. As adversity is characterised by unique experiences where situational demands are high, it is unsurprising that cognitive (e.g., intrusive thoughts, shift in attention), emotional (e.g., anger, emotional suppression), physical (e.g., illness, loss of fitness), and behavioral (e.g., performance withdrawal, social isolation) responses tend to reflect experiences of threat states (Howells et al., 2017).

The synergistic links between psychological states and physiological processes captured in the BPM (Seery, 2011) underscores the importance of the biological experience of adversity. The BPM draws on the idea of energy mobilisation via the activation of the sympathetic-adrenomedullary (SAM) and pituitary-adrenocortical (HPA) axes during motivated performance situations (Dienstbier, 1989). In these circumstances, the SAM mobilises energy swiftly via the

quick release and elimination of epinephrine and norepinephrine, whereas HPA axis activation occurs more gradually via the slow release and elimination of cortisol. Although the sudden onset of SAM activation has been outlined as an indicator of "toughened" individuals, the transient half-life within the body of only a few minutes limits its measurement potential (Dienstbier, 1989). Contrastingly, cortisol released via HPA activation has a half-life of over an hour making it amenable to measurement and therefore the preferred latent indicator of the stress response (Seery, 2011). The association between psychological stress and HPA axis activation has been especially prominent in environments with high ego involvement and low predictability and control (Kirschbaum & Hellhammer, 1994). The measurement of cortisol and representation of challenge or threat states has been approached using a range of physiological measures (e.g., urine, blood serum). Offering a real-time insight into the experiences of an individual, previous work has indexed challenge and threat states via four discrete cardiovascular measures (heart rate, ventricular activity, total peripheral resistance and cardiac output; Seery, 2011), whereas short-term (i.e., 24-hour period) accumulation of adversity has been commonly measured via saliva sampling (for a review, see Kirschbaum & Hellhammer, 1994). Hair sampling permits assessments of long-term of cortisol accumulation within the body, whereby 1cm of hair growth reflects approximately one month of cortisol secretion (Stalder & Kirschbaum, 2012). Despite the utility of such measures, a multi-modal approach that combines subjective (e.g., perceptions of stress intensity or appraisal) and biological (e.g., hair cortisol) indices is the preferred approach to capturing stress states following adversity (Weckesser et al., 2019). This multi-model approach to stress measurement is evident in recent work in sport settings (e.g., cardiovascular indices; Moore et al., 2018).

3.2.3 How Do Teams Experience Adversity?

Teams represent two or more individuals working towards a shared objective. As teams encompass multiple individuals, it is common to assume a reductionist perspective in that the collective experience of adversity simply represents an aggregation of these individual experiences (Chapman et al., 2020). However, common within the group dynamics literature is the holistic Aristotelian view that the whole is greater than the sum of its parts (Kozlowski & Klein, 2000). Lower-level characteristics (e.g., individual) emerge temporally at higher-levels (e.g., team) via composition or compilation (Kozlowski & Klein, 2000). Composition describes an isomorphic form of emergence where the individual level attributes combine as a team-level characteristic that is similar in make up to its individual-level constituent elements in that is has a similar meaning across levels. Contrastingly, compilation describes a process of emergence whereby the higher-level property holds a functional resemblance to the lower level construct, yet is distinct in nature from the individual constituent elements. For example, consider the difference between the concepts of collective efficacy and team performance within sport. Collective efficacy reflects composition emergence because it captures the degree to which individual level perceptions of the team's capabilities converge as a collective construct. Contrastingly, team performance emerges via complementary patterns and configurations of diverse individual level components, whereby the unique contributions of individual members interact to produce some type of functioning that is qualitatively different yet meaningful for the collective (e.g., putting together pieces of a puzzle). Distinct differences may be present in the antecedents and mechanisms underpinning the emergence process (Kozlowski & Klein, 2000), so it is important to consider the adverse experience for individual members and the team as a collective, and the processes that underpin emergence within and across both levels.

When it comes to understanding the experiences of adversity within teams, it is important to clarify what we mean by the concept of 'shared'. Shared adversities have been described as a unique event in which the same features or circumstances are experienced directly by all group members (Windschitl et al., 2003). Examples of this conceptualisation of shared adversity include sport teams who experience extreme environmental conditions (e.g., heat), relegation to a lower competition level, or loss within the final of a major competition. Common to each of these examples is the simultaneous experience of the same type of adversity across all individuals of the team. An alternative conceptualisation of adversity experiences within groups is one where the event is experienced directly by one or more members and indirectly by others (Martinelli & Day, 2020). This type of collective adversity experience is important because indirect or vicarious experience of adversity (e.g., witnessing a teammate being physically harmed) can affect people's experiences of stress. Previous work has demonstrated this effect via enhanced levels of cortisol secretion in the observer (Engert et al., 2014). Examples of this conceptualisation of adversity for sporting teams include the loss of a team member due to major injury (e.g., anterior cruciate ligament), witnessing a team member experiencing verbal abuse/racism from supporters, and the awareness of team member losing a close family member. Consideration of these two broad types of experiences of adversity among teams is important because they may affect collective functioning in different ways and ultimately the degree to which functioning may change because of that shared experience. Owing to the limited research in this area, we consider these two types of adversity experiences collectively in this chapter unless otherwise noted.

The cognitive underpinnings of shared adversity. Cognition, which has been defined as the "mechanisms by which animals acquire, process, store and act on information from the environment" (Shettleworth, 2010, p. 4), represents an appropriate starting point for considering

the nature of shared adversity experiences for teams and how they may affect collective functioning and growth. Conceptual work on shared cognition has evolved from a sole emphasis upon shared knowledge structures across individuals towards an interactive model of shared cognition that resides in the observable activities or processes between team members (Cooke, 2015). These dynamic team-level activities or processes are grounded in the context in which teams perform and play out over time. Rather than denying the existence of previously dominant static models, this interactionist approach acknowledges the existence of shared mental models, yet underscores the importance of observing the interactions between team members as markers of team cognitive processing (McNeese et al., 2015).

Knowledge components reflect an important start point for teams when confronted with adversity (Cooke, 2015). For example, organised knowledge structures encompassing representations of both task and team related factors that are shared between team members facilitate team coordination (Cannon-Bowers et al., 1993). Shared mental models, which reflect overlapping maps of the environment between team members, enhance team effectiveness via a highly shared and accurate understanding of task constraints, and the future needs and actions of other team members (Mohammed et al., 2017). The question of interest here is the degree to which team members are on the same page. More immediate in nature, situational awareness is reflective of an individual's knowledge of their direct environment, which includes (a) perceptions of task-relevant environmental cues, (b) comprehension of the information that is collected from that environment, and (c) projection of how such environmental information may vary in the future (Endsley, 1995). Conceptualised at the team level to be a shared interpretation of the immediate context, team situational awareness is deemed important for performance in complex and dynamic environments because members know what is going on around them (Mohammed et al., 2017).

These knowledge components of a team's shared cognitive experience represent important avenues in which to explore the effect of adverse experiences upon future team functioning.

Interactions among team members are critical for team effectiveness (Cooke, 2015). For example, there may be instances where certain teams with limited shared knowledge (i.e., newly formed teams) perform effectively. The ability to compensate for this limited shared knowledge may be explained by the presence of effective process components. Team coordination, which represents decision-making and behavior regulation with respect to the group and task context (Steiner et al., 2017), is built largely around the communicative ability of a team (Cooke, 2015). Notably, the effective transference of adaptive information across team members at the right time is crucial to the development of new knowledge, where integration of new ideas is a marker of cognitive processing at the team level. Knowledge processes (e.g., communication, coordination) within the context of adversity therefore may supplement the exploration of knowledge components and demonstrate observable proxies from which to gain insight into the cognitive aspects of shared experiences.

The emotional underpinnings of shared adversity. Emotions are neurophysiological states characterised by dimensions of valence (i.e., negative or positive) and intensity (i.e., the strength of the emotional experience) (Barrett, 2006). For teams, the linkage and transmission of emotional experiences from one person to another/others (i.e., emotional contagion; Hatfield et al., 1994) plays a pertinent role in future behavior (Barsade, 2002). Affective Process Theory (Elfenbein, 2014) provides a conceptual backdrop for understanding emotional connection via three broad mechanisms. Aligned with the direct experience of adversity, the *shared stimulus* mechanism reflects situations where team members are exposed to the same environmental stimulus and members' interpretations tend to converge over time via interactions and leadership

influence despite likely in their individual experience. Mechanisms indicative of indirect experiences of adversity can occur in two ways: (a) *imitated stimulus*, where one or more individuals encounter a stimulus and then imitate their experiences in ways that resonate sequentially across other team members' (e.g., observing the reaction of a teammate to a severe injury), and (b) *empathetic-through-stimulus,* where an individual becomes aware of an event through interaction with a team member (e.g., discussion with coach about an injury to teammate). The emergence of affective convergence via these three mechanisms, and the valence of such states has been shown to influence team behaviors (e.g., communication, group conflict, cooperation) and performance outcomes (e.g., task performance, self-related group performance, service quality appraisals) among various types of teams both inside and outside of sport (e.g., Barsade et al., 2018; Barsade, 2002; Totterdell, 2000). In essence, the dynamic nature of the affective state of a team in response to adversity holds influence upon important group processes and outcomes, and as such represents an important mediator of team functioning within such contexts. Understanding the conscious and subconscious mechanisms linking group emotions and the moderators of this dynamic state (e.g., leadership chacteristics; Johnson, 2008) represents important considerations for understanding team functioning following adversity.

3.2.4 What Might Changes in Functioning Look Like for Teams?

Team functioning might be affected negatively, positively or both across differing facets of team functioning following adversity exposure. In terms of deleterious effects, teams have been shown to lose an awareness of team perspective (Driskell et al., 1999) or to make poorer decisions under heightened levels of stress (Cannon-Bowers & Salas, 2001). The concept of growth is one area where teams might experience positive changes from adversity exposure. At intrapersonal and interpersonal levels, growth has been defined as "positive psychological changes experienced

as a result of the struggle with traumatic or highly challenging life circumstances" (Tedeschi et al., 2018, p. 3). Fundamental to this definition is the nature of change as opposed to enhancement of attributes. This definition distinguishes growth from resilience, where resilience is observed in the trajectory of functioning of a system rather than the changing nature of a systems' attributes. The attribute of growth reflects the functional-descriptive model of change in which individuals' fundamental assumptions regarding the world are challenged and constrained to change by adverse events over time, with internal (e.g., emotional distress, core beliefs) and external factors (e.g., social support, proximal and distal social-cultural dimensions) determining subsequent growth (Tedeschi et al., 2018). Importantly, it is inappropriate to infer collective growth from individual member growth because higher (i.e., macro) level properties cannot be assumed from the aggregation of individual (i.e., micro) level elements (Tedeschi et al., 2018). For example, individual member enhancements in motivation or coping strategies may affect collective behaviour negatively because it disrupts synchronicity between members. This disparity demonstrates the need to observe changes in functioning at the team level (e.g., relationships between members) and the potential for individual level growth to foster or undermine team growth.

Joseph and Linley's (2005) Organismic Valuing Theory of Growth (OVT) mirrors several of these characteristics, and has been the modal theoretical model used within studies of growth in competitive sport (Howells et al., 2017). Within the context of OVT, individuals' predisposition towards growth occurs via the changing of belief systems one holds for the world that occur following adversity (Joseph & Linley, 2005). This definition also reflects the common conceptualisation of growth as a process of change characterised via indicators of intrapersonal (e.g., self-efficacy), interpersonal (e.g., development of relationships), and physical (e.g., enhanced

performance) functioning (Howells et al., 2017). When considering growth within teams, it seems pertinent to consider necessary characteristics of growth as an emergent state or outcome characterised by (a) positive change at the team level in the quality or value of a team properties (e.g., shared belief systems, relationships, mental models, team philosophy) or activities (e.g., cooperation, coordination); (b) prolonged or robust change over a period of time following adversity and relative to the quality or value prior, and (c) change relative to the quality or value prior to the onset of adversity. Interested readers are referred elsewhere for a discussion of similar themes in relation to the multilevel nature of team resilience (Gucciardi et al., 2018).

The input, mediator, output, input (IMOI) model of team effectiveness (Ilgen et al., 2005) offers a structured yet flexible template of what collective functioning might look like for team following adversity. Inputs represent those conditions that exist prior to team performance, which can encompass individual (e.g., personality), team (e.g., composition), or context (e.g., organisational constraints) factors. Mediators include the ways by which inputs are engaged, integrated, and translated into valued outcomes via dynamic interactions among team members (e.g., communication). Outputs refer to the task and non-task consequences of the dynamic interactions among team members (e.g., learning, performance effectiveness). Finally, Ilgen et al. (2005) described the feedback-loop nature of team development and indicated the need to consider outputs as future inputs when assessing team-related constructs. This aspect may be important when assessing collective functioning following adversity to allow for an understanding of how over time outcomes lead in to future inputs and mediators to contribute to future outcomes (e.g., prolonged growth). Linking this framework to future explorations of team functioning within a sporting context requires an understanding of the key inputs, mediators, and outcomes underpinning this construct and their interaction.

3.2.5 How Might Adversity Promote Growth in Sport?

Benefits of shared experiences of adversity. Shared experiences of adversity may hold important functional bearing on the development of team affect and cognitive inputs to functioning. Notably, shared adversities enhance the effective teamwork capability of groups without intervention (J. C. Turner et al., 1984), with experiences of adversity proposed to stimulate processes of growth (Tamminen et al., 2013). Benefit finding among teams fosters relationships with others (Garrison & Sasser, 2009), matching the common identification of enhanced group cohesion following shared adverse experiences (J. C. Turner et al., 1984). As examples, shared experiences of pain in groups within laboratory settings enhances trusting interpersonal relationships between members (Bastian et al., 2014), whereas in sport an injury to a star player may bring teammates closer together (Bloom et al., 2003).

Underpinned by Social Identity Theory (Tajfel & Turner, 1979), shared adversity experiences are likely to facilitate team cohesion through enhanced perceptions of positive distinctiveness following events and through perceptions of a shared fate, meaning, and affective reactions that are ascribed to the event (Pollock et al., 2003). This internalisation of social identity within teams promotes interpretations of such experiences as ‘our’ problem instead of ‘my’ or ‘your’ problem. Internalising meaning via social identities fosters communal coping strategies that promote adaptive team functioning over deleterious processes (Leprince et al., 2018). Defined as “the cooperative problem-solving process salient in coping with both individual and collective stressors involving [sic] the appraisal of a stressor as our issue and cooperative action to address it” (Lyons et al., 1998, p. 579), communal coping strategies may reflect important transitionary processes for future functioning or an outcome of growth in itself following the immediate experience of adversity should pre adversity coping strategies be enhanced in some way (Howells

et al., 2017). Communal coping strategies in sport include problem-focused communal efforts (e.g., information sharing, refocusing, back to basics), relationship-focussed coping (e.g., motivational support, social bonding), communal management of emotions (e.g., interpersonal emotional regulation, reassurance), and communal goal withdrawal (e.g., task disengagement, venting emotions) (Leprince et al., 2018). An integral communal coping strategy triggered by adversity is systematic reflection upon experiences. For individuals, stressor reflection enhances awareness of current capacities and limitations (Crane et al., 2019). At the team level, reflections may clarify the capacities and limitations of the collective unit, and enhance awareness of the strengths and weaknesses of team members. Thus, purposeful reflections of shared experiences of adversity may promote the salience of the social identity within teams, enhance the cohesiveness of a group, and maximise the likelihood of effective strategies being adopted following such experiences to promote team functioning.

Training and shared adversity experiences. Team development interventions foster team competencies, processes, leadership and interactions that are critical to collective effectiveness (Lacerenza et al., 2018). Of these approaches, team competencies or teamwork expertise are key inputs to established teams that may benefit from training within the context of adversity. Team training has been defined as "a formalised, structured learning experience with preset objectives and curriculum that target specific team competencies" (Lacerenza et al., 2018, p. 519), with previous work showing the advantageous nature of training prior to stressful experiences (Driskell et al., 1999). Several specific team training strategies have been outlined including coordination training, cross training, and stress exposure training (C. S. Burke et al., 2004), with training within the context of adversity holding three overarching benefits (Driskell et al., 2008). Firstly, training within the context of shared adversity has been proposed to enhance a team's familiarity with the

performance environment. Developing a shared understanding of effects of adversity upon environmental and task constraints, teammates' behaviors under such circumstances (i.e., shared mental model), and the affective state of the team, with training in the context of adversity has been shown to generalise to novel, unexperienced adversities experienced by teams (Driskell et al., 2001). Secondly, adversity may foster the development of coordinative team performance strategies and skills to meet the demands of this context. For example, teams may adjust their playing strategy following the loss of a star performer to injury. Shared adversity experiences may also enhance creativity among team members; thus, applying training techniques within the context of adversity may facilitate novel solutions to problems (Bastian et al., 2018). Finally, grounding training in adversity may enhance the collective efficacy of a group when they encounter similar experiences in the future and the collective efficacy of the group more generally (Friedland & Keinan, 1982). For example, teams who experienced and successfully overcame the adversity of an unexpected managerial change may propel their confidence to a higher level when it comes to overcoming similar hurdles and subsequent adversities in future. In sum, experiences of adversity may add significant value to training programs where performance is incumbent (e.g., elite stage) through the development of core knowledge, skills, and affective processes and may be a prerequisite to desirable functioning following these experiences. However, it is important to adopt caution and awareness of the moral implications of such training. The relaying and sharing of previous adverse experiences has the potential to result in re-traumatisation, whereas sudden experiences of high severity adversity may also result in undesirable outcomes. Drawing a line in the sand ultimately requires a delicate balance of care, control, and progression (e.g., athlete driven).

3.3 Conclusion

There is intuitive and practical appeal to the idea that adversity experiences can promote collective functioning and growth among sporting teams. However, little systematic empirical or theoretical work has addressed this proposition directly. In this chapter, we reviewed research and theory from related fields with the view to shed light on several key questions that might provide a platform from which to consider the nature of this proposition and guide future work. Subsequent chapters within this thesis seek to further answer this proposition through detailed examinations of the adverse experiences triggering resilience emergence across collective systems. It is also essential that future work clarify the multilevel, temporally dynamic nature of adversity experiences for collective functioning.

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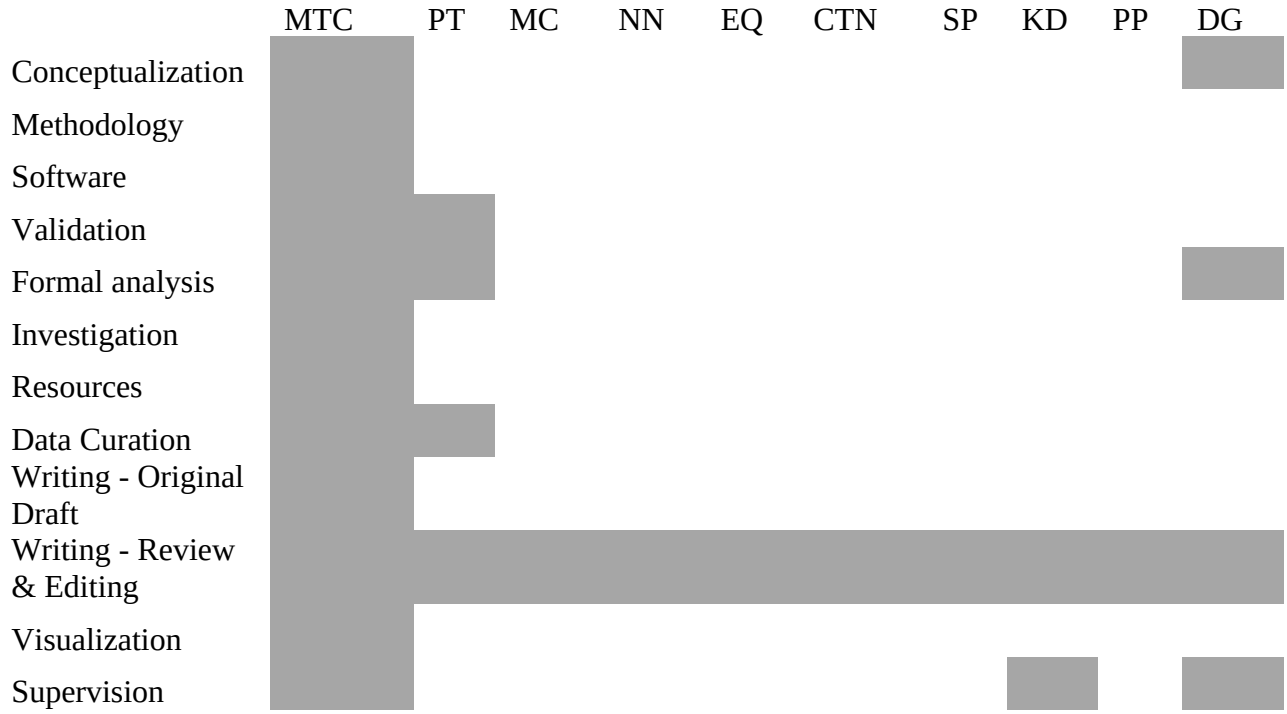
Author Contributions.

Chapter 4



Chapter 4: A Longitudinal Investigation of Team Resilience Perceptions and Experiences of Military Personnel Selected for Elite Military Training

4.1 Introduction

Teams represent critical building blocks of organisational success across many industries (e.g., health, safety, information and technology; Salas et al., 2018) who are often exposed to experiences of major stressors or adversities that can threaten their functioning and ability to achieve objectives. For example, a sales team may experience a 'performance slump' in revenue following the loss of a key member to illness. Sustaining or bouncing back relatively quickly to optimal levels of collective functioning following adversity exposure, that is, displaying emergent team resilience, has intuitive and practical appeal (Gucciardi et al., 2018). Scholarly work on team resilience has gained traction in recent years (for reviews see Chapman et al., 2020; Morgan et al., 2017), resulting in enhanced understanding of key determinants and the processes by which such factors foster team resilience emergence (e.g., Bowers et al., 2017; Gucciardi et al., 2018; Stoverink et al., in press). Nevertheless no empirical research has yet been directed towards examining the validity of these conceptual expositions of hypothesised determinants and processes with teams undergoing stressful experiences. We addressed this gap by conducting a longitudinal, qualitative investigation of team resilience emergence with personnel selected for elite military training from a larger pool of candidates.

4.1.1 Team Resilience Emergence: The Whole is Greater than the Sum of its Parts

Scholarly work on team resilience originated approximately 15 years ago (Chapman et al., 2020). As might be expected for a new area of research, scholars have defined team resilience in varying ways (e.g., capacity of a team, Glowinski et al., 2016; psychosocial process, Morgan et al., 2013). In line with an input-process-outcome framework (Ilgen et al., 2005), most

contemporary scholars define team resilience as an emergent property of a team's inputs and processes (Bowers et al., 2017; Hartwig et al., 2020). We subscribe to the definition of team resilience as "an emergent outcome characterised by the trajectory of a team's functioning, following adversity exposure, as one that is largely unaffected or returns to normal levels after some degree of deterioration in functioning" (Gucciardi et al., 2018, p. 735). Defining team resilience as an emergent outcome alleviates limitations of capacity and process-based definitions, such as a reliance upon the inferred positive functioning of a team in the context of adversity and ambiguity surrounding the necessary and sufficient characteristics distinguishing related concepts (e.g., adaptation). This definitional perspective aligns with recent calls to reconceptualise resilience as an emergent outcome of a system's trajectory of functioning (e.g., Kalisch et al., 2017) and, therefore, represents the definitional backdrop for our work.

The concept of emergence is central to theory and research on team-level constructs, including team resilience. Emergence is a bottom-up process, whereby micro-level elements of a system (e.g., characteristics of individuals) and the environments in which they are situated interact to produce constructs that exist at higher levels of the system (e.g., collective performance; Klein & Kozlowski, 2000). It is important to consider three key characteristics of emergent models when applied to the meso-structure of teams (Cronin et al., 2011; Morgeson & Hofmann, 1999). First, the nature of the emergence process and associated outcomes is informed by characteristics of individual members (e.g., cognitive ability), the collective (e.g., group norms), and the context in which they are embedded (e.g., organisational policies). This consideration will prompt us researchers to consider multiple factors across multiple levels of the system simultaneously, so as to "understand the whole and keep an eye on the parts" (Kozlowski & Klein, 2000, p. 54). Second, models of emergence are best conceptualised as process

orientated in that they capture the manner by which individual components of the system interact to generate emergent outcomes at the team level. Focussing upon team processes will also us to refine conceptual framework, to appreciate potential intervention targets to foster or maximise emergent outcomes, and incorporate revisions and extensions to theoretical perspectives of team concepts. Third, the nature of emergence requires time to develop. In this sense, conceptualising team resilience as an emergent phenomenon demands movement away from cross-sectional snapshots of key factors at a single point in time towards longitudinal designs that provide opportunities to shed light on the temporal dynamics. Considered collectively, therefore, it is essential that efforts to study team resilience as a dynamic, multilevel phenomenon incorporate knowledge of individual- and team-level factors that exist prior to the emergence process with information regarding the interactional dynamics that pull together these components in ways that produce meaningful patterns or configurations at the team level.

In taking stock of past theory and research, Gucciardi et al. (2018) proposed a multilevel conceptual model of team resilience emergence that has the potential to inform future work on this concept. The backbone of this conceptual model is the definition of team resilience as an emergent outcome noted above. The core elements of this model are captured via nine propositions: (P1) team resilience outcomes emerge from configurations of knowledge, skills, abilities and other characteristics of team members that are relevant and accessible to the teams' task-related functioning (i.e., human capital resources: Ployhart et al., 2014); (P2) these human capital resources are tied to the context of adversity and as such adversity acts as a trigger for such configurations; (P3) team members' situation awareness underpins their ability to recognise and respond to adversity through enactment of human capital resources; (P4) team resilience emerges via process mechanisms (behavioural, cognitive and affective) throughout and following

the adverse events; (P5) group norms hold an important role as a mechanism of emergence, dictating how human capital resources are coordinated at the team level; (P6) the formation of group norms and subsequent coordination are bolstered by the leadership of the team; (P7) the degree to which team members internalise membership of a team (i.e., team identification) acts as a moderator of the group norms – coordination association; (P8) collective planning and reflection develops shared mental models that moderate the influence of human capital resources on team coordination; and (P9) positive shared experiences performing in the face of adversity foster a collective belief to demonstrate effective functioning under future experiences of adverse events. Subsequent conceptual (Hartmann et al., 2020; Hartwig et al., 2020; Stoverink et al., in press) and empirical work (e.g., Karlsen & Berg, 2020; Talat & Riaz, 2020) has supported several elements of this multilevel model of team resilience emergence. However, the usefulness of this model in its entirety as a theoretical explanation of key conceptual building blocks and their interrelations for understanding the how and why team resilience emergence remains empirically untested. Addressing this empirical gap in the literature will provide clarification regarding the critical and potentially unobserved features of current theoretical conceptualisations of team resilience emergence.

4.1.2 Theoretical Contributions

Against this conceptual backdrop, we offer three key theoretical contributions to the literature on team resilience. First, we explore within a military context the practical relevance of these nine core propositions and their integration for characterising team resilience emergence (Gucciardi et al., 2018). This contribution is important because these theoretical propositions of team resilience emergence were assembled from literatures fragmented across diverse scientific disciplines (e.g., psychology, organisational behaviour) and occupational contexts (e.g., Defence,

medical). In so doing, we review the scientific utility of a theoretical exposition of team resilience emergence (e.g., conceptual boundaries) via an appreciation of the degree to which the conceptual building blocks and their interrelations reflect organisational realities (Hambrick, 2007). This contribution also has broader implications for the field of team resilience; scholars have proposed several conceptual expositions of team resilience in recent years (e.g., Hartwig et al., 2020; Stoverink et al., in press), despite a limited body of empirical work (Chapman et al., 2020), that has signalled the importance of factors such as situation awareness (Waring et al., 2018) and leadership (Van der Kleij et al., 2011), there is an urgent need for further examinations of the practical relevance of theoretical expositions of this phenomenon.

Second, we provide a contextually and temporally rich description and interpretation of team resilience emergence that sheds light on the interplay between the conceptual building blocks and how they unfold over time within the context of high-stakes military training characterised by substantial demands and challenges spanning several months. Context is an essential feature of theory development and evaluation in the organisational sciences as it outlines an important boundary condition of theory (Busse et al., 2017), yet context is something that is often overlooked and therefore has the potential to perpetuate erroneous or incomplete theoretical expositions of organisational phenomena (Johns, 2006; Whetten, 2009). This contribution is needed because of the reliance in past work on cross-sectional snapshots of team resilience where protective factors and processes are considered largely in isolation from the stressors or adversities that trigger the dynamic emergence (Chapman et al., 2020). Approaches to exploring team resilience that incorporate longitudinal approaches allow insight into the processes of emergence, which are focal to informing future intervention approaches. High-stakes occupational domains such as the military, emergency services, and medicine represent

ideal contexts in which to study team resilience emergence because adversity is prevalent in both training and operational contexts. We focus on elite military teams in the current study because training typically prioritises the systematic input of adversity for testing the capabilities of systems (e.g., individuals, teams). The key question of "resilience to what" can therefore be examined with precision and consistency across multiple phases of a training program. Within the context of the current study, therefore, these stressors and adversities include expectations of meeting high performance standards, ongoing assessment by superiors, high risk of mission failure, performance of highly complex and dangerous tasks in adverse environments, and daily tests of physical and mental abilities.

Third, we focus on newly formed teams at the early stage of their life-cycle to afford understanding of the critical inputs and formative processes at play during team resilience emergence. Teams vary with regards to salience, importance, and value of team characteristics (Benishek & Lazzara, 2019). Teams may vary in their nature of (i) skill differentiation (i.e., degree of specialisation of human capital resources that each member contributes to the collective), (ii) authority differentiation (i.e., distribution of decision making across the team), and (iii) temporal stability (i.e., degree of shared experience and likelihood of ongoing composition; Hollenbeck et al., 2012). Team type considerations for team resilience emergence are inevitably influenced by the team's development stage (Gersick, 1988). Research on team resilience thus far has typically studied mature or established teams (Furniss et al., 2011; Morgan et al., 2015) often in the absence of specific knowledge of adversity events. Newly formed teams are ideal for examinations of emergent phenomena as opportunities to observe emergent processes may be rife within the early stages of the life-cycle, relative to established teams where these processes may have already occurred (Allen & O'Neill, 2015). Further, the relatively short

(e.g., multiple weeks) normative lifecycle of military teams aligns method with practical realities, therefore enhancing the utility of prospective findings. Thus, observation of newly formed teams during their early stages of formation represents a unique vantage point upon which to explore team resilience emergence and to provide an insight into the amount of time required for this emergence process to occur that would be largely inaccessible within established teams.

4.1.3 Synergising Concept and Method

Maximising synergies between concept and method are essential for knowledge advancements on team resilience emergence. There are two important considerations that can be gleaned from the definition and conceptualisation of team resilience as an emergent outcome. First, it is apparent that team resilience emerges over a period of time and is relative to normal or healthy levels of team functioning. Therefore, longitudinal study designs are essential to generating insight into this process of emergence via a trajectory of functioning, rather than the modus operandi of static cross-sectional approaches that provide limited insight into temporal dynamics (Chapman et al., 2020). Second, without an awareness of the presence and nature of adversities confronted by teams, emergent resilience cannot be inferred to have occurred. It follows that the assessment of adversities experienced by teams is incumbent to observe the emergence of team resilience and to pinpoint the important inputs and processes underpinning this outcome. Adherence to these recommendations will maximise the merging of theory, operationalisation, and method within future work by enhancing the ability to clearly compare and contrast study findings. Methodologically, therefore, we align concept and method via a longitudinal approach that encompasses exposure to multiple adversities and therefore insight into the emergence process of complex systems (e.g., lessons learned from past adversity

experiences and their projection forward). We also broaden the focus from case studies of single teams in previous research (e.g., Morgan et al., 2013, 2019) to multiple teams who are exposed to similar types of adversities; this approach offers insights into a wider scope of experiences and perspectives on team resilience emergence. In so doing, we aimed to explore the experiences and perspectives of personnel selected for elite military training from a larger pool of candidates regarding team resilience emergence, specifically with regard to two training courses across an approximately 4-5 month period within an 18-month training program.

4.2 Materials and Methods

4.2.1 Philosophical Standpoint

Under the umbrella of an interpretivist approach, we adopted a natural inquiry (Rodwell, 1987) paradigm whereby our understanding of participants' perspectives and experiences was grounded in socially and experiential personal interpretations of our team (Malterud, 2016). Our ontological view is represented by a relativist approach in which reality is multiple and indistinguishable from people's subjective experiences of the world (Nicholls, 2009). To understand the subjective nature of reality and multiple truths, we adopted a constructionist epistemological perspective, whereby knowledge was acquired through the co-development of meaning between the participants, researchers, and their relationship in a social interaction (Malterud, 2016). Inherent within this approach is the notion of research reflexivity over objectivity, and an acknowledgement of the researchers' influence within the research process. In other words, the findings reported here represent our interpretations of the participants' subjective experiences of reality. In line with a naturalist inquiry (Rodwell, 1987) the overarching aim is to detail an idiographic area of knowledge in a way that describes the cases through reflection upon past propositions (Gucciardi, et al., 2018).

4.2.2 Sample and Context

We conducted this study within the context of elite military training, namely a sample of Australian military personnel who were undertaking training to become qualified Special Forces operators. To be eligible for this training, candidates must first complete a multi-week selection course that tests their physical and mental abilities and replicates the demands of operational environments. The pass rates on these courses can be quite low (Gucciardi et al., 2015; e.g., in the vicinity of 20%; Gucciardi, Lines, et al., in press) highlighting their demanding nature. Consequently, each year only a small and select ('elite') group of personnel will progress onto Special Forces training. During the training phase, candidates receive training in skills such as patrolling, roping, demolitions, weapons and tactics, and parachuting. This training is conducted over approximately 18 months during which time candidates must demonstrate the required performance standards on all components in order to pass the program and qualify for entry into Special Forces units.

During the 18-month training program, candidates must demonstrate proficiency in a broad range of tasks such as basic patrolling, roping, parachuting, close quarter combat, demolitions, signals, and combat first aid. The course requires individuals and teams to learn complex skills within a finite period and demonstrate these skills during activities that are representative of special operations missions. Throughout this training, candidates are exposed to a variety of acute and chronic stressors and adversities including having to: (i) assimilate new information when fatigued; (ii) acquire new skills within a defined period; (iii) make decisions and complete tasks under time pressure; (iv) meet performance standards at all times; (v) experience constant uncertainty about whether one will be selected at the end of the course; (vi) work in austere conditions (e.g., extreme weather, high altitude, variable terrain, minimal food

and sleep) for extended periods; (vii) perform at a high level with limited opportunities for rest and recovery; (viii) be away from home/family; and (ix) complete tasks involving major safety risks (e.g., firing live ammunition). Collectively, exposure to such different adversities (e.g., acute, chronic, intra-personal, interpersonal, environmental), situated within a program that requires individuals to work in teams on tasks that emulate real-world job demands, makes the course a useful context to study team resilience emergence. All candidates who were panelled on the training program were invited to take part in the study as they were best positioned to offer insights into their lived experiences of the training demands and share their perceptions of how team resilience emerges over time. We maximised diversity of responses by ensuring that all candidates had the opportunity to take part. This sampling approach offers richer insights than would have been achieved by capturing the views of a cross-section of trainees, or the perceptions of training instructors or support staff not directly involved in the course.

We focused on military personnel who were completing elite Special Forces training because their program represents an ideal context for the purposes of the current study in three ways. First, teams are critical to Special Forces missions; typically, personnel will operate in small teams of 4-8 members who work together for extended periods and often without direct support to achieve mission objectives. The training program focuses on identifying individuals who have the potential to excel as part of a small team and equipping them with the requisite knowledge, skills, and abilities to do so. Second, team composition within the Special Forces training program is dynamic, whereby teams are newly formed towards the start of each training course, in part due to membership changes throughout the overall 18-month program (e.g., candidates removed for not meeting the required standards, teams strategically recomposed for assessment purposes). This contextual feature meant team composition changed considerably

between each data collection point, yet teams were recomposed of members of the same overarching training cohort and changed minimally between courses. These changes in team composition afforded an opportunity to explore the development of shared realities after multiple experiences of forming new teams and thus experiencing 'swift' resilience emergence within the boundaries of a specific organisational context. Third, adversity is a characteristic feature of the training program for the entire 18-months; candidates must complete a variety of physically and mentally demanding scenarios (individual and team-based) that are indicative of those required during actual special operations missions. Throughout the course, these adversities vary in nature (e.g., interpersonal, intra-personal, and environmental), duration (e.g., acute vs chronic), and intensity (e.g., high vs low physical loads) at different times across the training program. Although adversity is present throughout the entire course, our discussions with the training staff identified two critical points in the program which they believed were ideal opportunities to collect data for our study. These two points were at the completion of the patrol course and close quarter battle training modules; these two were specifically chosen because they involve having to learn complex skills, working effectively as a team, operating in austere and dangerous conditions, and are typically regarded by training staff as the more challenging courses for candidates to perform well on. These 'adversity touchpoints' (i.e., expected events perceived to threaten functioning) provided a necessary backdrop upon which to generate a contextualised understanding of the temporal dynamics of team resilience in an ecologically rich (i.e., examination of frequent, naturally occurring adversities) way. We sampled participants for this study from one of the annual intakes of candidates undergoing Special Forces training within the Australian Defence Force. Our research team tracked these teams for 12 months prior to data collection as part of a larger project (e.g., self-reported surveys, physiological assessments of

stress) and so were familiar with our research team and the nature of the work. The majority of personnel from this annual intake participated in this study (N = 32 males; M_{age}=26.25±2.62 y); these personnel made up eight and seven teams at time point one and two, respectively. Participants' prior experience in Defence varied (6.87±2.28 y) and included non-officers (e.g., Corporal, Warrant Officer; *n*=27) and officers (e.g., Captain, Major; *n*=5) ranks.

4.2.3 Procedure

We received approval for the study procedures from a nationally accredited human research ethics committee prior to data collection. All individuals provided informed consent to participate in this study. We adopted a longitudinal qualitative design to explore shared perceptions of team resilience via group interviews, and the temporal dynamics of these perceptions at two points, 3-months apart, within the context of an 18-month military training program. In total, we conducted seven group interviews across time point one (4 focus groups, 32 participants) and two (3 focus groups, 24 participants). We chose these two points in the training program, not because of the time interval, but because they occurred immediately after two training periods of 8-10 weeks in duration in which candidates were assigned to teams and exposed to the most 'significant' adversities as defined by training staff. Accordingly, these courses were deemed to contain the necessary richness and degree of challenge to potentiate key transformations (i.e., emergence) within teams. We collected data following two separate training courses to permit explorations of the evolution of retrospective perspectives regarding team resilience emergence (Kozlowski et al., 2013). The initial wave of data collection occurred following participants' first significant exposure to a team-based training course within their 18-month program, prior to which activities primarily involved the upskilling of individual based competencies. The focus groups were conducted in a seminar room located on a military base.

The composition of these focus groups varied at each time point for logistical reasons, though each group typically included personnel from 1-3 teams (4-15 members); we always included personnel from the same teams for logistical (e.g., personnel from the same team performed training activities on the same schedule) and substantive reasons (e.g., personnel are best positioned to comment on collective dynamics in their own team). Focus group discussions, which ranged from 30 to 42 min (35 $\pm$ 4 min), were conducted using the same semi-structured interview protocol that was informed by conceptual work on team resilience emergence (Gucciardi et al., 2018; see supplementary material). The main differences in the focus group discussions between time points related to the types of probes we used to encourage participants to consider the temporal dynamics (e.g., how has [response] changed since last time we spoke?). We guided the conversation to examine participants' perspectives of adversities experienced during the training program and expectations of future adversities in the program, and key individual- (e.g., personal resources) and team-level (e.g., coordination, norms) determinants of team resilience emergence. Nevertheless, we welcomed 'participant driven' deviations from this schedule to maximise authenticity and leverage group dynamics within the discussion. Due to the collective nature of the conversation (i.e., presence of multiple participants), the interviewer (acronym blinded for peer review) took a facilitator approach where possible to allow group conversation to dominate and opportunities for agreement or conflict to occur (Bohnsack, 2004). Audio recordings of focus group discussions were transcribed verbatim prior to data analysis, with a total of 46,269 words spoken.

4.2.4 Data Analysis

The lead author conducted the data analysis, with the support of a senior member of the team who has substantive expertise on team resilience and contextual knowledge of the military

unit and Defence (see Sparkes & Smith, 2014). Both analysts met virtually and in person on several occasions during the data collection and analysis process to discuss critically and reflexively their interpretations of the participants' discourse and determine how best to illustrate the social construction of these unique perspectives. We adopted an abductive approach to data analysis (Sparkes & Smith, 2014), whereby we examined participants' perspectives in accordance with the guiding conceptual framework of team resilience emergence (Gucciardi et al., 2018), yet remained open to new themes or ideas that may disconfirm these preconceptions or reflect them in unique ways. Although we encouraged open discussion in response to questions and did not seek to establish consensus surrounding participant answers, no disagreements or conflicting responses were observed within focus groups. Within this abductive approach, data was initially analysed in an inductive method whereby coded data were organised into subthemes. Deductive analysis was adopted to inform the development of main themes using the focal theoretical model (Gucciardi et al., 2018) as a guiding template rather than a prescriptive structure. This allowed for the inductive development of main themes that were outside the scope of this template.

We initially coded data for all focus groups (i.e., cross-sectional) in line with Braun and colleague's six stages of thematic analysis (Braun et al., 2016), namely: (i) familiarisation with the data (i.e., reading and re-reading of interview transcripts and audio recordings), (ii) generating initial codes (i.e., creating basic, data and theory driven nodes), (iii) searching for themes (i.e., grouping of initial nodes through the use of thematic maps), (iv) reviewing potential themes (i.e., collaborative checks of the codes, themes, and entire dataset), (v) defining and naming themes (i.e., identifying the essence and boundaries of each theme), and (vi) producing the report. Each of these steps was conducted with the use of NVivo software (QSR International

Pty LTD, 2010). Consistent with a reflexive thematic analysis approach, we considered both semantic (i.e., explicit meaning from expressed statements, akin to the tip of an iceberg above water) and latent (i.e., implicit meaning via interpretation of ideas and meanings, akin to the base of an iceberg below the water level) details for the development of themes (Braun & Clarke, 2019). In this sense, we created themes to "reflect patterns of shared meaning underpinned or united by a core concept" that characterise participants' experiences and perspectives on an interpretive story concerned with team resilience emergence (Braun & Clarke, 2019, p. 5).

In line with the recurrent cross-sectional approach to longitudinal analysis of qualitative research (Grossoehme & Lipstein, 2016), we then compiled data for each overarching theme across individual matrices to analyse the frequency and nature of focus group responses across time. In so doing, we mapped themes constructed within the cross-sectional analysis across time points for the full cohort of participants using the 'query' function within NVivo (see Appendix C). From these matrices we inductively constructed themes from the raw coded information that reflected the nature of data at each time point. We then examined patterns of consistencies or changes between the two phases of data to create temporal themes that characterise the dynamics of perceptions across time. Particular attention was also paid to the occurrence and absence of information mentioned at time points as potential indicators of the emergence or dissipation of important factors. This approach was adopted to allow insight into the evolution of participants' perceptions surrounding team resilience emergence following repeated experiences of performing within newly formed teams who were exposed to adversity. Given the conceptual inconsistency between reflexive thematic analysis and saturation (Braun & Clarke, 2021), we relied on the concept of information power (i.e., richness of participant knowledge) as the most suitable demonstration of the sufficiency of our analysis.

4.2.5 Methodological Quality

Consistent with a relativist ontology, we adopted several criteria to judge the quality of the research (S. Burke, 2016). First, the worthiness of the topic was informed by a recent review of the literature (Chapman et al., 2020) and conceptual exposition of team resilience emergence (Gucciardi et al., 2018), and priorities of the key stakeholder (Commonwealth of Australia, 2016), such that our work reflected a nexus between substantive and practical importance. The former also ensured that our findings would offer a substantive contribution in terms of a contextualised understanding of team resilience emergence within a military environment. Second, rigor was maximised through the adoption of a longitudinal sampling approach, and the uniqueness and relevance of the sample for the purpose of the study (Tracy, 2010). In this sense, the repeated collection of data across time within a context replete with naturally occurring adversities provided a sufficient 'critical mass' of data to provide a valuable contribution to the literature (Tracy, 2010). Third, we addressed credibility via ongoing engagement with participants and other key personnel in the unit (e.g., training staff) in the 12 months prior to the first focus groups, command approval and support for the project, and team composition (e.g., mix of academic and Defence scientists). Finally, reflexivity is a logical contrast to objectivity and holds important value in the sincerity of qualitative research (Malterud, 2016). This sincerity was developed through a reflexive awareness of personal assumptions, values, and commitments of the researchers involved in data collection and analysis. In particular, as the researcher principally responsible for analysis I recognised within initial interviews my preconceptions regarding the exaggerated nature of military adversities (e.g., norm of enemy contact). As a result, I adapted my use of probes within focus groups to explore subtle but contextually relevant adversities (e.g., absence of feedback from instructors). One co-author acted as "critical friend"

(Sparkes & Smith, 2014, p. 182) for the lead analyst, with the view to evaluate the data collection and analysis iteratively, and provide a sounding board during the analysis (e.g., challenge assumptions or interpretations, offer alternative viewpoints).

4.3 Results and Discussion

4.3.1 Contextual evidence of emergence

We based our inference of team resilience emergence across the two training courses according to two key pieces of contextual information. First, participants discussed the progressively challenging nature of the two training courses, and the requirement for successful teams to maintain or quickly recover functioning in response to adversities embedded within the courses:

> Your training just accumulates and your tasks get more complex. You're going from like a zero skill level at the start when this patrol is all together to more complex...towards the later stage of the course, then things were getting a bit more hectic to that, some of those variations [in performance between teams] came out. [Time point 2]

In this sense, team members seemingly demonstrated to us a perceived growth in capacity to face stressful situations following the successful completion of courses. The competitive nature of these training courses also meant that teams who insufficiently demonstrated resilient performance following exposure to adversities were likely to be unable to complete training courses and likely incurred the removal of group members from the course. In other words, our sample were ultimately successful in utilising collective resources to navigate the individual and collective challenges embedded within the course. This emergence is evident in the following participant reflections on their progression through the course:

> [We ended up performing] probably pretty well. It follows that framework of forming, storming, performing norming, it's similar to that framework. Guys will get together, and start to understand how each other works and how you fit into that team. And as you work more in that team you understand each other's strength and weaknesses and where you fit into that team. [Time point 2]

> From the training leading up to it, we just dealt with stressors the whole time so that we've kind of grown accustomed to it a little bit, that's helped them get through. Because, like it's not really that bad. I know we can dust this off and keep going if we mess up. [Time point 2]
>
> Most of the things we've been able to come across and deal with have been sort of stressors. Maybe major stressors, but I don't think anything has been a complete disaster [with regards to our performance], or a complete breakdown that we haven't been able to overcome it relatively quickly to date. [Time point 1]
>
> I don't think there's been an adversity we've faced so far that's been so overwhelming that we haven't been able to cope. We've been able to work together and overcome it almost pretty instantaneously and then crack on. Work out the causes for it so it doesn't happen again, and then carry on. [Time point 1].

Second, participants paid attention to the need for teams to demonstrate resilient trajectories of functioning. Participants discussed their experiences of witnessing teams unable to progress through the course when these trajectories were inadequate:

> Yeah, in other groups, there was definitely times that they were double-checked (i.e., reprimanded or 'looked after' or taken away from the course) to a point if they weren't [performing successfully]. [Time point 2]

These participant perspectives, coupled with the contextual understanding of the content and assessment of course performance, demonstrates support for the assumption that collective functioning within these newly formed teams resembled contextually desirable trajectories following exposure to progressive adversities. . In line with recent conceptual pieces (Gucciardi et al., 2015; Hartwig et al., 2020; Stoverink et al., 2020), these perspectives also shed light on the contextually specific nature of trajectories characterising resilience. That is, one that is largely unaffected (i.e., withstand) or an almost immediate return to desired functioning (i.e., bounce back) (Galatzer-Levy et al., 2018; Gucciardi, Lang, et al., in press).

We created five overarching themes from our thematic analysis of the two waves of interview data. These themes captured the following commonalities in the participants' experiences and perspectives of team resilience emergence: (i) adversity is an enduring, shared

experience of an event; (ii) individuals recognise adversity through physiological and/or behavioural states; (iii) social resources bind together individual self-regulatory capacities when confronted with adversity to support team functioning; (iv) shared experiences of adversity and collective structures strengthen social bonds and mental models needed for team resilience emergence; and (v) behavioural processes and shared states are how collectives turn individual and team capacities into performance under adversity. Each of these five themes is presented and discussed from cross-sectional and longitudinal standpoints in the following sections.

4.3.2 Adversity is an enduring, shared experience of an event

The concept of adversity is central to the theory and practice of resilience because such events influence the direction, magnitude, and duration of psychological outcomes (M. Luhmann et al., 2020). Such effects are best understood alongside richness of detail regarding the nature of adversity experiences. Participants outlined a broad range of adversity experiences that varied in magnitude (e.g., degree to which the situation might destabilise homeostasis), frequency (e.g., once off or enduring), source (i.e., internal or external to the team), controllability (i.e., degree to which the team can control or influence an adversity), and the nature of sharedness (i.e., simultaneously mirrored or progressively transferred). In essence, adversity discussed within this context reflected a breadth of typically enduring, shared experiences that were underpinned by the desire to perform successfully over time (i.e., complete the course).

Participants discussed several examples across both time points that captured the ‘sharedness’ of adversity experiences within the context of their Special Forces selection and training courses. Previous work has characterised team resilience as involving a shared experience of adversity, describing the ‘collective encounter’ of such experiences (Morgan et al., 2013). Within the current study, participants described shared experiences in two unique ways

via (i) convergent linkages and (ii) complementary linkages. With regard to convergent linkages, participants referred to the common perceptions among team members, such as a shared physical demand or a change in task complexity for the team. In essence, this commonality characterised experiences that were mirrored simultaneously across teammates. The following quotes exemplify this form of 'sharedness' of adversity that were instantly mirrored across teammates with regard to physical exhaustion and encountering a simulated enemy force as examples of experiences:

> During our patrol course we had a shared adversity in that there was some pretty shit terrain that we were going through and everyone's physically taxed and that makes it a bit harder when you've got to make decisions. [Time point 1]
>
> Everyone is obviously on a level when it comes to a problem or something like that, one person sees something that's quite a large event (e.g., enemy threat); I think every person is thinking the same thing in your team. [Time point 1]
>
> Adversities tend to be individual but everyone experiences them as a team. So like everyone's under the pressure of assessment and the pressure from themselves to not get themselves in shit with the DS [directing staff]. [Time point 1]

This form of adversity matches those elements previously reported by teams within sport (e.g., defeated by lower ranked opposition, adverse weather, loss of teammate to injury; Morgan et al., 2019) and business (e.g., sudden shortfall in project funding; Edson, 2012). Thus, events that are encountered simultaneously by all members of a team represent an important consideration for understanding adversities within group contexts that underpin the resilience emergence process. The second description of shared experiences of adversity captured instances where one or more but not all team members directly experienced adversity with or without the awareness of other team members. Although some team members did not experience such adversities directly, participants acknowledged a 'flow on effect' for team functioning as a shared

adversity because of the common bonds (e.g., collective objectives). For example, one participant reflected on an adversity encountered by only one group member:

> So, I think everyone would, if something happened, being that someone went down, with heat or whatever happened, and that was considered an adversity by one person the whole group would have the same mentality towards that. So someone getting injured, everyone immediately knows, especially if you work in a small team, but this is an issue you need to get on straight away. [Time point 1]

It was evident to us that in the participants' discourse that adverse events experienced by some but not all members progressively transferred to other members via a contagion effect (Barsade, 2002). By and large, the shared nature of such adversities was underpinned by a type of emotional contagion acting upon team members. Emotional contagion, defined as the "process by which a person or group influences the emotions or behaviour of another person or group through the conscious or unconscious induction of emotion states and behavioural attitudes" (Schoenewolf, 1990, p. 50), has been proposed to occur via several key processes. The examples of shared experiences described above are indicative of two such processes; the former of convergent linkages, whereby individuals share the same vantage point *and* interpretations of the same stimulus, and the latter of complementary linkages, whereby the reactions of one person are the stimulus for emotional contagion (Elfenbein, 2014). The key distinction in this regard is the perspective from which members experience and appraise an event. Convergent linkages typically result in situations where members experience a similar affective state, whereas complementary linkages lead to diverse emotional experiences (Elfenbein, 2014). Congruency in affective states among team members, whether positive or negative in valence, are considered reflective of a shared team identity (e.g., Magee & Tiedens, 2006; van Kleef & Fischer, 2016). Shared positive emotional states in collectives directly and indirectly affect group effectiveness, yet the effects of negative affective states appear contextually dependent (Barsade & Knight,

2015). For example, the coordination of a team's affective state via complementary linkage may be beneficial to performance (e.g., optimising team arousal to deal with a threat) or detrimental (e.g., spreading of anxiety among team members) depending on the nature of the performance context and team dynamics. Thus, these distinctions regarding the shared nature of adversity experiences represents an important consideration for future work.

The length of exposure (e.g., persistent chronic, intermittent chronic, acute) is another key consideration for the characterisation of adversity (Cohen et al., 2019a; M. Luhmann et al., 2020). Individuals spoke to several challenges that were considered adversities because of their pervasive nature across the entire course. Situations of continued assessment or long term physical discomfort, in particular, were commonly discussed.

> Many of us had pressure to perform. So constantly judged and watched on everything from like your kit layout, how everything was set up, to having your mag load-out, to how you were performing. That was probably the biggest stressor... I think everyone could agree that was like the biggest, yeah, factor to show resilience in a team and individual. That was like the biggest thing, I'd say. [Time point 2]

> I think especially for the older guys I just know it's going to be shitty time, you're going to be cold, you're going to be hungry, you're going to be doing six hours on in high seas, you're going to be uncomfortable. [Time point 2]

Chronic stressors appear most damaging to a system due to the increased chance of adversity exposure being present at a point of vulnerability for that system, permanent changes in the state of system that may have knock on effects, and increased wear and tear (i.e., allostatic load) on the system (Cohen et al., 2019a). The availability of collective coping strategies to deal with such adversities is crucial for minimising these potential risks when confronted with adversities of an enduring nature. A broad range of inputs and mediators have been discussed in previous research (Morgan et al., 2019) and conceptual pieces (Bowers et al., 2017; Gucciardi et al., 2018) on team resilience, yet often absent of any consideration of the varying nature of adversity experiences.

Time is a critical consideration for the science and practice of team resilience because inferences regarding emergent resilience can be made only within the context of a system's trajectory of functioning in response to adversity (Gucciardi et al., 2018). Although elements of duration dominated the discussion of adversities here, we cannot ignore the importance of features related to the frequency, timing, and sequencing of events that represent heightened risk or vulnerability for advancing knowledge on team resilience emergence (for an overview of the importance of time, see Aguinis & Bakker, 2020). These conceptual and practical nuances regarding the temporal elements of adversity experiences are largely absent from past work on team resilience and therefore represent an important avenue of future research.

Temporal analysis of theme 1. The analysis of theme one across time afforded additional insights into the nature of the adversities experienced within this context, particularly with regard to the consistencies of experiences across time and variances in experiences across time points, which ultimately exposes the 'range' of challenges experienced. Consistencies across time were evident with regards to the shared nature of adversity experiences and the persistence of uncertainty across the training context. Exposure to shared adversities (e.g., physical challenge, complex team task) and the withholding of task-relevant information resembled core strategies utilised by training staff to challenge teams over both training courses. Despite consistencies across the training courses, unique challenges were also faced by participants at each time point. Notably, these differences encompassed changes in the length of exposure to adversity and the sources of adversity. Although chronic exposure to adversity was common among participants' reflections over both time points, repeated bouts of acute challenges were discussed primarily at time point two in contrast to the ongoing nature of adversity most prominent at time point one. Specifically, the repeated pressure to acquire and

demonstrate complex team skills was commonly discussed at time point two in comparison to the continued physical challenges prominent at time point one. For example, the following quotes highlight this shift in perspectives:

> I'd say conserving water. So, during our survival training some guys didn't have enough water. They just burnt through their water a bit quickly and it came down to redistributing water within your patrol to try and assist dudes in getting over the line to restock. That's probably one adversity that occurred. [Time point 1]
>
> All the close quarter battles. So, it's instantaneous decisions that need to be made, and those decisions essentially do mean life and death when you're doing a [mission]… So knowing the complexity [the challenges include] introducing all these skills, more enemy. [Time point 2]

These individual variances are reflective of the changes in nature of tasks conducted across the two time points and demonstrate an important contextual factor of this study.

Second, although discussed at time point one, participants' reported 'pressure to perform' as a more prevalent adversity following the second training course. The second time point represented a point after a training course within the latter stages of the 18-month training program, where personnel were subjected to numerous assessments and more complex training drills. These factors likely placed added emphasis upon participants' awareness of the need to maintain individual and team performance to pass the course. Collectively, these temporal nuances underscore the importance of appreciating context when making inferences regarding the nature of adversity experiences for team resilience emergence.

Variation in the perceived controllability of adversity also occurred between the two time points. Participants commonly discussed adversities to be controllable following the initial training course, yet when discussing adversity following the second training course responses were notably absent of the controllable nature of adverse events. For example, the following

quotes were indicative of this pattern within the first phase of data collection but were not mirrored within the second:

> So every action, time, or every scenario that could happen or a stressor is something that we'll always talk about before so we sort of have a task and [we know we] can actually get the job done in the right way if that makes any sense [Time point 1]
>
> We've got measures to control it [an adversity] so it doesn't come out of control or become an issue, or what others deem as an adversity, you kind of just react so it doesn't become a problem [Time point 1].

Although participants did not explicitly discuss the uncontrollable nature of adversity within the second phase of data collection, the absence of data between time points has been noted as an important signal of variation in perceptions within longitudinal analyses (Saldaña, 2003). Coupled with perceptions of enhanced task complexity and pressure to perform, these findings point to the progressive difficulty between the two courses.

Finally, participants' discourse changed when describing the nature of dynamic team challenges, wherein initial challenges of alterations in composition (e.g., loss/removal of team member) transitioned to observations of the deleterious effects of weaker team members on team functioning (e.g., mistakes or inability of particular individuals):

> That (adversity) might be, say, a contact or a casualty like you have to complete your casualty drill. And you know that you need to treat them, you know you need to evacuate them, the signallers need to use the communications, and call up for extraction. [Time point 1]
>
> Having members in the patrol who were just not up to standard. And I found that it was actually a big burden on the other team to carry them through run-throughs and scenarios and pick up the slack where they were falling off. It made people more aware, they had to be more aware, they had to be more focused, more switched on. They had to think not just about their role but what that person's doing also. [Time point 2]

This transition in discussion points is seemingly indicative of the more homogeneous nature of the participant cohort who remained on course at time point two. Diversity across deep level characteristics such as personality and ability can potentially disrupt group dynamics (e.g.,

intragroup conflict: Harrison et al., 2002); our findings support an interpretation of the beneficial nature of uniformity between team members in the current performance domain. This finding reinforces the need to consider context when examining team resilience emergence, as other organisational contexts have been shown to benefit from diversity in these deep level characteristics (e.g., product development teams; Edmondson & Nembhard, 2009).

4.3.3 Individuals recognise adversity through physiological and/or behavioural states

Scholars have discussed the importance of recognising adversity as a key mediator (Edson, 2012) or trigger (Gucciardi et al., 2018) of team resilience emergence. Participants echoed this sentiment; they discussed three key indicators of adversity and the importance of recognising such indicators to optimise effective functioning in the face of these experiences, namely (i) changes in team's trajectory of functioning, (ii) personal responses indicating the presence of adversity, and (iii) the observation of teammates' responses to adversity. Collectively, these discussions indicated that individuals recognise adversity through physiological and/or behavioural states, depending on the nature of the adversity or the situation in which they are embedded.

A team's trajectory of functioning throughout task performance in relation to contextualised criteria represents the core marker of team performance (Salas et al., 2008). Participants made reference to an awareness of threats to, or deviations in, collective performance as a result of adversity. The following participant's quote reflects an awareness of a change in the progress towards the 'end state' or objective of the team:

> …everyone would be able to identify once we've deviated off that path of getting the quickest way to reach the end state, essentially, and I think no matter what we do, we can all pretty much identify once it's either slowing us down getting that end state, or it's becoming for us, not the most favourable path essentially. [time point 1]

Identifying deviation from the desired team end state within the context of adversity exposure is consistent with the concept of situation awareness. Situation awareness reflects one's degree of understanding of the dynamics of external environments that is produced by mental processes including perception, memory, attention, and expectation, and the use of this information in relation to current and future goal directed action (Endsley, 1995). In this sense, individual situation awareness involves the perception of environmental dynamics, comprehension of these dynamics, and projection of this knowledge for future action (Endsley, 2015). Situation awareness is positively associated with performance on a range of tasks such as military planning (Salmon et al., 2009), simulated in-flight emergencies (Prince et al., 2007), and crash-avoidance in driving simulations (Gugerty, 1997). However, for complex systems, such as teams, unique insights regarding environmental dynamics need to be distributed compatibly among members for effective performance (Stanton et al., 2006, 2017a). Deviations from expected team functioning represented a shared metric in this regard, alongside other cues discussed below.

Individual recognition of adversity also related to internal stimuli. Participants discussed an awareness of their own physiological state in response to adversities experienced as a team. For example, one participant emphasised the enhanced level of activation in the following quote:

> You can feel when your heart rate's going up, or when something's about to hit, or you're about to do a jump or something. When your heart's literally beating through your chest... just through [as a response to] your stressors, it's going up. [time point 1]

Physiological states provide important knowledge about environmental demands, particularly during stressful situations (Appelhans & Luecken, 2006; Dickerson & Kemeny, 2004), which is an important first aspect of situation awareness (Endsley, 2015). From a social cognitive theory perspective (Bandura, 1997), people's interpretations of physiological states provide an important window into efficacy beliefs, particularly in situations where physical demands are

high and critical to task execution. Participants also paid attention to the recognition of adversity experiences via their teammates' behaviour, primarily with reference to changes in typical behaviour. For example, the following quote highlights the awareness of teammates changing their usual persona in the face of adversity:

> I guess you can know from their personality, if they're normally quite banterous. And if they're not, they're probably struggling a bit. I mean you hear everyone laughing, everyone starts losing it and wants a part of it, if that person doesn't you can sort of be like, yeah, they're either behind or struggling and they need help. [time point 1]

Contrasting these two themes suggests that indicators of stress experiences observed in others (i.e., deviations from normative behaviour) were largely incongruent with self-referenced markers (i.e., physiological states). Collectively, these points highlight that threats to team functioning are identified across individual and collective levels. The extent to which each type of indicator is most relevant likely depends on the degree of interdependence among team members; collective indicators are likely prioritised when interdependence is high, whereas individual markers would likely take precedence when interdependence is low (Kozlowski & Ilgen, 2006). The temporal analysis supported consistency in the nature of this theme across both time points and therefore the centrality of recognising adversity via internal and external states as a key feature of team resilience emergence.

Temporal analysis of theme 2. The temporal analysis supported consistency in the recognition of changes in team member behaviours or team level functioning across both time points. Participants provided less emphasis upon the value of recognising changes in internal states within the second wave of data collection. The limited discussion regarding the importance of individual-level indicators of adversity (e.g., changes in physiological state) following the second course was coupled with an emphasis of recognising adversity in team member behaviours and collective functioning:

> You could see them not wanting to be at the front, not wanting to lead, not wanting to go through the door first, not wanting to take that shot. They kind of try and sink to the back. It was noticeable who was always at the back and who was always at the front during the run throughs. And I think that's probably the key indicator where you can tell on the team who the people were that were either stressed out, nervous, when they were performing, and that was the probably the key indicator. [Time point 2]

Given the variance of specific tasks and adversities experienced across the two courses, this finding highlights the centrality of recognising adversity via external states as a key feature of team resilience emergence that may generalise across time and contexts.

4.3.4 Social resources bind together individual self-regulatory capacities when confronted with adversity to support team functioning

Once an adversity and its risks are identified, teams need to leverage resources that can mitigate or buffer the potential effects of these adversities. Consistent with past research and conceptual perspectives (Bowers et al., 2017; Gucciardi et al., 2018; Hartmann et al., 2020; Hartwig et al., 2020), the knowledge, skills, abilities, and other characteristics (KSAOs) individual members bring with them to the situation were considered key in this regard (Ployhart et al., 2014). Within the context of this study, these KSAOs encompassed emotional and cognitive abilities, as well as technical skills, were key to task performance when confronted with adversity.

Applying self-regulatory skills to maintain individual role performance under experiences of adversity was considered key to team resilience emergence in this context. Participants drew specifically upon the importance of skills that allow them to regulate their emotional and cognitive states to maintain effective and efficient functioning. For example, one participant noted the importance of maintaining focus in response to the challenge of receiving negative group feedback:

> The ability to refocus has got to be pretty good. Day to day you're getting very positive and negative feedback. If you get some negative feedback, you've got to be able to take it on board and still get on with it and perform at a high level. If you don't, you put it on your team, you're just going to keep slipping down a slippery slope. [Time point 2]

Participants also discussed more broadly the importance of past experiences applying self-regulatory skills successfully within the context of a variety of adversities as an important individual characteristic. This discussion point is unsurprising, as mastery experiences are a key source of efficacy beliefs (Bandura, 1997). Participants alluded to these benefits in terms of "past experience applying revision (i.e., regulatory) techniques" and the importance of successful experiences applying regulatory skills during challenging times on the course:

> You might just get the revision techniques and you apply it better, now that we've used it and we have experience with stressors along selection. Definitely. I think, naturally you just need to be able to control yourself in situations like that. Some dudes just break and we're a group of dudes that have proven it and that's why we're here. [time point 2]

Meta-analytic research supports the importance of psychosocial skills such as emotional and attentional regulation for human performance (Brown & Fletcher, 2017). Within the context of team resilience emergence, it is essential that individuals can access human capital resources that are relevant for collective functioning and apply them effectively when confronted with adversity (Gucciardi et al., 2018). Although certain characteristics (e.g., conscientiousness; Bell et al., 2018) may be broadly beneficial to team functioning, context shapes the importance of individual human capital resources on collective functioning. Self-regulatory skills, which have been trialled and refined via past experiences of adversity, represent an important human capital resource within the context of team resilience emergence in newly formed military teams. When individuals poorly self-regulate there is an increased risk of spillover effects to collective functioning (e.g., emotional contagion).

Individual self-regulatory skills are essential for dealing with stressors and adversities with regard to one's own task performance. Yet within the context of teams, there also is a need for regulation of the collective, particularly with regard to the social dynamics Participants acknowledged the complementary nature of these non-technical resources because they provide the 'social glue' that pulls together individual members in a united front (Kwon & Adler, 2014). Non-technical resources have been defined as the cognitive, social, and personal resources that support effective team functioning and complement individual technical skills (e.g., weapon operation; Flin et al., 2008). Consistent with previous work on team resilience in sport teams (Morgan et al., 2013), participants made specific reference to the benefit of social support outside of the immediate performance environment:

> Especially, that adversity, even prepping for something, everyone's helping the same, filling those gaps, helping each other, even before you step out the door. When you're out the door, everyone's helping. You're still performing, performing, performing, 'til the job's finished. And then it's still not just switch off. It's still help everyone out, prep your kit, and get ready again. [Time point 1]

Non-technical resources have been highlighted as beneficial to teams in dealing with adverse events through the reduction of the occurrence of team errors (McCulloch et al., 2009), particularly where team membership may be in its early stages (Flin & Maran, 2004). Given the broad range of non-technical resources available, these findings shed light on those most pertinent to the context of small military teams, that is, social resources and situation awareness that bind together the capabilities of individual members.

Temporal analysis of theme 3. An examination of the nature of this theme across time highlighted variance between the two waves. Participants placed approximately equal emphasis on the importance of self-regulatory skills (i.e., individuals withstanding stress or adversity or bouncing back quickly if they experienced a deterioration in their functioning) and non-technical

resources across both time points, yet the nature of discussion surrounding the importance of non-technical resources reflected a more refined understanding with time. Essentially, participants emphasised the importance of displaying prosocial characteristics following their first training course but with subsequent experience referenced the limited nature of such characteristics when faced with adversity. For example, team members would demonstrate less prosocial behaviours toward members of the team when they felt their performance levels had dropped past a certain point. These findings indicate the adaptive nature of teams to find ways to protect collective functioning based upon compositional features of the team (i.e., individual member performance). The following quote highlights a situation where prosocial characteristics were abandoned when faced with adversity:

> I think almost the worst situation you could get was where no one spoke about it, but [the team] knew that guy was about to get cut (removed from the course). They weren't going to help him or give him any additional help, they felt they couldn't. And that guy was just a nightmare and he was on the way out. [Time point 2]

Interestingly, the limits of these prosocial characteristics were considered in relation to shared constructs such as interpersonal trust or team pride. In the following example, one participant discussed how trust between team members would protect the importance of prosocial characteristics on a team's approach to optimise collective functioning:

> If the team trusts them, and it's just a bad day or a bad run through, possibly even a bad week, then they'll get 'don't worry about it' and you'll do anything to help them get off that slippery slope – to get back up to the standard. But it's just depending on when that trust runs out, that's when the team might possible leave you by the wayside. [Time point 2]

These findings indicate the maturing perspectives of participants by highlighting the added complexity of the means by which teams might actively protect collective functioning. In so doing, the varying importance of team members' prosocial characteristics according to individual

(e.g., performance ability) and collective (e.g., trust) features offers unique insight into the numerous ways by which resilience may emerge within complex systems.

4.3.5 Shared experiences of adversity and collective structures strengthen social bonds and mental models needed for team resilience emergence

When describing the importance of team-level factors that underpin team resilience emergence, participants spoke to the benefit of shared past experiences and team structural factors (e.g., shared leadership) to support the development of social constructs (e.g., team identity) and the coordination of behaviours during experiences of adversity. In other words, this theme reflects an identification of initial conditions of a system based upon prior experiences of adversity and organisational norms that increase the likelihood of resilient outcomes (Hackman, 2012). Within the context of newly formed teams, scholarly perspectives of team development have changed from one of gradual movement across stages (Tuckman, 1965) to the belief that teams form certain capacities shortly after formation, which hold a strong influence over group dynamics up to an approximate midpoint of team performance (Gersick, 1988). In line with this perspective, this theme is characterised by specific social and structural factors of a team that support team resilience emergence from the individual level KSAOs of group members.

A key discussion point regarding the initial conditions of the team related to the importance of past shared experiences of adversity during the early stages of team formation and development. Most notably, these shared experiences seemed to foster feelings of togetherness, shared confidence, and identity. For example, participants discussed benefits for team cohesion that resulted from challenges of performing in adverse environments:

> Yeah, so there's definitely some times where you're freezing your nuts off. And you're hugging each other's backs and that sort of thing. That's a key thing. And that's on selection as well, breaking through that physical barrier. And actually pushing yourself into somebody else's back to warm them, to warm you, that's something…(Speaker 1)

> The fact, to go along with that point, the fact that we all know that we've been through worse than pretty much any situation we could come across now ... Probably draws everyone to be closer as well. (Speaker 2) [Time point 1]

When considered in conjunction with the shared nature of adversity experiences, these early opportunities for social exchanges as a collective provided a basis from which to foster a sense of "us" and "we" rather than "I" and "me" (Bastian et al., 2018). Such social identities are integral for people's cognitive and behavioural engagement with stressors, particularly in group settings where they can prompt collective efforts (Haslam & Van Dick, 2011). Unsurprisingly, social identity has been identified in past research as a salient factor for team resilience (Morgan et al., 2013, 2015, 2019). Participants also outlined the importance of these experiences in fostering a team's shared confidence for future performance. Notably, this individual outlined an incremental nature to their shared confidence following a past experience of adversity:

> I personally think it brings everyone way tighter. You draw on those past adversities, like, we've all done it. I know we've all been in shit spots and brought each other out of it, we're all still here. In my head it makes me think that we can do anything that we can put our heads to. Yeah, it gives you that confidence like [name removed] said, yeah. We did that, so I've got confidence that we could do something bigger. [time point 1]

The perceived importance of emergent team confidence aligns well with experimental work that has demonstrated its positive effects on collective performance (Fransen et al., 2017). The structural components of teams were also discussed within participants' discussions of factors that promote team resilience. A shared leadership structure, clear but flexible team roles, and the presence of detailed contingency plans were commonly mentioned. With regards to leadership, participants described the importance of shared leadership abilities within the team to support problem solving in the face of challenges:

> Being a leader of the group doesn't also allow everyone else here to also slack off and just wait to be told what to do. Everyone here, how we overcome stuff is everyone here shows that initiative and ability. They've kind of already switched on as to what's coming in so

> they can start doing that work for the group, sort of setting the conditions for everything; you sort of solve it yourself, pretty simply before the leader actually needs to give out information. So that's where we work really well together. [Time point 1]
>
> Everyone kinda here has been selected by their leadership ability as well, so even when we do come in groups and there is a leader, everyone in their own right has shown leadership to be where they are. So essentially the leader of the group can also take on board suggestions and all that sort of stuff from everyone rather than just saying what he says goes. [Time point 1]

This emphasis on shared leadership is consistent with past research on team resilience in sport (Morgan et al., 2015, 2019) and aligns well with research that has demonstrated the superiority of horizontal forms over traditional hierarchical or vertical structures (D'Innocenzo et al., 2014; Nicolaides et al., 2014; Wang et al., 2014). The presence of role clarity was another prominent discussion point. Within a military context, standard operating procedures play a key role in guiding the structure and nature of such roles. The criticality of these roles and the collective's awareness of them was captured clearly in a participant's reflection of an adversity characterised by failure in communication equipment:

> I think the same thing. Before we step off, everyone knows their job without comms [communication channels] and actions on without comms. Everyone sort of knows there's a certain amount of time or whatever. If you don't have comms, then everyone knows the plan they need to execute from there, where we can all marry back up again to find out what the f*** has gone wrong with the comms, or find out who's good or what's good. Even with this is happening, I know what to do from here now. [Time point 1]

Standard operating procedures that include clear definitions and knowledge of key roles and tasks are essential for distributing situation awareness across individual components of complex systems such as a team, particularly when the collective has limited or no past experiences working together (Stanton et al., 2006, 2017a).

Temporal analysis of theme 4. The temporal examination of this theme afforded discovery of nuances in role adherence, such that the importance of this factor was pervasive across time points, yet the nature of the theme was discussed differently at each wave. For

example, perceptions changed from one of ‘knowing your role’ to one where participants underscored the benefit of flexibility to switch across such roles, highlighting an important adaptive process of the team. Team knowledge structures have been proposed as effective in supporting adaptive processes of teams (Christian et al., 2017). Shared mental models, which reflect convergent maps of the task environment that enable individuals to explain and predict their surroundings (McComb, 2008), were discussed by participants across time points. Within the initial wave of interviews, participants spoke to a collective team knowledge that reflected “everyone acting on the same idea” and having a shared understanding of the “end state” during adversity. However, the discussion on these shared mental models evolved to resemble an understanding of teammates’ strengths and weaknesses, and the prediction of teammates’ behaviours throughout adversity three months later. Although team members were grouped into small teams, this evolution in shared mental models is likely a product of the knowledge participants developed of the entire trainee cohort over time. Within the context of this study, these changes represent the development of a team’s shared mental model from solely an accurate understanding of task constraints towards the additional knowledge of the future needs and actions of other team members (Mohammed et al., 2017). This finding is consistent with recent trends in the area of team cognition, where scholars have proposed the importance of such knowledge structures being translated into action via interactive team behaviours (i.e., interactive team cognition; Cooke, 2015). As such, this finding indicates the practical benefit of fostering the development of such knowledge structures to support interactive team behaviours in response to adverse events.

4.3.6 Behavioural processes and shared states are how collectives turn individual and team capacities into performance under adversity

The final theme was characterised by two dimensions indicating the importance of team-level processes and shared affective or attitudinal states in converting individual member resources into emergent team resilience. Scholars have highlighted several mediating factors or mechanisms by which emergent team resilience unfolds over time (Bowers et al., 2017; Gucciardi et al., 2018). In essence, the shared meaning of this theme reflects the enactment of interdependent actions and the salience of shared states as the primary means by which teams utilise their individual level capacities to sustain or quickly recover performance in response to heightened risk or vulnerability, that is, demonstrate emergent team resilience.

Participants spoke to the importance of leadership behaviours in coordinating the actions of team members when faced with adversity. A key behaviour in response to adversity is one where leaders make quick and effective decisions and communicate this information to the team:

> Being able to make that absolute decision then, rather than trying to wait or trying to figure out what a 100% decision is. Just making a decision and sticking to that decision, making that work. Rather than pausing, waiting and spending too much time trying to figure out what the optimal solution is, because there probably isn't one. You just need to make a decision and then make that decision work. [Participant]
>
> Is that an individual or is that as a team? How does that work? [Moderator]
>
> Individual and team. Because once that first person makes that decision then everyone else can start to understand what they're doing, then everyone else will start to work off that. And then as a team you'll start making those decisions, and understanding what the play is [participant]. [Time point 2]

Participants also discussed a leader's influence with regard to coordinating the affective state of team members, particularly for regulating team members' activation levels. Perhaps most characteristic of the discussions, leaders who demonstrated calm actions were identified as 'infectious' upon others:

> Yeah, definitely someone that's calm and can coordinate a situation is obviously infectious as well. Like, shit hits the fan and everyone's freaking out then it's just infectious as well. So someone that's calm and collected can coordinate, sort of step up, whether they're in a leadership position or not. But yeah, calm and collected and being able to coordinate a small group, it's definitely important. [time point 1]

In addition to leadership processes, a range of behavioural processes between individual members were used as strategies to facilitate the emergence of shared affective states across the team (see supplementary material). Most notably, participants commonly referred to the use of humour about the prospect or direct experience of adversity as a means by which to foster positive affective states within the group and support sustained high performance (see also, Morgan et al., 2013, 2015). Aligned with a social identity perspective (Haslam & Van Dick, 2011), for example, one participant indicated how joking between team members following the experience of challenge was representative of their team and a 'signature' coping strategy adopted by the group:

> And the biggest thing that would help us as a group would be comedy amongst us. We take the piss out of each other, hard. If you're an outsider and you see the things we say to each other, you'd be like, "Oh, they don't like each other." That's a big part of how we deal with stuff. [Time point 1]

Humour represents an effective self-regulatory strategy by which to manage one's experience with stress and maximise performance (Mesmer-Magnus et al., 2012). From a cognitive standpoint, humour fosters perceptions of controllability and adaptive appraisals of stress (e.g., seeing the positive or challenging side to a situation; Martin et al., 2003). Humour also enables people to release pent-up energy and thereby effectively manage their emotional responses to stress, which can be transmitted to their peers (Robert & Wilbanks, 2012). Most pertinent to this study, humour serves as an important 'social lubricant', whereby it fosters and sustains quality relationships with co-workers and maximises knowledge of each other (Holmes, 2000), which in turn increases opportunities for social support (Moran & Hughes, 2006). Acting upon these

opportunities for social support was also outlined by participants as a key team process. Participants discussed how proactive cooperative behaviours that lightened the workload or experience of adversity within team members was a crucial process. This voluntary rotating of task roles to spread the experience of adversity across the team is another indicator of the importance of the relationship between group members and their ability to recognise team member's experiences of stress:

> Constantly looking for work and filling the gaps so we talked a lot about ownership or initiative so that you expect people to be looking for what needs to be done and then to go and do it. We can't as team members be thinking "Oh this needs to be done, you got to do that." It's happening too quickly. So expect that out of your teammates that they're looking to help you out. [Time point 2]
>
> That situation awareness within the team supports key factors that help us bounce back identifying someone who's struggling down and helping them up. Identifying, 'that dude's doing better', so he'll pick everybody up. When it needs doing he'll do it.
>
> Is that an expectation amongst - You know, explicit or implicit, that it is, if someone's in the dumps, you get over there and do what you can? [Moderator]
>
> Yeah, I think that small team environments sort of been harped on the whole time we've been here, so you have to get used to that. And if you're not, then we need to be. You need to be used to that, everyone needs to be in sync, everyone needs to be happy and healthy otherwise it just won't work. It'll fall apart. So I think everyone's good here at picking guys up, making sure everyone can keep performing in the situation. [Time point 1]

Shared states were discussed as a means by which to complement these interdependent behavioural processes. Participants referred to the beneficial nature of states such as shared trust between team members when performing within the context of adversity. Such states were proposed to act as a protective factor through limiting the experiences of stress across team members. Reflecting upon situations, both within and outside of task performance, participants spoke to the importance of trust in supporting teammates, with one candidate referring to this trust in allowing him to focus on his own individual coping strategies (e.g., combat breathing):

> And that's that trust as well, so you know that if shit does hit the fan, you don't have to stress through the roof because your mates are doing their job, you can do yours. You're on task, off task, helping each other out. It gets you through that stressor and then you can do your combat breathing, whatever helps you. [Time point 1]

Although there is ongoing debate regarding a universally accepted definition, team trust refers broadly to "generalized expectations of trustworthiness and the willingness to accept vulnerability to all members" (Costa et al., 2018, p. 171). Team trust is a positive predictor of team performance, even after controlling for important covariates (e.g., trust in leader, past team performance), yet is contingent upon the degree of task interdependence, authority differentiation, and skill differentiation (De Jong et al., 2016). Nevertheless, as a dynamic concept itself, the degree and nature of the team trust-performance link may differ according to temporal and contextual elements (e.g., initial level of team trust at formation, time lag; Feitosa et al., 2020). Notably, our findings are broadly consistent with a previous qualitative study in which humour and team trust were identified as key social capital factors associated with military team resilience (Temby & Vozzo, 2017).

Temporal analysis of theme 5. Several temporal elements were evident in participants' discussions that underpinned the nature of this theme. At time point one, participants predominantly discussed the importance of supportive coping behaviours (e.g., sharing the workload of a teammate experiencing challenge), humorous interactions, leadership behaviours, and the presence of trust between teammates at the initial interview. At time point two, participants paid greater attention to the relevance of shared states of cohesion and confidence between team members but remained consistent in expressing the importance of effective leadership behaviours to coordinate group members. The discussion surrounding the use of humour as a behavioural process is potentially reflective of the nature of adversities experienced at time point one. As reported previously, participants referred to the predominantly chronic

nature of adversity exposure experienced at time point one. The ‘relief’ utility of humour to displace ongoing suffering (Godfrey, 2016) points to the potential benefit of humour to cope with prolonged adversity exposure. This potential link between the behavioural processes surrounding the use of humour and chronic adversity exposure reinforces the need to consider the nature of adversity when exploring key resilience factors. This finding was mirrored by the predominant discussion of planning and reflection activities following the extended challenges experienced within the initial training course and less so when faced with the more frequently occurring and complex challenges in the latter phases. Accordingly, these findings may offer direction for scholars interested in disentangling the interaction between different forms of adversity and coping strategies.

Longitudinal analysis also discovered that cohesiveness and collective efficacy were discussed more prominently within the second wave of interviews. For example, one individual described how “everyone has more confidence now being able to work with the people [who] are left”. The absence of discussion at the initial stage of interviews may not reflect a change in the net worth of these shared states, particularly as collective efficacy has been cited as an influential component of team resilience in sport contexts (Morgan et al., 2013), but rather the need for time spent as a group to foster their emergence, or at least appreciate their significance for the team. Collective efficacy, for example, is most influential upon team functioning after a period of several weeks as a result of prior teamwork behaviours (Tasa et al., 2007). As previously mentioned, the importance of interactions between the members of the entire cohort between training activities would have acted to foster emergence of shared states, and points to the potential links between early team coping behaviours and protective emergent states. Specifically, certain interactive coping strategies enacted within the initial experiences of

performing in a new team may have served as inputs to the development of collective states that further act as protective factors within the second training course (e.g., humour fostering social cohesion: Godfrey, 2016). Such a perspective is consistent with the conceptualisation of resilience factors as dynamic network models, whereby one resilience factor may be 'activated' by another resilience factor (Kalisch et al., 2019).

4.4 Theoretical Implications

We evaluated a theoretical exposition of team resilience emergence (Gucciardi et al., 2018) for its practical utility in making sense of the organisational realities of newly formed teams within a military context. Our qualitative approach provides a contextually and temporally rich description and interpretation of team resilience emergence that sheds light on the interplay between the conceptual building blocks and how they unfold over time within the context of high-stakes military training characterised by substantial demands and challenges spanning several months. In so doing, the results of this study offer two key theoretical contributions to the literature on team resilience.

First, our thematic integration and interpretation of military personnel's perspectives support key elements of our guiding theoretical model of team resilience emergence. In terms of theoretically-informed elements, we demonstrated support for the centrality of adversity experiences as triggers for emergence processes (Gucciardi et al., 2018; Stoverink et al., 2020). Additionally, we signalled support for individual human capital resources (Gucciardi et al., 2018), situation awareness (Gomes et al., 2014; Gucciardi et al., 2018), team-level factors and states including leadership, team identity (Gucciardi et al., 2018; Morgan et al., 2013), and shared mental models (Gucciardi et al., 2018; Morgan et al., 2019; Stoverink et al., 2020) as key drivers of the emergence process and outcomes; and behavioural, cognitive, and affective (i.e.,

humour, trust) coordination among members in translating capacities into high-performance when confronted with stressors or adversities. In particular, we uncovered links between specific characteristics of adversities and the coping mechanisms adopted in such circumstances, such as the use of humour to handle chronic stressors. We also illustrated how task constraints play a role in shaping the coping mechanisms adopted by newly formed teams. For example, performing repeated complex activities precluded the use of planning and reflection regulatory strategies. Considered collectively, these data connect theoretical perspectives with the dynamic realities of newly formed military teams' engagement with stressors and adversities in ways that shine a spotlight on potential theory refinements to the phenomenon of team resilience emergence.

Second, our contextually and temporally rich exposition of adversity experiences over time provides new insights into the nature and range of adversities common within this context. These insights illustrated how shared adversities can arise from either shared experiences or the 'catching' of experiences from others, and the more debilitating effect of chronic stressors upon team functioning. This contribution is important for the science of team resilience because adversity is a necessary condition that must be present for conceptually and empirically robust operationalisations of the emergence process and outcomes. In other words, in the absence of knowledge of the adversity experience that has triggered the emergence process, we are unable to answer the question "resilience to what". Adversities are characterised by elements relating to valence, impact, predictability, challenge, emotional significance, change in world views, social status changes, external control, and extraordinariness (M. Luhmann et al., 2020). Our findings underscored the centrality of the nature of sharedness for characterising adversity experiences within the context of organisational teams and the team resilience emergence process. Whether an adversity is experienced simultaneously among all members or is progressively transferred

from one or some members to others has important implications for the emergence process and outcomes (e.g., contagion). These implications include the immediacy of disturbances to team functioning, and the ostensible nature of adversity to team members that would dictate the tailoring of reactive coping strategies (e.g., whole team vs sub-section responses). Thus, our findings underscore conceptual and practical nuances regarding the temporal elements of adversity experiences that are largely absent from past work on team resilience (for a review of multilevel stressor research in teams, see Razinskas & Hoegl, 2020). Extending beyond the science of team resilience, therefore, our work underscores the need to broaden conceptual perspectives of major life events to encompass elements related to the social nature of such experiences, which are absent from existing perspectives and taxonomies (M. Luhmann et al., 2020).

4.5 Strengths, Limitations, and Future Directions

Key strengths of this study include an approach that maximised synergies between concept and method, that is, a contextually and temporally rich investigation of newly formed teams undergoing high-stakes military training characterised by numerous stressors and adversities. Future work may look to leverage and extend these findings, particularly with regard to the conceptual and methodological limitations of our work. For example, our reliance on retrospective interviews could be strengthened via data-prompted discussions that leverage stimuli from in situ experiences with major stressors or adversities (e.g., biofeedback, audio and visual recordings). Relatedly, the absence of metrics to characterise trajectories of collective functioning over time within the context of adversity means we are unable to appreciate fully the degree to which teams in this study demonstrated emergent team resilience, other than a crude assessment of successful progression through the course. For example, there may be important

nuances in the perspectives and experiences of teams who demonstrate varying degrees and/or types of emergent team resilience (i.e., bounce back from or withstand adversity). Additionally, the uniqueness and secretive nature of this study context meant not all events or training experiences could be spoken to openly. This feature may have limited the representativeness of interview data in relation to the performance experiences of members. Finally, we acknowledge there is a need to consider the complexities of team resilience emergence within multi-team systems (Shuffler & Carter, 2018) including work contexts where the stakes are low and adversities are less frequent, yet team functioning remains critical to work success.

4.6 Conclusion

Scholarly interest in the phenomenon of team resilience emergence is on the rise (Bowers et al., 2017; Hartmann et al., 2020; Hartwig et al., 2020; Stoverink et al., in press). We examined the perceptions of team resilience emergence within the context of newly formed military teams following two training courses across a 4 to 5 month period within the context of an 18-month long training program, and provided insight into temporal dynamics of these perceptions of team resilience over the early stages of team development. We constructed the essence of participants' discussions across five broad themes and considered their temporal elements across the two waves. These five overarching themes reflected the importance of the nature of adversity; recognition of adversity; individual characteristics of team members; initial conditions of the team; and key mediating processes and states of team resilience emergence. Temporal analysis allowed insight into the patterns of change or consistency of these themes across time, supporting the salience of early team development and varying characteristics of adversity upon team resilience emergence. Collectively, these data support the theoretical conceptualisation of team resilience emergence that informed this work (Gucciardi et al., 2018). We hope this work

provides a meaningful basis for scholars to consider when interpreting and exploring conceptual perspectives of team resilience emergence within future empirical studies.

Chapter 5: Collective Resilience within Military Multiteam Systems Undergoing Training Embedded with Disruptive Events: A Case Study Approach

5.1 Introduction

The need for integrated specialised component teams has been driven by growing demands for innovations and solutions to highly complex and large scale problems, otherwise referred to as ‘grand challenges’ (George et al., 2016). Efforts to combat the Australian bushfires in 2020, for example, demanded the coordinated action of multiple teams including fire and emergency services; local council environmental rangers; local, state, and federal governments; and the Australian Defence Force to provide relief and safety to communities affected by widespread devastation to home and land. Even within single organisations, independent teams are frequently deployed in a collaborative fashion to achieve critical, large-scale objectives; as one example, consider the scenario of a law enforcement agency bringing together multiple tactical response squads to achieve order in the face of large scale civil disorder. Suffice to say, effective collaboration and coordination of multiteam systems (MTSs) is critical to the safety, health, security, and success of societies and their citizens worldwide. The ‘problem space’ in which these MTSs operate is highly dynamic and complex (e.g., technological advancements, globalisation, environmental volatility), requiring contributions across disciplinary boundaries to identify and deliver agile solutions in response to or within the context of substantial threats to their functioning. Knowledge of which factors and processes allow MTSs to demonstrate resilient functioning, and where and how these considerations unfold in response to or within the context of threats to functioning is of significant conceptual and practical worth. We sought to

shed light on this need via a qualitative, case-study investigation of resilience emergence for a MTS within a military context.

5.1.1 Defining and Conceptualising Multiteam Systems

Increased scholarly attention on MTSs in recent years has clarified knowledge of key structural features, mediators of collaboration, and best practices for facilitating effective functioning (Shuffler & Carter, 2018). Formally defined, MTSs represent "two or more teams that interface directly and interdependently in response to environmental contingencies toward the accomplishment of collective goals" (Mathieu et al., 2001, p. 290). Intersecting between the team and organisational level, MTSs offer a unique viewpoint of complex adaptive systems (DeChurch & Zaccaro, 2010) as they are distinguished from comparative 'team-based' organisations (e.g., dispersed teams, task forces) in five overarching ways: (i) MTSs are comprised of at least two component teams, (ii) MTSs may be embedded within a single organisation or comprise teams that span across several independent organisations, (iii) component teams demonstrate functional interdependence (i.e., highly simultaneous and collaborative interaction; Tesluk et al., 1997) with at least one other component team, (iv) MTSs are open systems that demonstrate material exchanges with the environment, and (v) MTSs demonstrate goal hierarchies whereby component teams hold potentially unique proximal goals but share distal goals and a common superordinate reason for collaborating (Mathieu et al., 2001). Against this backdrop, MTSs can be characterised according to three overarching attributes (Zaccaro et al., 2012). First, compositional attributes resemble the demographic features of component teams and include dimensional element (i.e., number and size of teams), boundary nature (i.e., number and proportion of teams from multiple organisations), diversity (e.g., geographic, functional, cultural), and the motive compatibility and expected contribution

(i.e., effort and time). Second, linkage attributes represent aspects of the connective mechanisms between component teams including factors such as the level of interdependence, communication structure, leadership hierarchy, and centrality of power. Third, developmental attributes encompass characteristics that outline the temporal dynamics and patterns of MTS development. During the genesis stage of development, for example, anticipated lifecycle and consistency of membership heavily influence the nature of an MTS. These conceptual works underscore the social (e.g., stakeholder dynamism, scope and scale) and task (e.g., environmental information load, diversity and change) complexities faced by MTSs and provide an important lens through which to interpret MTS research.

5.1.2 Disruptive Events and Multiteam Systems

Common across open systems, disruptive events occurring via interactions with the internal (i.e., within the embedded organisation) and external (i.e., outside the organisation) environment are key determinants of functioning, yet such events may be unique in nature at the MTS level (Mathieu et al., 2001). In their broadest sense, stressors are events that are consensually perceived as threatening or harmful to the functioning of a system (Cohen et al., 2019b). In the context of MTSs, stressors are those events that draw attention and dictate effort towards maintaining or quickly recovering system functioning in some way. These events are commonly a product of the unique nature of both the structure of MTSs and the environment within which they function (Mathieu et al., 2001; Shuffler et al., 2015). Structurally, the flexible, multilevel nature of MTSs as open systems enhances the scope of the system-environment interface such that component teams dispersed across organisations and geographic locations increases the range of potential threats to functioning from team systems. The presence of goal hierarchies – combinations of unique component team goals underpinning an overarching MTSs

goal – also increases the likelihood of threats to functioning occurring across the system (Marks et al., 2005). A further caveat to MTSs adversity is the potential for threats to occur within and/or across multiple layers including individual members, teams, and the system as a whole. Within intensive functionally interdependent systems (i.e., simultaneous and collaborative interaction; Tesluk et al., 1997) that are composed of multifarious component teams, MTSs are also susceptible to cascading effects of adversities that cause downward (Wijnmaalen et al., 2018) or upward influences across levels of the hierarchy (Bick et al., 2018). In sum, the environmental and structural features of MTSs mean interactions with events that threaten or harm functioning are frequently experienced across performance phases, and the successful navigation of these events represents a necessary marker of overall effectiveness.

With regards to environmental features, MTSs are characterised by complexity, dynamism, novelty, and uncertainty (Mathieu et al., 2001) coupled with a need for urgency to functioning effectively within these environments (Shuffler & Carter, 2018). Complexity refers to the diversity and number of interacting elements within the environment that require MTS attention; dynamism resembles the degree of environmental change or stability; and novelty and uncertainty resemble the degree of uniqueness or familiarity, and predictability of the environment respectively. Resembling outcomes these characteristics, explorations of MTS coordination have examined critical events such as attacks on public sites (Bick et al., 2018; Waring et al., 2020), unprecedented length missions, and integration work alongside private organisations (Pendergraft et al., 2019). In sum, the distinct nature of MTSs and the various, unique environments within which they operate presents a novel platform to understand adversity, which is an essential piece of the puzzle for efforts designed to shed light on emergent resilience.

5.1.3 Emergent Resilience: Bouncing Back from or Withstanding Disruptive Events

There exists widespread interest in the concept of resilience among scholars in the psychological sciences, covering individual, team, and organisational resilience (for reviews, see Bowers et al., 2017; Chapman et al., 2020; Hartmann et al., 2020; Kossek & Perrigino, 2016). Scholars acknowledge that resilience emerges via an active, dynamic process of coping with significant threats to system functioning (Kalisch et al., 2017). Consistent with this view of resilience as an emergent concept, resilience has been defined as "an emergent outcome characterized by the trajectory of a [system's] functioning, following adversity exposure, as one that is largely unaffected or returns to normal levels after some degree of deterioration in functioning" (Gucciardi et al., 2018, p. 735). Modelled on the widely adopted Input-Mediator-Output-Input model (Ilgen et al., 2005), collective resilient functioning in response to significant threats to functioning is said to emerge from individual (e.g., personality characteristics) and team level (e.g., composition) inputs via affective, behavioural, and cognitive coordination that can be strengthened or dampened by team-level factors such as leadership and team identification (Bowers et al., 2017; Gucciardi et al., 2018; Hartmann et al., 2020). For MTSs, resilience is ideally operationalised via the trajectory of functioning at the MTSs level relevant to the superordinate goal of the entire system. For example, an MTS formed with the purpose of responding to the natural disaster such of a forest fire may assess resilience as the rate of land extinguished from fire that emerges via the coordination of reconnaissance, airborne water bombing, and ground firefighting teams. Nevertheless, efforts designed to shed light on emergent resilience within MTSs demands knowledge of protective factors and processes within and across each layer of the system (e.g., individual, team and inter-team levels) that facilitate or inhibit MTS functioning.

5.1.4 Facilitators of Effective Multiteam System Functioning

The recent growth in attention toward MTSs within academia has shed light on key structural features, mediators of collaboration, and best practices for facilitating effective MTS functioning (Shuffler & Carter, 2018). The essence of empirical findings regarding MTS effectiveness can be summarised in terms of between and within team coordination, leadership structures and processes, and emergent states alongside the influence of goal type, boundary statues (i.e., within or across organisations), and component team distance (i.e., cultural, functional and geographical diversity of MTS members) (Zaccaro et al., 2020). First, coordinative elements such as interpersonal processes (e.g., inter-team conflict management), high-quality communication between teams, and intra-team alignment between transition planning and action cycles are considered key to collective effectiveness, especially in external MTSs with diverse membership (e.g., geographical, cultural). Second, leadership functions that foster MTS identity development, negotiate conflicts, bridge differences across component teams (i.e., provide boundary spanner role), and display role dynamism (i.e., moving into certain roles at different times) optimise MTS effectiveness because they foster coordination and alignment with environmental demands as MTS structure complexity increases (Zaccaro et al., 2020). Third, shared communication mental models and transactive memory systems foster a common language and collective task understanding, and therefore enhance MTS effectiveness, particularly so for MTSs composed of diverse members (e.g., culturally, functionally) or teams located across organisations. Given the complex and challenging environments that MTSs perform within, these past observations of features underpinning MTS effectiveness may offer insight into factors or processes that are focal in fostering resilience emergence.

Direct examinations of resilience emergence with MTSs are absent from the scientific literature, yet there have been calls to develop this knowledge (Pendergraft et al., 2019). Nevertheless, research on MTSs functioning in the context of significant events such as unexpected/non-routine events (Sessa et al., 2019; Uitdewilligen & Waller, 2012; Wijnmaalen et al., 2018), large scale organisational milestones (Pendergraft et al., 2019), and events triggering the formation of MTSs (Waring et al., 2020) provides foundational knowledge regarding facilitative and debilitative factors, and mediating processes. Successful MTS functioning in response to significant events has been operationalised via MTS outcomes such as adaptation of processes (Sessa et al., 2019; Uitdewilligen & Waller, 2012) and organisational performance (Pendergraft et al., 2019), or overarching MTS processes such as information sharing (Waring et al., 2020) and coordination (Wijnmaalen et al., 2018). These examinations of successful functioning of MTSs have uncovered several underlying facilitative processes and factors. For example, the use of an iterative process of sense-making and action supported functioning in response to unexpected crisis events within a storage facility (Uitdewilligen & Waller, 2012), whereas the use of a common communication frame (or lexicon between functionally heterogeneous component teams fostered functioning following the large scale event of a train derailment (Waring et al., 2020). Additionally, the presence of a highly MTS-centric identity within group members (over high component team identity) and effective boundary spanners (i.e., individuals who bridge differences and communicate information across component teams; Shuffler et al., 2015) have been proposed to protect functioning in MTSs faced with events that dictate a change in processes (e.g., extreme weather conditions for an emergency response team in action; Sessa et al., 2019). Although these conclusions of previous MTSs research offer preliminary insight for MTS resilience, the limited understanding of event characteristics and the

nature of MTS functioning limits the generalisability of findings. Rather, these observations suggest the need for progressive efforts toward developing a unifying framework for MTS resilience to fulfil previously suggested future directions (i.e., event taxonomy; Zaccaro et al., 2020) and coordinate past and future assessments of MTS functioning in response to significant events to align and integrate understanding of significant MTS factors and processes under one conceptual umbrella.

5.1.5 Avenues for Progressing Multiteam System Resilience Understanding

Despite the recent development of resilience theory within team (Gucciardi et al., 2018) and organisational-level (Bhamra et al., 2011) collectives, generalisation of these findings to MTSs may be limited for two key reasons. First, factors that are pertinent for team level functioning may be irrelevant when transposed to the MTS level. As an example, cohesion is an important mediator of team effectiveness (Carron et al., 2002), yet for MTSs cohesion between component teams may be unnecessary for MTSs configured of remotely operating (e.g., virtual) or sequentially interdependent component teams (e.g., surgical team and emergency response team). Second, factors conducive to team functioning can exert opposing effects for MTS functioning (i.e., countervailing forces; Zaccaro et al., 2020). One countervailing force is that of team identity. High team identity within component teams can negatively influence MTS functioning via reduced interdependency between component teams and reduced clarity of behavioural norms (Porck et al., 2019). Additionally, organisational resilience findings are limited in generalisability to MTSs. MTSs hold features (e.g., singular overarching goal, highly interdependent teams, and potential to span across multiple organisations; Mathieu et al., 2001) that are notably unique to the organisational level but may still contextually influence MTS

resilience. Thus, there is a need for work dedicated explicitly towards understanding emergent resilience within the context of MTSs.

Assessing the present state of research addressing resilience within MTSs draws several overarching considerations that require attention. First, given the dynamic nature of MTS environments, past work has focussed predominantly on controlled events that either occur prior to MTS formation (Wijnmaalen et al., 2018) or are predetermined within simulation activities (Uitdewilligen & Waller, 2012; Waring et al., 2020) at the expense of capturing dynamics in the face of naturally occurring stressors and events. This development would offer insight regarding 'how' events are experienced and interpreted within these large collective systems and subsequently provide researchers and practitioners guidance of proactive strategies to navigate the challenging environments MTS function within. Second, MTS studies have understandably focussed attention primarily to inter-team dynamics (Zaccaro et al., 2020), yet knowledge of the influence of intra-team dynamics is crucial when holding an emergent perspective of resilience. Finally, there has been a reliance on conceptual approaches to understanding various MTS constructs (Marks et al., 2005; Mathieu et al., 2001; Shuffler et al., 2015; Zaccaro et al., 2012). Recent observations of the limitations associated with existing theory within the social sciences have heralded calls to bridge the inferential gap between theory and reality through conscious approaches (Fried, 2020). These observations characterize the current state of understanding surrounding MTS resilience and demonstrate the need for empirical efforts to build upon existing theory.

Empirical studies of emergent resilience within the context of MTSs are largely absent from the literature. The current case study approach involved the continued (>18 months) interaction with members across all levels of the organisation to provide a detailed and

multifaceted exploration of a real-life setting (Crowe et al., 2011). This study looks to provide a conceptual 'stepping stone' in the development of MTS resilience theory. Recent works support this approach, arguing the need for greater theoretical elaboration within organisational domains (Fisher & Aguinis, 2017). Within a framework of theory elaboration, situations are 'ripe' for construct specification or the refinement of theory to reflect the realities more accurately of the constructs and associations (Fisher & Aguinis, 2017) where (i) an initial model of theory exists, (ii) the explanations of the theory are hindered by inadequate explanations or ambiguity, (iii) there is a potential to collect further data, and (iv) there is an obvious need to increase the scope of the original theory. Accordingly, the overarching aim of the current study was to extend current understanding of collective resilience in MTSs through an abductive exploration of resilience emergence within a naturalistic setting. In this sense, an abductive approach reflects the empirical exploration to uncover patterns to generate tentative explanations that provide a basis for future theoretical development (Bamberger, 2018). To achieve this aim, we sought to answer the following questions:

1. How do members of MTSs experience stressors or adversities that represent threats or harm to the overall functioning of the system?
2. What are the perceived individual, team, and inter-team factors and processes that may foster the emergence of resilient MTS functioning following stressors/adversities?
3. What are the perceived contextual features of MTSs that may influence the emergence of resilient functioning?

5.2 Methods

5.2.1 Philosophical Standpoint

My approach was situated within an interpretive paradigm, whereby I consider reality to be a dynamic product of an individual's experience with and interpretations of social phenomena (Poucher et al., 2020). Ontologically, what I perceive as 'real' is assumed to exist in the form of mental constructions of the social world that evolve through experiences, reflecting a relativist perspective, rather than independent of them and their experiences. Consequently, I assume knowledge is subjectivist in nature and generated from the process of meaning making and shaped by social influences (Malterud, 2016). This approach dictates that my findings do not represent hard truths but rather a perspective of data collected that must be considered alongside my researcher experiences and perspectives, as well as societal constraints (Levers, 2013). Epistemologically, therefore, efforts to appreciate the subjective nature of reality and multiple truths are best enacted as a collaborative enterprise between participants and myself as a researcher that is underpinned by reflexivity rather than objectivity (Malterud, 2016). In essence, my approach aligns with an interpretive indirect investigation of resilience emergence that looks to make sense of participants' experiences and interpretations with the social settings of their occupational context, with a specific focus on adversity experiences (Kozlowski et al., 2013). Given my active role within this perspective, it is important to present personal biases that would have influenced the development of themes. In particular, my academic stance and past experience within elite sport settings likely influenced my interpretation of data. To minimise the influence of these recognised biases, I sought involvement of individuals external to academic settings with a thorough understanding of the military context that is outlined further below.

5.2.2 Sample and Context

We conducted this study with members of a cavalry squadron within the Australian Army. The primary role of cavalry is to conduct mounted offensive (e.g., fire and manoeuvre), defensive (e.g., counter-fire), and security actions (e.g., reconnaissance) against enemy forces (Australian Army, n.d.). Cavalry personnel operate Light Armoured Vehicles (LAVs) within three-person teams (comprising a commander, gunner and driver) which are referred to as crews. The focal squadron of this study encompassed three distinct MTSs – known as troops – that each comprised of three to five, three-person teams or crews (see Figure 1). Our investigation of these MTSs commenced at the approximate mid-point of a 12-month readying phase of the Australian Army's Force Generation Cycle, whereby the squadron conducts a series of intense and extended training exercises to develop individual, team, and troop-level proficiencies to ensure they are ready for deployment should the need arise (Australian Army, 2015). These field exercises are designed to provide realistic training for individuals and teams by simulating events and experiences that might be encountered by military personnel on combat operations. Accordingly, realistic training for cavalry personnel typically involves operating for extended periods (e.g., several weeks) in armoured vehicles by day and night in a range of environmental conditions (e.g., hot and cold weather); operating in complex terrain (e.g., open and close country); conducting fire and movement drills involving the use of large calibre weapons against simulated enemy targets; conducting reconnaissance activities in concealed locations for long periods (e.g., hours or days); conducting mounted sentry duties on a shift cycle resulting in restricted sleep for team members; working with limited and uncertain information, having to change plans at short notice due to unexpected events (e.g., vehicle breakdown); waiting in location for long periods due to safety constraints while other force elements complete training activities; and having to

repair damaged or recover bogged vehicles in the field. In addition, cavalry personnel may be required to support other force elements to meet their training objectives (e.g., being tasked to 'play an enemy force' or transport personnel to field location). Due to the inherent risks associated with manoeuvring armoured vehicles over complex terrain, members of vehicle crews may at times sustain injuries during training activities, which may necessitate changes to team composition. As a registered training organisation, the Australian Army employs a competency-based training framework and supports professional mastery via graduated training activities that progressively increase in complexity, performance feedback from senior organisation members, and provision of refresher training opportunities. As with other military forces, cavalry personnel in the Australian Army are routinely assessed and provided feedback on their performance during field training exercises by their superiors, often in the form of post-activity debriefs, also known as after action reviews (Tannenbaum & Cerasoli, 2013). Given the potentially catastrophic consequences of making errors in the military, such performance feedback from senior organisation members may be 'frank and fearless' to reinforce learning points and competency standards, and to ensure any corrective action is taken, including the removal of team members if necessary. As previously mentioned, our investigation was conducted with cavalry personnel who were approximately at the mid-point of their 12-month readying training cycle. Within this period it is common for the composition of team members within vehicle crews to be altered either organically (e.g., removal of team member for not meeting required performance standards, loss of team member due to illness or injury) or by design (e.g., rebalance experience levels within team, optimise interpersonal dynamics within team). Given this feature of cavalry teams, and the time point of our study, the sample were progressing between the 'norming' and 'performing' stages of their team development – and reasonably

assumed to still be developing their taskwork and teamwork skills, as well as their collective resilience. In essence, realistic military training is challenging, risky, and designed to simulate aspects of real-world operations. For these reasons, military personnel may reasonably perceive and experience training to be demanding and stressful, even when conducted under strict safety protocols.

We adopted a theoretical sampling approach (Eisenhardt & Graebner, 2007) and focussed on a MTS within this context for several reasons. First, component teams are geographically co-located with simultaneous performance episodes (see Table 2). This limited nature of performance complexity allowed for data collection with the troop as a collective. Second, as part of the readying phase, course trainers intentionally inject challenges alongside tasks and continually assess individual members, the component teams, and collective MTS in conditions that are designed to simulate the harsh conditions of warfare (e.g., sleep and food deprivation, sudden changes in environmental landscapes). The regularity of adversity experiences within the military training program makes these conditions an ideal context in which to explore emergent resilience for MTSs outside of a warfare context. Finally, troop-level exercises are conducted over an extended period, typically at least 3-4 weeks in duration. This contextual feature meant the MTS experienced repeated adversities within a concise, specific temporal period allowing insight into the dynamics of resilience factors and processes. Predetermined periods for field exercises also allowed data collection to be planned directly following these activities, thereby limiting the influence of retrospective bias. We tracked study participants across the entire 12-month readying cycle as part of a larger research project. In total, 25 members (M_{age}=25.46±5.10 y) across four troops participated in the focus groups, which included both non-commissioned (n = 21) and commissioned (n = 3) members with a range of Defence experience (7.00 ± 3.85 y).

5.2.3 Procedure

We received approval for the study procedures from a nationally accredited human research ethics committee prior to data collection (Defence Science and Technology: LD 03-18). We conducted two waves of focus groups immediately following extended field training exercises (April and August in a single calendar year), and one individual interview with a senior member of the organisation. In total, seven focus group interviews were conducted with various troops across a four-month period (four at time point 1; three at time point 2). Three of the four troops were re-interviewed at time point two with one absent due to organisational constraints. We conducted the interview and focus groups discussing using a semi-structured interview guide (Appendix B), which was informed by conceptual perspectives of team resilience emergence (Gucciardi et al., 2018). Briefly, the interview guide was structured around explorations of adversity and individual, team, and troop level aspects of MTS resilience. Probe questions were also used to explore areas of interest to the study team in greater depth (e.g., MTS level features), with participants encouraged to discuss further areas of perceived relevance. The interview process was led by the first author [MC] with the support of three members of the research team [PT, BH, DG]; interviews ranged in duration from 41-117 minutes. The interviewer actively sought and encouraged responses from all group members in an attempt to mitigate the potential influence of power imbalance within focus groups (Belzile & Öberg, 2012). All interviews were audio-recorded with participants' permission and transcribed verbatim to support data analysis. Within this sample, some participants – and personnel referred to by them – hold positions in the organisation that make them potentially identifiable by virtue of their rank and position title. To protect the privacy of individual identities as part of our research ethics responsibilities, we have modified the position titles of personnel mentioned in this document. This procedure resulted in

a total of 164008 words transcribed across 169 pages in size 12 single-spaced Calibri font style from 423 minutes of focus group discussion.

5.2.4 Data Analysis

We analysed the interview and focus group data using a reflexive thematic approach to provide a flexible and theoretically relevant framework to explore participant perceptions (Braun & Clarke, 2020). This reflexive thematic approached followed a six stage process: (i) familiarising ourselves with the data via reading and re-reading of transcripts, and noting initial perspectives, (ii) generating initial codes, (iii) searching for themes within the data, (iv) reviewing of themes, (v) defining and naming the themes, and (vi) ongoing reflections throughout the writing process. The first author [MC] led the data analysis with the support of three 'critical friends' [PT, BH, DG] with substantial contextual knowledge of the military unit and substantive focus of the work. Stages one and two were conducted independently by the analyst team at which point we engaged in several collaborative discussions to identify (stage three) and review (stage four) themes. Collaborative discussions focused on supporting the lead author in interpreting the meaning of quotes and codes, rather than looking for agreement in interpretations (Smith & McGannon, 2018). Stages 1-3 of data analysis took an inductive approach, followed by abductive approach in stages 4-6 where we considered codes and themes against pre-existing frameworks of collective resilience (Gucciardi et al., 2018) and MTS effectiveness (Mathieu et al., 2001). In line with reflexive thematic analysis, we considered the semantic (i.e., surface level) and latent (i.e., underlying) meanings of quotes to generate codes and form the basis of themes, with the idea a central organising concept or shared meaning prioritised in the formation of themes (Braun & Clarke, 2019). Data analysis was supported by NVivo Qualitative software (QSR International Pty LTD, 2010).

5.2.5 Methodological Quality

Despite the abundance of approaches available to assess rigor within qualitative research, it is important to ensure synchrony between our philosophical standpoint, methodological approach, and the format of this examination (Smith & McGannon, 2018). Accordingly, we avoid the adoption of universal criteria and propose the following indicators to serve as 'guides' for readers in their assessment of our work, namely credibility, transparency, substantive contribution, and comprehensiveness of findings as these align with the ontological and epistemological perspective underpinning our approach. With regard to credibility, we maximised the trustworthiness and plausibility of findings via our ongoing work within the occupational (i.e., military) context for a period of 12-months surrounding the data collection period. Numerous touchpoints with participants and the squadron fostered rapport, openness of participants, and an acquired appreciation for the MTS context. Sincerity of findings was addressed through our reflexive awareness of idiosyncratic interpretative lenses and potential influence of personal knowledge, experiences, and values (e.g., recognising exaggerated preconceptions regarding the nature of military adversities led to adaptions of interview probes to explore subtle yet contextually relevant events) . Key to this process was the utilisation of critical friends who acted as sounding boards and encouraged consideration of alternative perspectives that were fed back throughout the analysis process. The substantive contribution or 'worthiness' reflected a combination of conceptual and practical importance, with the aims informed by the academic literature (Chapman et al., 2020; Zaccaro et al., 2020) and stakeholder priorities (e.g., team resilience; Commonwealth of Australia, 2016). Finally, we utilised data triangulation to maximise comprehensiveness of findings (Denzin, 1978) by conducting focus groups at multiple time points, and conducting interviews with members at different levels of the

organisation hierarchy to appreciate different perspectives of factors associated with resilience emergence. We also adopted triangulation approaches within the context of the analyst team, and conceptual interpretation of the findings via consideration of diverse theories of salient themes.

5.3 Results and Discussion

5.3.1 Stressor Experiences are Underpinned by the Dispersion, Clustering, and Shared Interpretations of Events

Answering the question "resilience to what" is critical for research and practice on resilience in human and non-human systems. In so doing, this theme provides essential context upon which to appreciate the nature of resilience emergence for MTSs, and forecasts the generation of new knowledge regarding the types of stressors experienced by MTS (Zaccaro et al., 2020). We approached this theme from the perspective of event systems theory in which events are characterised by three interacting elements of strength (novelty, disruption, criticality), space (place, location, hierarchy), and time (duration, timing in development, strength change) (Morgeson et al., 2015). With regard to the strength element, events are considered salient when they are new or unexpected relative to past experiences, alter the status quo, and encompass elements that are critical to the optimal functioning of the system. Event space reflects the location within a system where an event originated and interactions take place, and the directional nature of effects as they 'move' throughout the system (i.e., top-down, bottom-up, within-level). Event time captures temporal elements regarding the duration of events, points within the developmental lifecycle at which events occur for a system (e.g., early stage, mature stage of development), and dynamic and evolutionary elements of event strength throughout the life course of a MTS. We considered these core elements of events to make sense of the common and unique perspectives of stressors experienced by participants during and around two major

field exercises. Participants described three key features of events that contributed to perceptions of threats to functioning of the MTS. First, events varied across levels of the system and the location in the environment (i.e., internal or external) where interactions occurred, and with regard to the static or dynamic nature of event effects throughout the system. Second, discrete, time bound events that were related by time, type, or causation acted to threaten the system meaningfully. Third, events that lacked clear meaning or intrinsic value 'stood out' as substantial threats to troop functioning. In sum, threats to troop-level functioning were a product primarily of the spatial, clustering, and interpreted nature of events.

Origin and subsequent effects of interactions between MTSs and the environment. Participants' descriptions of events that triggered the prospective enactment of resilience processes were underpinned by varying spatial characteristics of events outlined within Event System Theory (Morgeson et al., 2015). Specifically, events described varied with regards to the origin (i.e., hierarchical level and environmental location) and effect dispersion (i.e., single-level or cross level) throughout the system. When considering environmental location, participants discussed events that involved interactions between the troop and both the internal (i.e., embedded organisation) and external environments (i.e., factors outside of the organisation) (Mathieu et al., 2001). MTS stressors originating from interactions between the troop and the external environment were described as salient demands that originated via direct effects. For example, performance within challenging environmental conditions for extended periods was a reoccurring experience for all troop members that immediately influenced behaviours. Across both time points of data collection, participants discussed continued events of exposure to hot environmental conditions that were experienced by all troop members:

> That [the hot weather] often puts a strain on us, especially the drivers, because they're stuck down inside the car and sweating […] It just saps the energy I think

> of a lot of people. So weather and the heat in general definitely makes it hard to do things.

The proportion of the troop who directly experienced external events in this case is affected by its component team distance (i.e., geographical, cultural, or functional variance). Specifically, the close proximity or low geographical component team distance (Zaccaro et al., 2020) of the MTS in the current study means that external environmental events (e.g., inclement weather conditions) were experienced across the entire system, yielding an immediate, multi-level effect that may be absent in MTSs where components and levels of the system are highly dispersed. Within the current context, resilience interventions that foster system-wide responses to homogenous external environmental events would yield benefit, yet a geographically dispersed MTS may require more diverse interventions to foster functioning in response to unique external events. Thus, structural factors unique across MTSs should be considered when tailoring resilience interventions, such as aligning the type and timing of coping strategies to MTS structure and the subsequent diversity of members (i.e., geographical, functional, or cultural).

Discussions of events originating from interactions with the embedded organisation were also prominent but varied with regards to who directly experienced this interaction across the troop hierarchy and the nature of their subsequent effects (i.e., event dispersion). For example, the most junior members of the system hierarchy reported unexpected change of plans and changes to troop and crew composition as key events that threatened troop-level functioning. This pattern of MTS stressor occurrence is reflected in the following quote, where changing plans during a training exercise originating at the squadron level were experienced as stressful across vehicle crew members via a direct, top-down pathway:

> It was frustrating that we didn't [get to] conduct the plan.... So if we did do that task, it would have been fine. However, it was just annoying and frustrating, we

> didn't do it. Then all of a sudden we get a task [from their superiors] that we hadn't planned for, and that's where the stresses were put on us I think.

Events that originated from interactions between the internal environment and members of the highest level of the troop hierarchy were also present. The most prominent cases of such events occurred between the highest level of the troop hierarchy and the squadron. In the following example, one troop leader outlined how assessment of the troop's performance (from a superior responsible for maintaining performance standards in the squadron) acted as a key stressor. Although acknowledged as a significant event by the whole troop, this event was experienced directly as a significant stressor by the troop leader and likely heightened by social-psychological influences of this event (i.e., perceptions of responsibility for troop performance; Slavich, 2019).

> We went through, did the live fire, assessed run, and got destroyed. ..The [senior member] [told] us we were [not performing to the required standard]… And once all of that negative feedback was received, I just shut down. […] I just shut down internally.

This example epitomised the potential for event effects to 'move' across levels of MTSs (Morgeson et al., 2015). In the following conversation, we can appreciate how the rest of the troop experienced the 'knock on' effects of this event perceived as a stressor directly by the troop leader:

> [*Interviewer*]: Did you all notice this sort of shut down that [name removed] was talking about?
> [*Vehicle crew member*]: Yeah, it was obvious [to all of us].
> [*Troop leader*]: It was pretty evident. There was no dancing around it. I've dropped the ball and […] you had lost me.

This top-down effect (i.e., MTS leader to vehicle crew member transition) was acknowledged further within the following reflection of the troop leader; this quote demonstrates personal recognition that the absence of effective personal coping responses to this event acted as an antecedent of an eventual stressor experienced across individuals:

> [In future] I need to go through what people tell me is criticism, and think, yeah, but that was actually pretty good. […] Instead of shutting down, what I should have done is [communicated] guys, this is not good. Let's move on, let's keep training, we'll keep doing our own thing and be more positive. But instead, I took it as a hugely personal attack. And so, I think, maybe being a little bit more resilience would have helped [the troop], because I was not resilient enough for that.

As a contrast to this situation where one individual's coping responses were maladaptive, another troop leader described an alternative approach in which negative assessment feedback can offer protective value for future functioning. Essentially, rather than dwelling on the critical feedback in isolation, leaders can engage their members collectively to digest the feedback constructively and within the context of environmental and logistical limits:

> After receiving the assessment feedback…] I just talked to our guys like, "Look, we talked about a few things." I was like, yeah I absolutely agree with these major things they want us to improve on but we all know what's within our limitations and what we can affect. So some things were given to us, there was either a legitimate reason as to why we can't change that or there was a reason […] why that something was happening. They said that wasn't good, you need to change this. And it's like we can't. That's not within our scope. So literally just immediately debriefing, once they left, yeah let's take this on board. Don't worry about this, this, and this because it's not within our scope to affect.

The effect of leaders' experiences of stress and subsequent behaviours on negative outcomes in group members (e.g., stress, burnout) is well recognised (Harms et al., 2017) and underpins this experience as an antecedent of a shared experienced of stress at the MTS level. The role of troop leaders as a key boundary spanner between the overarching squadron and MTS component teams means that the availability of effective coping skills within leaders and their activation may attenuate the effects of events that occur between the MTS and squadron. This may be especially important for leaders when engaging teams in debriefing following such events (Lines et al., in press).

MTS stressors also arose via bottom-up effects from events experienced directly at the component team level. For example, the experience of an intercom issue for one component team

had ‘knock-on’ effects at the troop level. In this scenario, this stressor event at the team level initiated behavioural (e.g., adjustment of coordinated actions) and psychological (e.g., pressure, frustration) effects that transferred to the troop level across other component teams and the troop command team:

> But when we had larger issues that started [such as the] stopping [of our vehicle] intercom. That created a bigger headache, not just our vehicle, but now for the whole troop, which meant that everyone had to sort of more or less pick up our slack because we couldn't function as we wanted to. And that was a bit of a headache for not only just the crew, but I would imagine for the rest of the other crew commanders as well.

Clusters of repeated, related, or simultaneous events. Threats to MTS functioning were also a product of the clustering or combined occurrence of discrete events. Participants discussed three forms of event clusters, namely the repeated experience of homogenous events, simultaneous occurrence of unrelated events, and causal chains of events that represented a potential threat to collective functioning. One common example of this first event cluster is discussed in the following quote, where the repeated occurrences of vehicle breakdowns were identified as a wearing experience across individual component teams that together presented as a threat to troop functioning:

> I had a steering component randomly break on me on a night move, [another vehicle driver] had his alternator issue, the boss and [their vehicle] both had issues with their turret. I don’t think a single vehicle for the entire squadron managed to get pretty close to going through the entire exercise without having a vehicle casualty, without having to be recovered and have mechanical work over the course of the exercise.

The occurrence of vehicle breakdowns during field exercises was acknowledged by participants to reflect the age of the vehicles; as at the time of interview, the Australian Defence Force (ADF) was in the process of acquiring new combat reconnaissance vehicles (to upgrade the ADF’s land combat vehicle capability as part of Project Land 400), to replace the current fleet of Australian Light Armoured Vehicles (Department of Defence, n.d.). Participants also discussed events that

were linked by time that occurred at different points within the system (i.e., across individuals and teams). This typology of event cluster is a product of the structural complexity (i.e., size and number of parts interfacing with environment) and unique environments (i.e., dynamic, uncertain, complex) of MTSs and demonstrates threats alien to individual and team systems. A troop leader described the coinciding occurrence of distinct events in close proximity – multiple 'causalities', vehicle breakdown, and negative performance feedback from superiors – as threats to troop functioning:

> I think it's a little bit of a "death by a thousand cuts" too. We started minus one person, we lost [three personnel to injury]. And the "ambo" [ambulance] got bogged twice. The "ambo" got stuck on its way out [due to the terrain]. So, it's a lot of little things that chipped away at our resilience over time… And then, when we were slammed after our second run [negative feedback from assessment staff following an activity], that was why my resilience, my little shell had been chipped away at.

Finally, participants also paid attention to the experience of multiple events that were linked via causal pathways. This format of adversity, distinct to the cascading effects of events that reverberate across the system, resembles unique events that take place subsequently as a product of prior events. As characterised in the following example, the pause of an exercise (triggering event) was perceived to cause the loss a vehicle to simulated enemy fire (secondary event) and the eventual change in vehicle composition to accommodate a member of the MTS command team (see Figure 1). In other words, the combined effect of the trigger and resultant events exceeded the troop's resources and provided a threat to troop functioning:

> [Exercise staff were instructed to] pause the exercise. So, we brought the dismounted support [team members on foot] back. We were in a hide [a concealed location] then the exercise begun. And within 20 seconds, my car had been [immobilised]. I had to be back-loaded, which meant the whole troop had to pick up and move. We were then a vehicle short. We activated the ambulance. They had to come and pick me up, took myself and [Name removed] away. That meant that [a command team member] had to change vehicles. They stepped off one car short.

These examples of event clusters indicate that threats to the functioning of the troop may emerge from solitary events and the additive effect of distinct, yet potentially related events experienced by a troop. For individuals, excessive allostatic load (i.e., the repeated wear and tear of demands to adapt to stressors) strains interconnected biomarkers (e.g., cardiovascular, neuroendocrine) that may eventually 'collapse like dominoes' and result in maladaptive outcomes (Juster et al., 2011). At the MTSs level, the repeated exposure to events may, taken together, threaten functioning via the breakdown of interconnections among individuals and teams. One troop leader typified this interpretation, describing how numerous 'dents' to the system resulted in one indiscriminate event to cause the breakdown of their connection with the troop and the subsequent deterioration of troop functioning:

> There's lots of little things that dent resilience and then all of a sudden, this massive thing just wipes me off the planet. If I drop my bundle [respond negatively to events], it makes it so easy for everyone else to do it, because they go, "Well, […] the boss [crew commander] has had enough, we've had enough!" So, that's a big learning point that I took out of it. I think, in future, I need to hold that together a bit longer, even if I'm really struggling, just keep it to myself.

These event clusters act as repeated 'dents' that can occur across different points of the system (e.g., individual, team, whole troop). From a network perspective (Kalisch et al., 2019), these threats to troop functioning are a product of numerous activations of individual and/or team nodes that place strain upon the interconnections critical to the highly interdependent functioning of this MTS. Coping strategies that act to limit disruption or recover quickly the activation of interconnected nodes across different points of the system may foster resilient functioning in response to stressful event clusters. In sum, future explorations of MTS resilience emergence should consider the following as important contextual moderators of the emergence process: (i) the presence and effects of multiple events (i.e., event domains; Cohen et al., 2019), (ii) tailoring

multiple coping strategies across different points of the system to event clusters, and (iii) the MTSs structure typology.

Individual interpretations of purposeful training challenges as meaningless can emerge into MTS stressors via aggregates of member states. The final characteristic of troop members' experiences of stress related to events that were interpreted as resource demanding (e.g., sentry duty) due to lacking in meaning, but deemed purposeful and beneficial at the organisational level. Although interpretations of certain events (e.g., sleep disruption) were perceived as core training challenges, participants commonly spoke to the recurring challenges of rapidly changing plans without apparent reason, ambiguity regarding the purpose of a task, and performing in conditions with minimal perceived training value as negatively impacting their affective states. For example, in the following quotes, vehicle crew members outlined how unexpected changes in tasks were perceived as 'frustrating' and 'annoying', yet in the subsequent quote maintaining functioning in the face of changing events was signalled as a key 'trait' of these MTSs and important for future military operations by a senior organisation member within the squadron:

> *[Vehicle crew member]*: With that planning, what we did as well, it was frustrating that we didn't conduct the plan […] so if we did do that task, it would have been fine. However, it was just annoying and frustrating, we didn't do it. And then all of a sudden we get a task that we hadn't planned for, that's where the stresses were put on us. I think.
>
> *[Senior organisation member]:* So to me, if I was to say a team was resilient sorry, it's their ability to adapt. Maintain a mission focus. So by that I mean they understand the bigger picture. They rapidly transition between task, and it's not a big deal to put it in simple language. Because for some people, that is a big deal to be told that: "You're doing this, you're doing this, and okay now you're doing this." It throws them and you can really see a team that has developed resilience and maintains the mission focus. They go: "Yep," and they will just do it. It's a trait in armoured core that is you know set in high regard, is the ability to transition between tasks.

In contrast, the following individual explained how they interpreted a change in tasks to be within their 'scope' of performance and therefore a challenge rather than a stressful experience:

> *[Interviewer]*: How did and how does that [short notice tasks] affect how you would normally operate, as an individual and as a collective?
> *[Troop member]*: It's part of our role to be adaptive. It's not outside of our scope to receive those last-minute taskings. It's something that we might be [not like] at the time, because it might be an [unenjoyable] tasking, but it's just something that our expectations should always be managed to do.

Similarly, events that required performing with limited resources (e.g., vehicle availability) were interpreted by troop members as unnecessary and lacking significant purpose. In contrast, a senior member in the squadron outlined how utilising limited capabilities to achieve performance outcomes was a core purpose of this military troop:

> *[Vehicle crew member]*: We've spent the last four, five months building up to something, and then, at the end of next week, it's going to go, because that's what needs to be done. The soldiers understand that's what needs to be done. But, that lot of stress could be fixed by that, by the resources and stuff coming in, in place, to have it done, with the ageing fleet, and everyone on that is, all that vehicles would be gone now that we're ticked in the box.
>
> *[Senior organisation member]:* The troop leader needs to have those capabilities to be effective in cavalry. It's an economy of force capability. So you need to be able to do a lot with very little. That's what gives us our strength. So you have to demonstrate those capabilities that I keep talking about, otherwise you won't be an effective cavalry organization.

These findings underscore two important considerations. First, there is a need to consider events that signal a lack of meaning to individuals (i.e., tacit stressors) as potential threats to troop functioning alongside situations that represent obvious threats or harm (e.g., enemy contact). The significance of this findings aligns with the widely accepted conceptualisations of stressor experiences as a dynamic interaction between person and environment (Lazarus & Folkman, 1984). Second, observed at the individual level, these events were discussed as being without value or worth and did not present obvious threats to troop functioning (i.e., MTS stressors).

However, when present across numerous troop members, the aggregate effect of these interpretations characterises a threat to troop functioning via disturbances to the affective states (e.g., frustration) and behavioural processes (e.g., task disengagement) of individuals. This finding reinforces the unique nature of stressful events or adversities across system levels. Specifically, at the individual level, vehicle members' may not perceive these events as significant stressors, yet at the troop level leaders' perceptions of pervasive changes across individuals may act as indicators of future threats to system functioning and signal the need for MTS leaders and members to deploy salient capacities and processes to maintain functioning.

5.3.2 Event Meaning Optimises the Affective States of Troop Members and Adaptive Processes

Event occurrence and system action are separated by an interpretative, sense-making process (Morgeson et al., 2015). Participants described how a comprehension of events in line with the 'bigger picture' protected individual functioning in real time and for future events, yet this degree of appreciation was disproportionate across levels of the troop. In this sense, situation awareness – the comprehension of environmental dynamics meaning and projection of this knowledge for future action (Endsley, 1995) – acted as an important mediator of emergent resilience within the context of this MTS. As present in the initial theme, the absence of comprehension surrounding the meaning behind environmental events results in disturbances to the affective states and subsequent functioning of the troop.

Comprehension and projection of environmental information influences affective states. Situation awareness was proposed to protect individuals from the destabilising effect of events within environments that are commonly ambiguous, dynamic, or complex (Mathieu et al., 2001). For example, the following crew member highlighted the protective nature of situation

awareness at the individual level against the potentially destabilising influence of internal events in the form of a sudden tasking while performing a backup role:

> I think understanding the bigger picture of where we sit in a plan. Being a reserve troop [back-up role within a field training exercise], it […] sucks but it's necessary and it's something that someone needs to fill. It makes it easier... Yeah, we are sitting somewhere and not doing anything but if there is a snap task then we're always going to be ready to step up and do that.

This perspective was echoed by a senior member in the squadron, outlining that situation awareness developed prior to the onset of events may enhance the likelihood of resilient functioning in response to environmental challenges:

> [*Senior organisation member*]: It will be how people maintain readiness. Their fitness and motivation. Their understanding of the bigger picture. So those that are not resilient will either not care or not try educate themselves on why these things occur. The guys that are the ones that seek out clarification, ask questions, are interested and look for answers. So they're informed. …They will get it and they will understand the bigger picture. Know why things occur and be prepared for it and able to adapt quickly.

Further insight into how this factor facilitates resilience processes was also discussed. Individuals pointed to the influence of situation awareness upon the affective state of the troop members whereby comprehension of the meaning behind events supported the projection of future valuable environmental outcomes and thus positive affective responses of individuals. In line with the three-level model of situation awareness (Endsley, 1995), we perceived that troop members witnessed events that dictated effortful performance (i.e., perception; level 1) but were also interpreted as having an ambiguous worth (i.e., absence or inaccurate comprehension; level 2). This combination lead to a pessimistic outlook (e.g., having little control over future events) and negative emotional outcomes (i.e., projection; level 3). MTS leaders reflected upon a cultural shift within Army where the role of event comprehension and attempted projection of information are determining factors in either positive (e.g., motivated) or negative (e.g., frustration) emotional states within the current generation of soldiers:

> [*Senior organisation member*] The generation of soldiers now is at the point where, intellectually you can't just be a passenger in this army. Otherwise, you will just be very sad and not know what's going on all the time. You just won't get it. All of them will be frustrated but not all of them will seek out and go: "Well why am I frustrated? Why is this occurring? What do I need to do about it? How can I change this?" They will just ride it out. There is nothing you can do about those guys that don't know what else to do.
>
> [*Troop Leader*]: That's a big thing for the generation change. Like, soldiers five years ago wouldn't bring those kind of things up. The new generation of soldiers, they need reasons why they're doing stuff rather than just 'you will clean this car', if I tell them you're cleaning this car because it's getting handed over to a different squadron to go out in field again then they'll [have a positive reaction]. That's another thing I've seen the most the past five years and it puts a lot of stress on soldiers when you don't give them that information.
>
> [*Crew Commander*]: I mean the newer generation, too, if you tell a new driver who's 17 [years of age] coming out stand on that turret and make sure there's no one coming from here to here they'll say, "Well, we know no one is out there." They'll go why are we there? You're training for it for the future. Some of the new generation coming through don't really start ... Well, there's no one out there so why the hell am I standing on a turret in 38 degree heat. A lot of the new drivers, the generation which is coming through, they'll start to question that stuff why they're doing it in that kind of heat and environment if they know there's literally 20 kilometres of dirt out there.

This perspective was echoed by vehicle crew members who spoke to how knowledge of the rationale for events allowed them to respond positively to changing tasks. As a collective, these positive interpretations of and emotional responses to events support the behavioural contribution of individuals to the overall functioning of the troop (Ashkanasy & Dorris, 2017). Additionally, affective states also tend to converge across team members (Barsade, 2002; Elfenbein, 2014; van Kleef & Fischer, 2016). In this sense, the following example can be interpreted as an important process in protecting against the deleterious effects of ambiguous events on troop functioning:

> [*Vehicle crew member*]: Knowing the bigger picture for me always helped. So like the Sergeant was saying, understanding we're not firing as opposed to just being told you're not and this is why. That definitely does help me personally sort of alleviate that stress because it's well, okay, I didn't understand that. I just thought we were getting stuffed around. That's why. Okay, cool. I can deal with that.

These observations offer an advancement upon previous work that has explored situation awareness (Stanton et al., 2017a) by indicating an affective element of this construct. Past work has acknowledged the cognitive and behavioural outcomes of situation awareness (i.e., perception to cognition to action) (Endsley & Jones, 2001), such as the delay in decision making and information sharing across component teams under circumstances where situational awareness is incompatible across MTS members (Waring et al., 2018, 2020). Our findings instead highlight the destabilising affective outcomes (e.g., feelings of frustration, reduced goal commitment) of incongruent or insufficient individual situation awareness and the influence of this incongruence upon resilience functioning. Said differently, individual comprehension of events (i.e., resilience factor) may protect the affective states of individual troop members and foster the swift and effective enactment of adaptive intra- and inter-team adaptive strategies (i.e., resilience processes) that protect or recover troop functioning. Future work is required to shed light on the effect of situation awareness on performance via shared affective states.

Event comprehension and projection is influenced by shared mental models that are constrained by organisational hierarchy. Despite its importance for collective functioning, participants discussed how the structural nature of the troop meant situation awareness was apportioned uniquely across different levels, with vehicle crew members afforded fewer opportunities to form a comprehension of changing events. Command team leaders, in particular, conveyed an inherently broader degree of situation awareness when faced with challenges (e.g., awareness of challenges incidentally included as training measures) because of their higher degree of accessibility of information horizontally and vertically within their collective system. In this sense, the troop leaders' role as a boundary spanner is critical in disseminating information pertaining to the meaning behind internal environmental events (J. Turner et al.,

2020). In the following quote, one troop leader outlined how the hierarchical rank structure determines their key role in the dissemination of information (e.g., change in troop objectives) passed down from senior members of the organisation:

> So when we are essentially giving our commanders the intent [goal/objective], it is our intent and also the higher-up intents. So every [troop] commander interacts mainly with the [senior members], and then my intent, we pass down to these guys.

Overcoming this organisational constraint of a strict hierarchy of leadership is an important contextual challenge to consider when aligning potentially incongruent perspectives of the shared challenges faced by members (e.g., varying interpretations of ambiguous tasks). Key here is the important protective nature of aligning unique, yet complementary psychological representations of environmental dynamics (shared mental model; Rouse & Morris, 1986) across troop members in contexts whereby natural alignment may be stifled by the strict hierarchical nature of the military troop. From a practical perspective, interventions that optimise the cross-pollination of information horizontally (i.e., crew-member to crew member) and vertically (i.e., crew commander to crew member) or via technological systems (e.g., computer interface) would likely benefit the enactment of adaptive processes required for environmental challenges.

Situations where leaders experienced insufficient or incongruent situation awareness were less frequent but also discussed. Unique to vehicle crew level experiences, command team members' experiences of inaccurate or absent comprehension behind environmental events resulted in a disproportionate influence upon system coordination. One Troop Leader described how, in response to a Squadron decision to change the training location, they ineffectively comprehended the meaning behind events experienced and subsequently lost control of their affective state, which in turn negatively influenced the affective states of troop members and functioning for an extended period:

> Let’s say that we were given, so this is your piece of ground, you'll have this space. In this space, I want you to come up with training outcomes. Okay great. I'd spend an entire night coming up with training outcomes. I would talk to my NCOs, my troop sergeant. We would come up with what the troop was going to do the next day. And the next morning, I'd get told, "No, we've given you a different piece of ground." I'm sorry, but training doesn't just […] happen. […] It takes time and analysis and working on this piece of ground is good for this, this piece of ground is good for that. […] And that, was frustrating to me. I don't know how that affected everyone else, but I think if I'm frustrated, it's probably fairly evident, because I'm not good at keeping that to myself, I would just be pissed off. And I think that can negatively affect people [i.e., other members of the troop].

This example highlights the criticality of leaders flexibly updating situation awareness with the dynamic information present within the embedded organisation to interpret the meaning behind future events adaptively. Leaders act as key boundary spanners for troop shared mental models (i.e., compatible interpretations of environmental changes; Cannon-Bowers et al., 1993) and their affective responses to events may hold disproportionate influences upon troop functioning. These interpretations align with meta-analytic findings demonstrating leader experience of stress to influence their personal behaviours negatively, leader-member exchange, and subsequently act as a key determinant of subordinate stress (Harms et al., 2017).

The updating of shared mental models to foster effective individual event comprehension and projection is a two-way process. Participants discussed two key processes by which to facilitate the updating of shared mental models and thus compatible interpretations of events. First, participants highlighted the importance of leadership communicating contextual information surrounding the ‘bigger picture’ when faced with challenging tasks. This top-down process is reflected clearly in the following quote, where one troop leader identified ‘regular communication’ as essential for keeping vehicle crew members aware of their nominal role within a large exercise:

> Bringing it back to coping, [one aspect] I suppose was adaptability. The expectations were managed at our level. We knew that it was a bigger exercise, but I think we were

> part of a bigger exercise, the target audience wasn't us at all. So everyone kept that in mind. We kept reminding them of it throughout the exercise. So that was big coping mechanism of dealing with those frictions that came out of that.

Second, participants emphasised the importance of crew members actively sourcing information that can optimise their situation awareness by aligning their mental model with those of individuals above them in the troop hierarchy. Vehicle crew members described how 'fighting for information' was critical for developing contextual understanding that was in synergy with those of the command team level:

> Fighting for information at all levels […]. But at the same time, even incorrect information is helpful because it might not give you the full picture of what you're doing, but it might give you timing. Say we're going to do this task by then although sometimes we just got no information. [We just] Got told "go".

The provision of event rationales is considered a critical characteristic of workplace environments that foster internalised motivation and goal acceptance (Gagné & Deci, 2005). Meaningful rationales enable people to appreciate the meaningfulness or value of a certain task or behaviour and in so doing internalise the reasons for engaging in it (Teixeira et al., 2019). Processes that support the comprehension of situations through meaningful rationales (e.g., top-down information sharing, bottom-up information sourcing) play an important role in the coordination of affective states (e.g., motivation, goal commitment) of troop members. These mechanisms discussed here may be broad ways in which to optimise this emergent state, yet other forms of interactions may also provide worth. From a socio-technical systems perspective, for example, non-human artefacts (e.g., information systems) may help to augment these dynamic interactions with MTS (Stanton et al., 2006).

5.3.3 Interpersonal Trust Fosters Behavioural Coordination and Affective Synergies between Members

Trust was discussed by participants in response to the range of challenges experienced by members of this MTS. Consistent with past conceptual work (Fulmer & Gelfand, 2012), participants differentiated trust according to the referent and layer of their system at which it resides. As an interpersonal construct at the individual level, trust is defined as "a psychological state comprising willingness to accept vulnerability based on positive expectations of a specific other or others"; for teams, this willingness to be vulnerable is defined as "a shared psychological state among team members" and is based on "positive expectations of a specific other or others" (Fulmer & Gelfand, 2012, p. 1174). Team trust represents a group-level construct; rather than the aggregation of isomorphic states between group members, it represents "generalized expectations of trustworthiness and the willingness to accept vulnerability to all members" (Costa et al., 2018, p. 171). At the interpersonal level, trust also can be characterised based upon 'who' the recipient of this state of trust is targeted, otherwise known as trust in a referent (e.g., leader, vehicle crew driver). Participants underscored the importance of both interpersonal trust in specific individuals (e.g., troop leader) and trust shared across a team in the context of specific adversities that were time constrained, complex, or ambiguous. These discussions provided the necessary background context upon which to appreciate the nature of interpersonal trust in this MTS. For example, one vehicle crew member preceded discussion of trusting the troop leader's decision-making by outlining events where the troop was suddenly tasked with an objective in a low activity period and with minimal time to prepare:

> You're so used to being on the go and continuing [to do] it [tasks]. You're just in that mindset, "Okay, let's go do this. We're ready for it," instead of having to change your mindset from 'I'm just sitting here doing this and planning for a task in three days' to, I found out 20 minutes ago I've got to do this [activity].

In a separate example, one participant provided background to future discussion of the importance of trust in other troop members by outlining a situation in which they were faced with the combination of losing a component team vehicle due to a mechanical issue and lacking training for dealing with such an event:

> I think even if we do train in the sim [vehicle simulator] and assume to lose a vehicle, we'll lose it for a short period of time and then we'll reset [the simulator]. Whereas the issue we had, was that when we got pulled out to get a new alternator [one vehicle crew]. [We were told initially] that the job was going to take more than three hours [to fix]. [So] we head back and then they said the part will be here in two days. Five or six days later, the parts still didn't rock up. So we've trained to lose the vehicle but then have it replenished pretty soon in. Whereas we just didn't have that [vehicle] and that was a problem not just our unit [squadron], it was into the brigade [wider organisation].

Aligned with the defining features of major life events (M. Luhmann et al., 2020), participants discussed trust largely within the context of adversity events characterised by low predictability (e.g., unexpected tasks), high external control (e.g., changing of group composition), or high challenge (e.g., navigating of dangerous ground). Common among these scenarios is the requirement of certainty and quickness of coordination at the troop level. In these situations, the processes of relinquishing control (e.g., a troop leader allowing a crew leader greater autonomy) and accepting vulnerability (e.g., a vehicle driver performing leader-directed tasks within an unpredictable setting) are ostensibly necessary within teams (i.e., driver-gunner-commander trust dynamics) and across teams (i.e., crew commander-troop leader trust) to match the environmental demands troops faced. Interpersonal trust in these contexts, therefore, acted as a protective factor that may generalise across varying threats to troop functioning.

Trust was discussed as a state that was present for different referents within and between levels of the troop. Consistent with evidence on the importance of trust in leadership (for a review, see Burke et al., 2007), states of vulnerability and a willingness to relinquish control

flowed upwards across levels from (i) the vehicle crew members (i.e., driver and gunner) to the crew commanders and troop leaders, (ii) crew commander to troop leaders, and (iii) troop leaders to the senior members of the squadron (see Figure 1). As an example of this upward flow of vulnerability, one vehicle crew member spoke to the protective nature of trust in their direct leader (crew commander) for risk minimisation or mitigation:

> So you know that he understands, absolutely... For me, that's the first thing, so he sort of just knew what a junior driver was like, he knew that I wouldn't know certain things that a more senior person would know. So the trust that he would lead me in the right direction, because he understood everything [crew member regarding crew commander].

The upward referent of trust was also evident among the command team. One troop leader, for example, pointed to the importance of trusting senior members' intent and 'relying' upon such information for action. In this sense, trust can be distinguished from confidence in that trust implies that something may be lost (e.g., choosing to act with the possibility of disappointment), whereas confidence symbolises situations where this possibility of losing something important, or alternatives to positive outcomes, are not considered (Costa et al., 2018).

> At the troop level, I'm sure they've mentioned it, but mission command is what we rely on heavily, which is essentially your commanders' intent. So [I would give] my intent and also the higher-up (i.e., Squadron level) intents. So every commander [above me], gives me their intent, and then with my intent [added], we pass this down to these guys.

This 'flow' of vulnerability was mirrored from higher to lower levels of the system. For example, at the command team level, one troop leader spoke to their trust in the most immediate junior members of the command team to carry out their intent by supervising the essential preparation needed for troop functioning (e.g., vehicle preparation):

> I need the trust and they need the intent. The trust is developed through performance, pretty much. You can't put an ad hoc team together and just expect mission command to work, because they haven't actually developed that trust. It could work, but it's not proven. Trust is implemented at a lower level below me by the commanders doing inspections on their cars to make sure that the gunners are cleaning their weapons and maintaining weapons, making sure the drivers are maintaining their cars through inspections and also

> through seeing the performance of the gunner and driver doing their job. That is how they develop their trust.

Vehicle crew commanders also spoke to the importance of trusting their vehicle crew members. In the quote below, for example, one crew commander discussed their uncertainty regarding the capabilities of one crew driver as an impediment to demonstrate trusting behaviours and therefore relinquish some of their duties when navigating a complex situation. This example illustrates the potentially detrimental effect the absence of trust may have upon intra-team coordination in response to threats to troop functioning:

> So I was almost as concerned about keeping my head away from the sights to make sure that I don't lose a mouth full of teeth as I was with scanning my targets because you never know. You don't know if he's like, if he's going to be confident enough to make the correct judgement, decisions at [a river] crossing or something like that. I think, yeah, this is, you degrade [in performance], especially at the lowest level.

These quotes and the overall nature of the discussion demonstrated that the downward and upward flow of trust was apparent only within vehicle crews and between the most immediate of levels of the system hierarchy. Essentially, none of the participants discussed trust in referents that 'jumped' levels in the hierarchy (e.g., crew driver to senior organisation members) or across vehicles in the troop (e.g., vehicle driver to vehicle driver). The immediacy of trust states between individuals may be explained by linkage attributes that act as important input factors within MTSs, reflecting the interdependence and communication structure of the team (Zaccaro et al., 2020). Within the context of the organisation at the heart of this study, linkage attributes may constrain the emergence of trust in two key ways. First, the explicit rank structure that exists within military organisations dictates an organisational norm surrounding the communication pathway between troop members, whereby interaction among team members occurs predominantly between the most immediate rank levels. The hierarchical chain of command present within military settings therefore constrains the emergence of a 'pathway' of trustor-

trustee relationships. Second, at the lowest level, the ‘reach’ of vehicle crew members’ trust in referents stretched only within the same vehicle as a result of the dispersed nature of vehicles. Within this context, vehicle crew members’ communication is restricted to intra-vehicle communication on one radio system, whereas the crew commander may also communicate with members of other vehicles, indicating one constraint that shapes the chain like structure of trust within these MTSs. In sum, this chain of command and communication structures provide an important contextual backdrop to understand the nature of trust that may protect effective troop functioning.

The presence of these top-down and bottom-up trust states across component teams fosters resilient MTS functioning in several ways. First, adverse events may threaten the continuation of system coordination by destabilising interpersonal connections (e.g., reduce information sharing and reciprocal behaviours) at key points in the system (Kalisch et al., 2019). Following events where consistent team processes were the best approach to optimise MTSs functioning, trust can foster MTSs resilience by preventing coordination breakdowns through processes such as suspending uncertainties or doubts during task performance towards task goal (Dirks, 2000) and reducing the risk of relationship conflict (Simons & Peterson, 2000). Second, trust can optimise MTS functioning when changes in collaborative processes are required. For example, behaviours such as accepting influence (e.g., behavioural direction) from team members (Costa et al., 2018), performing risk taking behaviours, and increasing communication are beneficial to adaptive functioning and an artefact of these interpersonal trust states. Finally, top-down trust held by leaders (e.g., mission command, troop leader, crew commander) also promotes behaviours conducive to adaptive processes. Specifically, increases in leader communication, decentralised decision making (Mishra, 1996), and leaders’ willingness to

allocate greater resources to lower echelon members, or engage themselves in risk taking behaviours (Burke et al., 2007) can optimise the behavioural coordination of troop members following the onset adversity and thus the overall troop functioning. The presence of trust across key points of a MTS represents an important protective and facilitative factor for their emergent resilience. Importantly, these findings demonstrate the contribution of trust at both the team and multi-team levels, enhancing the worth of this construct and acknowledging the absence of potential countervailing influence.

Although trust in referents did not stretch across vehicles or multiple system levels, participants spoke of a troop trust that existed across all members and, at the troop level, was described as a general feeling of team trust in 'everyone'. This emergent team-level state – the generalised expectations of trustworthiness of members across the troop – was discussed by participants as a belief in their ability and an affinity between members of the troop. For example, at the troop level, participants expressed how knowing each other's personalities was a key characteristic of this troop trust:

> The thing is, it comes down to everyone hanging out and knowing how everyone works and knowing everyone's personalities. It's a lot of trust. We have a lot of trust in each other's abilities. And if that person doesn't have trust, there's people there that will help them get to them to that standard.
>
> I think another thing of trust is just getting to know your troop, like actually knowing everyone personally so you can trust them because you know something about them.

The affective nature of troop trust can be explained by the organisational structure of this MTS in that more distal (i.e., separate vehicles) troop members exhibit lower levels of interdependence and thus a lower requirement to be vulnerable each other's actions. In this way, affective trust is based upon the emotional investments and care between group members, which contrasts to cognitive elements of trust that resemble perceptions of competence, reliability, and

dependability (Costa et al., 2018). In essence, these findings point to variations in the nature of trust at the interpersonal and team levels; trust within the current context between immediate referents is characterised primarily by cognitive foundations (e.g., willingness to be at risk in highly interdependent task). At the troop level, although cognitive foundations of collective trust may also be valuable (e.g., coordination of vehicles in troop activity), these findings indicate troop trust may also be characterised by reciprocal care for wellbeing (e.g., support outside of task environment). These variances point to the multifactorial nature of trust on MTS resilience emergence.

Presumed and Proven Sources of Competence act as the Basis for Emergent Trust

The emergence of trust in leadership within the troop was spoken about directly in two ways. First, trust emerged swiftly via immediately available sources of information that presumed the competence of the leader. Second, trust emerged through and was sustained by experiences of trustee behaviours that demonstrated competence in supporting troop performance and that were perceived as ‘likeable’ by troop members. In essence, trust in leadership by troop members emerged via presumed and proven trust.

When discussing the emergence of trust in leadership, participants described the role of contextual information in promoting positive perceptions and beliefs about the intentions, motivations, and behaviour of the trustee. One contextual cue that fostered immediate perceptions of ‘presumed competence’ (and thereby trust) was the strictly defined and competitive rank structure, and associated high performance standards, present within the organisations, where participants expressed their awareness of the proficiency needed to attain promotion within the organisational structure. In the following quote, this trust in the rank

structure arose from knowledge that poor performance within senior positions would lead to removal:

> [Within the context of trust…]Yeah, that position of authority is assumed in this corps because this is one of the few corps, actually one of the only corps that sack people if they're not doing their job. And it happens every year. So across at least one of them it will happen. It's happened several times this year, and in all three regiment where people at all positions have been sacked because they haven't been performing to the required standard, you know?

In addition to awareness of the standards and competitiveness of promotion within the rank structure, presumed trust within leadership occurred via an awareness of the organisation's training process. A key consideration in this regard was awareness of the sequential nature of leaders' training and job progression, whereby leaders have received first-hand experience in each of their subordinates' roles:

> I think at the crew level a lot of the trust comes from knowing that your crew commander has been in the same position that you've been in. So you know that he's been a driver and a gunner before, so you know that he understands, absolutely... For me, that's the first thing, so he just knew what a junior driver was like, knew that he wouldn't know certain things that a more senior person would know. So the trust that he would lead me in the right directions [was there] because he understood everything. Same with the gunner. You understood how to steer the gun in the right way, that sort of thing.

The rigorous, standardised, and role-specific nature of training further fostered positive perceptions of members' behaviours. In this way, members were willing to be immediately vulnerable to the actions of newly appointed troop members. In the following quote one member described how this standardisation of training supported component team functioning when faced with prospective challenges:

> It's just like a standardisation of your training. Everyone should know if you're a gunner and you're changing troops, I'm still doing the same job. It's just different people. Crew is changing. For myself, I came into this troop just before we went out to field in a new position as well. So, I just had to do what I thought my job role was until I got comfortable with how everyone else worked. It's just sticking to your job role, for what you know it is. And then, getting used to everyone, like the troops, SOPs [standard

> operating procedures], and how the boss wants things run and Sarge wants things run and then picking up on the other superiors.

These findings support past conceptual models (C. S. Burke et al., 2007; Costa et al., 2018) and empirical studies (Moorman et al., 1993) of trust emergence in which organisational norms and structure are considered key contextual factors. Within the current study, cues built into the organisation (e.g., recognition of rank achievement, established role progression sequence) fostered immediate perceptions of leader and component-team member competence, which were critical to the emergence of a willingness to be vulnerable to their actions. These findings contrast with the view that formal, centralised leadership structures are less conducive in the development of trust among team members (Costa et al., 2018). This contrast may be a product of the length of a MTSs life-cycle. In the current study, we focused upon a permanent MTS rather than one created for a transient period (e.g., formed solely to respond to a natural disaster). Our findings suggest there may be benefits to developing role-specific norms around the intentions and behaviours of positions held within formal hierarchical structures, and implementing robust training across organisational roles prior to integrating new members within a MTS to optimise collective functioning in the context of adversity.

Participants also discussed the importance of proven sources of trust to support the emergence of this state within a bottom-up nature (i.e., trust in leadership). For example, the following vehicle crew member outlined how trust in rank structure only lasted up to a certain point.

> Hand-in-hand with that, when we have new NCOs [command team members] that come in, they have a level of trust given to them by virtue of rank, however on a personal level if someone was to come in, there's a different level of trust that's given through an experience that you've shared with them. You've gone out on task and you might be put into a situation where you've had to rely on each other, and from that you subconsciously or consciously you go, ‘I am more than happy to put my life in their hands at that point’

The development of this trust between individuals over time was enhanced by 'getting to know' one another and 'knowing each other personally'. As opposed to awareness of technical skills (e.g., driving, gunnery skills) that foster a willingness to be vulnerable via perceptions of capability, interactions over time that support positive expectations around reciprocal behaviours, and mutual commitment to goal achievement were also important in the development of trust:

> *[Vehicle crew member]*: I think another thing of trust is just getting to know your troop, like actually knowing everyone personally so you can trust then because you know something about them.
> *[Interviewer]*: And so there's specific things that you do within this troop to build that understanding?
> *[Vehicle crew member]* Troop functions, barbecues. Just, like when you first get a new boss or a new troop just, spending five minutes introducing yourself to everyone. So sure right, out in the field together, talking […] it like helps builds up your trust, it helps a lot. You actually get to know each other helps build the trust.

From a social exchange perspective (Lewicki et al., 2006), the experience of positive interactions of reciprocal behaviour between troop members develops trust between individuals in a reinforcing cycle. In this sense, when speaking about 'getting to know one another', continued observations of cooperative and reciprocal behaviours of team members act to foster a willingness to be vulnerable based on a dynamic belief that this vulnerability will not be exploited by another. This perspective resembles characterisations of unconditional trust within organisations. In contrast to conditional trust, where knowledge based perceptions enable individuals to suspend the belief that another may be untrustworthy and allow basic cooperative action, unconditional trust is characterised by an assured willingness to be vulnerable based upon mutual awareness of shared values (i.e., a feeling of mutual identification) and strengthened relationship bonds between members (Jones & George, 1998). In this sense, the emergence of trust from proven sources may resemble these strengthened relationship bonds at salient junctures of the MTS, which protects functioning in the face of adversity through strong desires

to maintain cooperation and risk taking behaviours in the response to events that are ambiguous, arduous, and/or time-consuming (Jones & George, 1998). Our interpretation of this data presents the benefit of strategies that expedite knowledge-based trust development between key boundary spanners within MTSs

5.4 Theoretical Implications

We brought together two contemporary conversations within the social sciences on resilience and MTSs to present features and process that underpin effective MTS functioning in response to adverse events (e.g., event interpretation, boundary spanner trust). Existing work provides knowledge of each concept in isolation, yet a limited understanding exists of their interface and therefore the conceptual makeup of MTS resilience emergence. We addressed this gap by exploring MTS members' perceptions of resilience emergence within an occupational context offering repeated and ongoing exposure to naturalistic stressors. This exploration of MTS resilience emergence yielded several theoretical implications. First, the results of this study offer new insights regarding the collective experience of stressors within the context of multilevel MTSs. Examination of events that threaten functioning within the workplace has received widespread attention from varying conceptual frameworks (e.g., Job Demands-Resources Model, Demerouti et al., 2001; Job Diagnostic Survey, Hackman & Oldham, 1975; Challenge-Hindrance Framework, Lepine et al., 2005). However, knowledge regarding the necessary and sufficient characteristics of stressors is notably limited when applied to collectives such as teams or MTSs (Slavich, 2019). We outlined key situational (i.e., origin, target, cascading effects, clustering) and system (i.e., heterogeneous interpretations across individuals) characteristics that establish threats to functioning at the MTS level. In so doing, these findings provide preliminary insight into how collectives experience stressful events and offer further

impetus for ongoing systematic efforts to disentangle the nature of stressors for collectives such as teams or MTSs. This challenge is closely aligned to the absence of an established taxonomy of collective stressors. There exists recent advancements regarding a taxonomy of stressor events for individuals (M. Luhmann et al., 2020), yet action of calls to provide such measures within MTSs are absent (Zaccaro et al., 2020). Given the centrality of stressor experiences to numerous constructs within the workplace (e.g., hardiness, Lambert et al., 2003; posttraumatic growth, Maitlis, 2020), a taxonomy of stressor experiences for collectives is necessary to allow alignment and integration of future findings in a systematic fashion. We contribute to this literature by shedding new light on the multilevel nature of stressor experiences for MTSs in two key ways. First, we unveil salient findings that benign perspectives of events at the individual level can threaten MTS functioning (accumulation of loss). Second, we highlight the need to consider pertinent contextual features when measuring stressors. For example, the proximal nature of component teams in our study meant external environmental events were likely to reach all members in a simultaneous fashion. Collectively, therefore, these findings provide the foundations for the future development of a taxonomy that categorises event experiences within the context of MTSs by offering insights to the necessary structure (multi-level), content (e.g., nature of individual items), and measurement approach (i.e., importance of member perceptions).

Second, we offer new empirical evidence that clarifies existing conceptual perspectives of emergent resilience for collectives (e.g., Bowers et al., 2017; Stoverink et al., in press). Understanding the ‘what’ and the ‘how’ of emergence is at the core of understanding team resilience (Gucciardi et al., 2018) and team effectiveness more broadly (Kozlowski & Ilgen, 2006). Our findings clarify key features of resilience from an in-depth exploration of a context

rich in stressors to balance parsimony with comprehensiveness in theoretical contributions (Whetten, 1989). Specifically, we outlined how situational awareness and trust emerge across an MTS and how these factors contribute to the enactment of resilience processes across levels of an MTS hierarchy, and in so doing add empirical support to past conceptual models of collective resilience (Gucciardi et al., 2018). These findings expose resemblances to the interactive nature of mediators of emergent states (Ilgen et al., 2005); we expand upon linear descriptions of discrete inputs and mediators by demonstrating the interactive nature of trust and situation awareness whereby the presence of trust at critical junctures of the MTS seemingly offsets circumstances where refined situation awareness is absent (e.g., sudden task change). Therefore, these findings contribute important foundational knowledge regarding the non-linear translation of MTS input factors into performance outputs. Future work can leverage and extend our findings by conducting multi-method assessments (e.g., in-situ observations, self-report measures) of key factors that may foster convergent or complementary perspectives.

Third, our findings offer new insights regarding situation awareness and shared mental models within collectives. Unique to the cognitive and behavioural mechanisms of this former construct outlined previously (Stanton et al., 2017a), we build upon conceptual perspectives by demonstrating the role of individual situation awareness in aligning the affective states of group members. Fostered via the development of shared mental models, situation awareness within individuals was found to protect against experiences of negative emotions (e.g., frustration) that arose from an inability to comprehend current and future environmental dynamics. This finding supports perspectives regarding the important quality of situation awareness in terms of its sufficiency to provide individual explanations of environmental dynamics rather than as a direct representation of the environment (Stanton et al., 2017a). Further research is required to

disentangle the nature of this novel finding regarding situation awareness and affective states and its role in MTS resilience emergence.

Fourth, we offered new insight into how contextual features of MTSs influence emergent resilience. Given recent calls to consider the 'who, where, and when' aspects of theory (Busse et al., 2017), coupled with an awareness of the range of MTS typologies (Zaccaro et al., 2012), the presence of influential contextual features offers significant theoretical worth. Notably, our findings point to the presence of a strict leadership hierarchy, geographically proximal component teams, and the internal status (i.e., teams within one organisation) as key boundary conditions that should be considered when observing MTS resilience. These findings offer initial insight into exogenous factors that can inform future theoretical and empirical studies of MTS resilience, which can be extended in future examinations of emergent resilience across other MTS typologies to clarify knowledge of such boundary conditions and their inferential generalisability (Smith, 2018).

5.5 Strengths, Limitations, and Future Directions

Key strengths of this study include an approach that maximised synergies between concept and method via a contextually rich investigation over two time points of a MTS who experienced stressors and adversities as part of their training and development cycle. Despite efforts to optimise the rigor and quality within the current study, three key limitations should be acknowledged when evaluating our findings and considering avenues for future work. First, although retrospective bias was limited by the collection of data soon after stressor experiences, our reliance upon post-hoc interview data means that we cannot rule out the effect of time upon participants' perspectives of their experiences. There is a need for innovated methodologies that minimise the potential influence of time and which maximise synergies with 'in situ' experiences

of stressors and adversities (e.g., data prompted interviews, observations). Second, we acknowledge the limitation of our focus upon one specific context of MTSs within the current study. We recommend that others expand upon our findings through explorations of resilience within other domains and typologies of MTSs. Finally, the purely qualitative nature means that we did not objectively measure the nature of member stress experiences of MTS functioning. Therefore, we are unable to comment on the specific magnitude or duration of participants' stress levels and state the outcome of MTS functioning. Rather, we hope to forecast insight into the theoretical make up of this novel area and encourage future work to explore such avenues to develop this understanding. Third, we acknowledge within our interpretivist standpoint that another research team may have developed a different thematic model with this same data. Although we explicitly acknowledge personal biases, these themes should be understood as an informed interpretation of data that requires further evidence to support or deny our perspectives.

5.6 Conclusion

Scholarly interest in the concepts of collective resilience (Bowers et al., 2017; Gucciardi et al., 2018) and MTSs (J. Turner et al., 2020; Zaccaro et al., 2020) is on the rise, yet their integration remains empirically unexplored. In light of the relative importance of both resilience and MTSs to the success of modern organisations, we provided an initial examination of the triggers (i.e., stressors and adversities), inputs, and mediators underpinning emergent MTS resilience. Given that theoretical development rests heavily on the contribution of qualitative research that can afford insights into complex social processes (Eisenhardt & Graebner, 2007), we hope these findings open the conversation of emergent MTS resilience by exceeding the scope of quantitative approaches, and provide a 'proof of concept' for future empirical and conceptual explorations.

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Table 2. Overview of contextual features of the MTS within the current study.

MTS Typology	Description
Size	Each MTS comprised of 3 to 5 component teams. Each component team comprised of 3 person.
Boundary Status	Internal. All component teams are from the same organisation.
Nature of interdependence	Functional interdependence at the intra- and inter-team level.
Distal Goal Type	Physical tasks (i.e., coordinating behaviours to achieve task outcome based upon existing knowledge)
Nature of Functioning	Effectiveness via quality and efficiency of performance. Objectively measured through: - Continued physical task completion amid rapidly changing tasks. - Task assessments (e.g., navigate and manoeuvre through defined area, defeat a tactical threat etc., maintain safe manner, maintain tempo).
Diversity characteristics	Geographical: component teams physically dispersed across single location. Functional diversity: homogenous component teams each consisting of driver, gunner, and commander. Cultural: prominent organisational culture based on military norms.
Leadership hierarchy	Three tiers of leadership: troop leader, crew commander, and soldier. (Note: troop leader and crew commander make up command team – see Figure 1)
Performance episode of component teams	Simultaneous, interdependent performance of component teams.

Note. MTS typology characteristics taken from Mathieu et al. (2001) and Zaccaro et al. (2020).

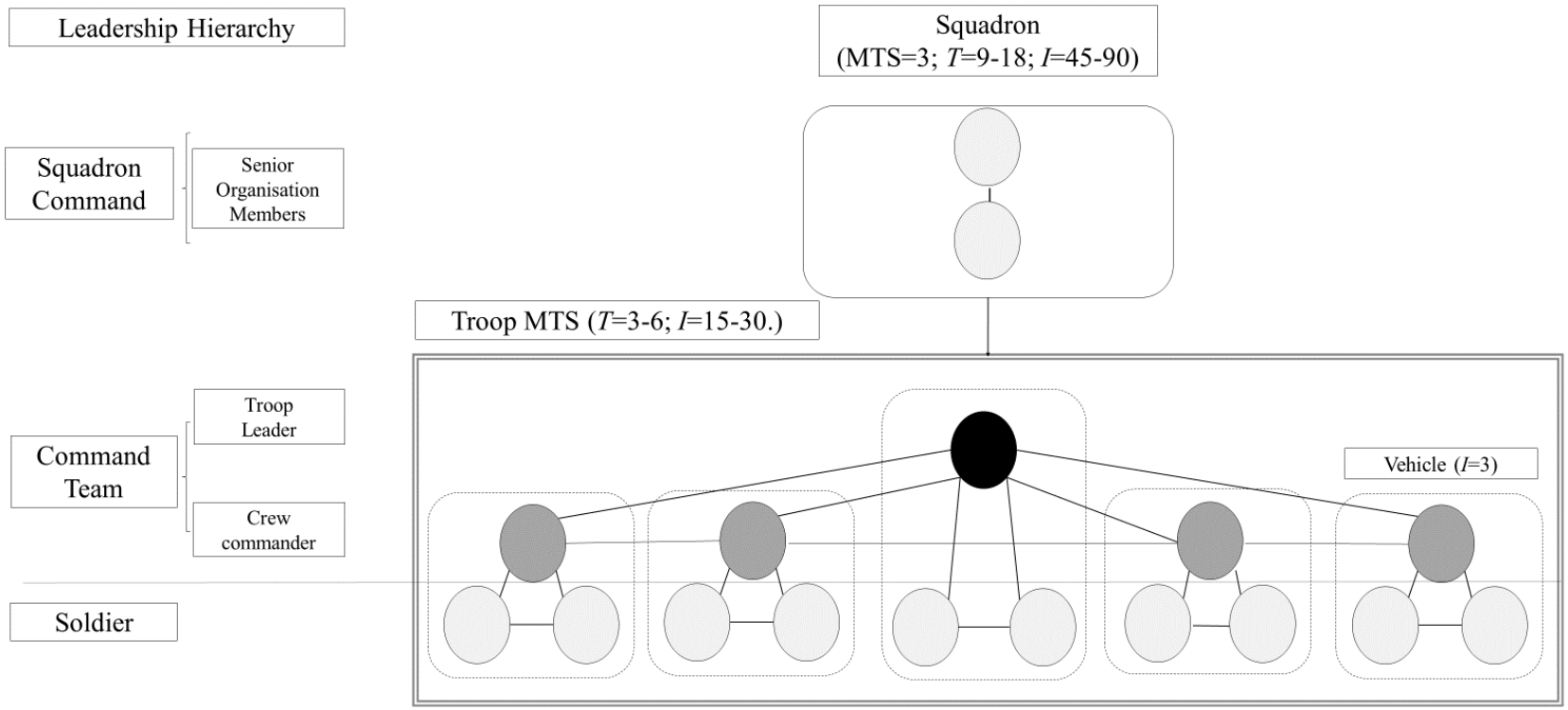

Figure 1. Network model of Troop MTS and internal environment (i.e., embedded organisation. *Note. T*= no. of teams, *I*= no. of individuals. The double-lined box outlines the complete structure of one MTS of which four were interviewed within this study. Connecting lines between nodes indicate communication pathways. Thicker single lines represent more frequent communication pathways. Node shade represents the centrality of individuals within the troop (i.e., the number and strength of interdependent relationships). Dark (highest degree) to Light (lowest degree

Chapter 6: General Discussion

The purpose of this PhD thesis was to contribute to conceptual and empirical knowledge on resilience within collective systems through a detailed exposition of existing literature and perceptions of military teams members engaged in stressful training and selection courses. Accordingly, I aimed to (i) review and critically appraise current perspectives on team resilience, and the related constructs of collective experiences of adversity and team functioning, and empirically explore (ii) the nature of collective experiences of stress and (iii) perceptions surrounding the core factors and processes that foster resilience emergence within collective systems. In this concluding chapter of my thesis, I pull together the lessons learned from this work with regard to the conceptual and empirical implications for future research and practice on team resilience.

6.1 Summary of Chapters

Following an introductory chapter to set the scene, I provided an examination of existing definitions, conceptualisations, and operationalisations of team resilience via a systematic scoping review of the literature. A key conclusion from this review related to the ambiguity of and limitations regarding the definitional quality of this concept with variances in the breadth (e.g., unidimensional versus multidimensional), content (e.g., input, process, outcome), and quality (e.g., essential and necessary attributes). I also revealed, via a scoping review, shortcomings in existing conceptualisations (i.e., single level conceptualisations of team construct) and methodological approaches (i.e., cross-sectional explorations of emergent phenomena) of team resilience. It was evident to us from this review that future work was required to clarify the definitional and conceptual elements of team resilience via empirical research that synergised concept and method, namely the interface of multilevel and longitudinal

approaches within the context of adversity. The empirical work in my thesis occurred alongside conceptual interrogations of the literature by our research group (Gucciardi et al., 2018), which served as the conceptual backdrop for the empirical studies in my PhD.

Given the centrality of stressful and adverse events to the conceptualisation and operationalisation of team resilience, my lead supervisor and I conducted a narrative review of key considerations for clarifying knowledge of collective experiences of adversity and functioning (Chapman & Gucciardi, 2020). We identified the unique nature of adversity experiences across individuals and collectives as well as the potential modalities by which to observe such experiences at the individual (e.g., biological indicators) and team levels (e.g., shared cognitive and affective states). We also considered how such experiences may influence potential trajectories of team functioning following adversity experiences (e.g., growth, drop-off) and the mechanisms (e.g., social identification, benefit finding) by which positive outcomes following shared adverse experiences might emerge from these person-situation interactions. This narrative review provided an important platform upon which to consider the interpretations of empirical findings of studies in which I explored collective experiences of adversity in subsequent chapters of my thesis.

I leveraged the findings from our systematic scoping review of team resilience (Chapter 2) and narrative review of collective adversity experiences (Chapter 3) to conduct two empirical studies in which I examined military personnel's perceptions of team resilience emergence as they undertook field training exercises characterised by stress and adversity. In the first of these studies (Chapter 3), we examined elite military personnel's (N=32) experiences and perspectives of team resilience emergence within the context of an 18-month, high-stakes training course where personnel are required to operate in small tactical teams for extended periods. We were

particularly interested in newly formed team members' perspectives of the nature of adversity, and the key features and processes of resilience emergence directly following two activities embedded with adverse events. Our interpretations of the participants' subjective experiences of reality were constructed according to five key themes regarding the shared and enduring nature of adverse experiences; the importance of adversity recognition; complementary nature of self-regulation and social skills; benefit of shared experiences and certain team structures; and facilitative nature of specific behavioural processes and shared states in response to adverse events. Temporal analysis of participants' perspectives across two time points shed light on the dynamic nature of these thematic interpretations of key factors and processes facilitating resilience emergence. These findings demonstrate an initial theoretical exposition of team resilience emergence, resulting in a characterisation of the contextual richness of team resilience emergence within newly formed teams, and insights into the salience of time upon the nature of emergence. These findings are reflected in the development of a thematic framework that outlines the relationship between subthemes, themes and temporal features.

In the second of my empirical studies (Chapter 5), we built upon our findings obtained with teams (Chapter 4) by extending our focus on collective resilience emergence to the context of multiteam systems (MTSs). There has been growing scholarly interest in the interface of collective resilience and MTSs. Despite this growth, conceptual and empirical developments within each area has progressed largely in isolation leading to little conceptual clarity surrounding emergent resilience within MTSs. Accordingly, we executed a case study approach to explore the nature of MTS resilience within the context of an armoured cavalry squadron with team members positioned within military troops that operated as multiteam systems. We abductively examined members' (N=25) perceptions from across different levels of a MTS in

conjunction with existing conceptual and empirical knowledge on resilience and MTS to provide insight into the (i) nature of stressors experienced collectively by members of a MTS; (ii) the perceived factors and processes focal to fostering resilience emergence at the individual, team, and inter-team levels of the system; and (iii) how the unique contextual features of the MTS structure influences emergent resilience. Following a reflexive thematic analysis approach, we outlined and described three overarching themes that provide a contextually rich perspective of emergent resilience for an MTS: (i) clustering, location, and shared interpretations of events characterise threats to MTS functioning, (ii) event meaning optimises the affective states of troop members and adaptive processes, and (iii) interpersonal trust fosters behavioural coordination and affective synergies between members. These findings provided an important foundational contribution to the theoretical picture of emergent resilience within MTSs and offered a platform for further conceptual refinements and elaboration.

6.2 Theoretical Implications

6.2.1. Antecedents of Collective Stressors

The conceptual and empirical contributions of this thesis provide important knowledge regarding the antecedents of stressors for collectives. I frame the exact nature of this contribution of collective stressors by building upon Razinskas and Hoegl's (2020) multilevel framework of team stressors. Insights across Chapters 3 and 4 allowed deconstruction of such experiences that demonstrate the prevalence of cross-level effects that underpin collective stressors. These transitionary processes from individual to collective experiences resembled two overarching forms. First, negative individual affective outcomes are a product of undesirable appraisal (i.e., threat or harm) coupled with inadequate coping resources (Lazarus & Folkman, 1984). I showcased conceptual and empirical examples whereby stressor experiences at the individual

level transitioned into team stressors via the ‘spreading’ of emotional states between team members (i.e., emotional contagion; Barsade, 2002). Drawing from Affective Process Theory (Elfenbein, 2014), these contagion related antecedents of team stressors resembled pathways of empathy or behavioural cue recognition. Empirically, this emotional contagion effect was most prominent within participants’ perspectives reported in Chapter 3 (small tactical teams) when compared to Chapter 4 (multiteam system), most likely a product of a higher shared vantage point (i.e., the degree to which perspectives of matching events are shared; Elfenbein, 2014) because of the selective nature of entry into the training course and therefore likely homogeneity of the study cohort. Presumably, therefore, this degree of ‘sharedness’ in the perceived meaningfulness of adversity experiences prior to subsequent stressor exposure represents a potential moderator of individual affective states on collective functioning via emotional contagion. Participants undergoing an 18-month high-stakes training course (Chapter 3) also reported more beneficial consequences (e.g., subsequent enactment of collective coping processes) of this emotional contagion effect than participants from the armoured cavalry squadron (Chapter 4). Collectively, therefore, these findings suggest that emotional contagion effects within teams can have positive, negative, or neutral effects on collective functioning depending on personal and contextual factors. Consistent with a social functioning perspective of emotional responses to stressors (Fischer & Manstead, 2008), a key consideration for the valence of such outcomes is the degree to which members have available adequate protective resources and whether or not the emotional contagion process triggers the activation of these resources (e.g., communal coping; Basinger, 2018). Second, in line with Event System Theory (Morgeson et al., 2015), I highlighted how novel elements of stressful events that occur at individual or organisational levels of a system may also act as antecedents to collective stressors. For example,

both cohorts discussed individual events (e.g., experience of family problems) that triggered team levels stressors (e.g., vehicle crash due to diver error). In contrast, MTS members primarily discussed events that occurred at the organisational level (e.g., change in training policy) that triggered team stressors (e.g., cessation or change of task) at lower levels of the system, presumably because of their integration within a hierarchical organisational structure where such top-down effects are most salient. Collectively, therefore, emotional contagion and cross-level effects reported here support the need for consideration of within- and across-level triggers of collective stressor experiences for future conceptual and empirical work on collective resilience.

Our results also provide insight into broader contextual influences upon the stressor experience within collectives. We highlighted that certain stressors may hold social-psychological information (Slavich, 2019) that act as antecedents to team stressors. We identified examples across both small team (e.g., a pressure to impress directing staff) and MTSs (e.g., negative assessment of leaders in front of subordinate members) that underpinned their perceptions as threats to functioning. Regarded as influential characteristics at the individual level (Slavich, 2019), these factors are likely pronounced within teams and MTSs where social perceptions hold strong influence upon individual performance (Lord, 1985). Thus, the findings reported in this thesis outline the presence of and need to consider contextual features such as social-psychological characteristics and structural features that may influence the existence and strength of team stressor experiences. In sum, our findings extend contemporary understanding (Liu & Liu, 2018; Razinskas & Hoegl, 2020) of team stressors by shedding light on unique antecedents that prelude these collective experiences. From a practical perspective, predictive awareness of event origin may facilitate the enactment of coping resources to protect against

future threats to team functioning, even when members and collectives have limited control over such antecedents.

6.2.2 Characterisation of Team Stressors and their Emergence in Teams

The work reported in this thesis offers two contributions to the conceptual clarification of team stressors. Extending foundations for the operationalisation and measurement of collective stress experiences, my findings contribute substantive support for the level-specific nature of team stressors (Liu & Liu, 2018). Existing work has relied upon composition models of collective stress in which shared perceptions of stressor experiences among team members (Chan, 1998) are assessed via additive (i.e., aggregate of individual perceptions), direct-consensus (i.e., mean scores of individual perceptions framed at the individual level), or referent-shift consensus (i.e., means of individual perceptions framed at the team level) approaches (Razinskas & Hoegl, 2020). The findings reported in this thesis suggest that the convergence among lower-level units of the collective at higher levels as a shared perception of threats to functioning is inadequate because there are situations where all or most team members are naïve to threats to team functioning (e.g., event experienced by critical group member or subtle deteriorations across individuals' functioning due to fatigue). In such cases, team stressors may emerge at higher-levels in a system via a compilation fashion where individual elements of the system – in this case team members – experience unique elements of the environmental context that together form an emergent configuration that is different to the lower-levels (Kozlowski & Chao, 2018). Of course, as team members interact and share their perspectives, team stressors may evolve from a compilation emergent state to a composition form in which their experiences and understanding of the situation converge to some form of shared meaning. Thus, there is a

need to consider both compilation and composition based operationalisations of team stressors in future work in ways that maximise congruency between research question, concept, and method.

Existing conceptual expositions of team stressors include limited discussion of the characteristics of singular events (Razinskas & Hoegl, 2020), yet the results of my work demonstrated that an awareness of multiple events is crucial for advancing knowledge on this concept. My findings support the importance of mirroring advances within scholarship on individual resilience by identifying associations between stressors that speak to different types of stressor domains (Cohen et al., 2019b). Three overarching forms of stressors domains were highlighted across both empirical studies: (i) time (i.e., occurring simultaneously or in close proximity), (ii) type (i.e., repeated experiences of similar events), or (iii) causation (i.e., events resulting in subsequent events). In this way, events linked by these features may represent progressively greater threats to team functioning as a product of prior experiences. For example, events linked by type (i.e., identical events) may represent team stressors as a product of frustration arising from failure to learn from earlier experiences. Integrated with past perspectives at the individual level, these demands associated with repeated adjustments to events reflect the influence of the allostatic load placed upon the collective system (McEwen & Wingfield, 2003). Aligned with calls to consider multiple stressors over observations of stressors in isolation (Scheffer et al., 2018), the findings reported in this thesis contribute new knowledge on specific relational properties of discrete events that may result in disproportionate influences upon team functioning when considered in conjunction with each other.

6.2.3 Refining Knowledge on Team Resilience Emergence

As the core focus of this doctoral program of research, it seems appropriate to reflect on the contributions of this work to knowledge on team resilience emergence. Broadly, the

knowledge and evidence generated contributes to conceptual perspectives on team resilience largely by elaborating upon past conceptual models (Gucciardi et al., 2018; Morgan et al., 2013; Stoverink et al., 2020) to specify the crucial features underpinning resilience emergence within a contextually relevant sample (Fisher & Aguinis, 2017). Commonalities among the research findings of both empirical studies highlight the importance of two overarching constructs that fostered resilience emergence, namely trust and situation awareness.

Despite the wealth of conceptual and empirical interest in the construct of trust within the context of team effectiveness (Costa et al., 2018), there has been limited attention directed towards to the salience of trust for collective resilience. My findings extend past conceptual work by illustrating the nature of trust, and the mechanisms by which this concept might foster resilient functioning within collectives. Briefly, I outlined how the affective state of a willingness to be vulnerable to others – trust – at both the interpersonal and team levels supports the behavioural and affective coordination of individuals across both action and transition time points. Within the context of MTS resilience, I highlighted how reciprocal trust as an interpersonal concept is essential between specific dyads within the strict leadership structure of a military troop. Although past conceptual work has drawn attention to the protective nature of trust (Gucciardi et al., 2018; Morgan et al., 2013), these findings illustrate the value of disentangling the exact nature of trust within dynamic person-situation interactions with collectives and testing interventions designed to optimise trust as a mechanism by which to foster collective resilience.

Situation awareness across individuals in teams and MTSs was constructed as an important feature of resilience emergence by participants in my doctoral research. To date, this concept has been conceptualised primarily as resembling knowledge of environmental dynamics

that supports appropriate behavioural responses (Stanton et al., 2017b). Accordingly, conceptual models of team resilience signpost situation awareness as an essential factor that underpins the recognition and comprehension of adversity and the subsequent deployment of relevant knowledge, skills, and abilities in response (Gucciardi et al., 2018). My findings largely supported this conceptual expectation regarding the benefit of situation awareness for cognitive and behavioural responses to dynamic task demands, yet they also extended them through identification of the utility of situation awareness in regulating the emotional response of team members. Given the growing body of literature demonstrating the importance of affective coordination upon team outcomes (Butler, 2015), these findings demonstrate the multifaceted nature of situation awareness and further uncover processes underpinning the development of this construct among team members. Taken together with past research on situation awareness (Endsley, 1995; Stanton et al., 2017b) and conceptual work on team resilience (Gucciardi et al., 2018; Hartmann et al., 2020; Stoverink et al., 2020), my findings reinforce the need for ongoing consideration of situation awareness as a resilience factor that is ripe for future intervention based studies. Of particular interest are interactive processes that facilitate the acquirement of and updates to existing degrees of situation awareness across teams within dynamic environments.

An emergent perspective of collective resilience requires consideration of top-down effects (Kozlowski & Klein, 2000) or contextual constraints (Cronin et al., 2011) acting upon this team level construct. My research generated new knowledge on potential boundary conditions (i.e., the who, where, when; Busse et al., 2017) that might help refine conceptual perspectives of team resilience emergence. First, my findings indicated how the emergence of resilience may vary in nature across time. As resilience factors may vary in significance with

respect to stages of system development (Fritz et al., 2019), the comparison of my findings with existing empirical investigations of collective resilience with mature teams highlights key points of difference. Notably, my findings suggest there is greater value of individual level skills (e.g., emotion regulation, situation awareness) for team resilience emergence until which time group level features have had time to develop and evolve (e.g., team culture, McCray et al., 2016; group norms, Morgan et al., 2013), thereby underscoring the necessity of early stage team states developing into more robust states. This latter point is exemplified when the perceived willingness to be vulnerable to potentially negative outcomes (i.e., trust) is juxtaposed against shared states where alternative outcomes are perceived as less likely and therefore often overlooked (i.e., confidence; N. Luhmann, 1988) within studies of established teams (Morgan et al., 2013). Second, my findings underscore the role of organisational level moderators of resilience emergence within collective systems (Cronin et al., 2011; Zaccaro et al., 2020). Given the unique nature of military collectives, features such as the strict hierarchical structure, high level of member interdependence (i.e., functional interdependence; Tesluk et al., 1997), and organisational norms (e.g., implicitly accepted communication pathways) were observed as organisationally relevant properties that shape the emergence of resilience, most notably by influencing constraints upon the nature of coordination between group members (e.g., nature of hierarchy engenders interactions primarily with most immediate superior when performing). Taken together, my thesis contributes novel information contextual characteristics in which teams are embedded may augment or constrain resilience emergence.

These findings also offer wider contributions to the understanding of team resilience outside of military domains. In particular, the examination of findings in line with existing conceptual models of team resilience (e.g., Gucciardi et al., 2018; Hartwig et al., 2020; Morgan

et al., 2013) demonstrates an appraisal of the key tenets of such models. For example, the presentation of common findings across empirical chapter (e.g., centrality of adversity, protective nature of trust etc.) offers important analytical generalisation (Smith, 2018) that extends across organisational contexts. In addition, given the descriptive richness of qualitative chapters, researchers and practitioners can interpret the congruence and fit of these findings within wider contexts (i.e., inferential generalisability, Lewis, 2014). Similarities in the typology (Hollenbeck et al., 2012) of collectives explored within this thesis, specifically those with high levels of interdependence, and collective goals that require performance under repeated adversities may afford the transferability of findings. For example, future academic or practical efforts to explore or develop team resilience within emergency response organisations (e.g., medical, fire etc.) may benefit from leveraging the resilience processes and factors highlighted within this thesis.

6.3 Limitations

As with any scientific endeavour, there are key limitations that should be recognised when interpreting the findings of this thesis. First, I aimed to provide a detailed exposition of collective resilience within the two empirical chapters, yet the absence of metrics characterising the relative trajectories of functioning within these systems hinders my ability to state with certainty that these collectives demonstrated resilience outcomes. Although resilient trajectories can be inferred from the samples examined (e.g., selection course nature of teams within chapter 4), key resilient resources or processes may have been missing from participant perspectives. Second, when exploring people's subjective experiences within both team and multiteam contexts, it is possible retrospective bias may have influenced these findings. In particular, the specific collective processes that were present in response to adverse events are likely to be

missing from participant perspectives' due to other attentional demands (e.g., individual task role). Alternative methodological approaches, such as data-prompted interviews, may have enhanced my ability to tap into subjective experiences, yet these methods were unfeasible given the confidential nature of training commensurate with military environments. Third, despite efforts to explore the temporal dynamics of resilience emergence, it is important to acknowledge the limited granularity of my approach to collecting data across time. Constrained by barriers to accessing the study participants 'in situ' when conducting activities, I was unable to ascertain the specific nuances of resilience emergence across time from the current findings.

Fourth, resilience is a concept that is broadly used within military training and doctrine (Bond, 2019). It is possible within both empirical chapters that participants presented perspectives that were a product of knowledge gained from experiences outside of team performance (e.g., training guides, organisational norms). For example, if participants perspectives were underpinned heavily by research-informed military doctrine, responses would be limited in novel information (i.e., telling us what we already know). Finally, it is important to recognise my predominantly interpretive stance within this thesis. As a feature of this, my personal knowledge, experience, and biases influence the findings presented (Braun & Clarke, 2019). Although there are benefits as a product of this (e.g., extended understanding of military context), certain personal characteristics (e.g., primarily organisational psychology knowledge base) may have limited my interpretation of findings.

6.4 Future Directions

As a product of the findings of this thesis, it is possible to signpost important avenues as guides for future explorations of collective resilience. The complex and dynamic nature of events triggering resilience emergence (e.g., stressors, adversities) became apparent from the conceptual

(Chapter 2) and empirical (Chapters 3 & 4) explorations reported in this thesis. Although recent efforts have been made to bring together disparate measures of stressors at the team level within a guiding framework (Razinskas & Hoegl, 2020), further work is needed to flesh out the nature of these events by synthesising and building upon the promising in-roads that have been made across the fields of organisational (Morgeson et al., 2015) and social (M. Luhmann et al., 2020) psychology. More specifically, integrating the unique characteristics of collective stress experiences (e.g., shared nature, event domains) represents an important next step to capture such phenomena. Such work will provide an important foundation for measurement development in the hope of fostering the integration of future studies of constructs for which such events are central to their understanding (e.g., resilience, posttraumatic growth, hardiness).

The exploratory approach adopted within this thesis warrants future investigation of the most salient inputs and mediators that facilitate resilience emergence across further domains necessary for theoretical development (Corley & Gioia, 2011). Although I recognise the need for further approaches to flesh out the core and most apparent findings within this thesis (e.g., trust and situation awareness), I also acknowledge the need to assess the interactive nature of inputs and mediators of collective resilience and their interactions (Ilgen et al., 2005; Kalisch et al., 2019). For example, my findings indicate a complementary association between cognitive and affective mechanisms of resilience emergence (i.e., trust and situation awareness). Building upon the burgeoning understanding of the ‘what’ surrounding the emergence process, approaches that develop upon the insight gleaned regarding the complex nature of ‘how’ these features complement or detract (e.g., countervailing forces; Zaccaro et al., 2020) from one another may also consider the influence of team composition. Findings that expose how key individual characteristics outlined here and within other studies coalesce to foster resilient team functioning

would greatly benefit organisations that commonly employ ‘swift teams’.

I propose these lines of future inquiry should avoid utilising approaches common in past work that resemble single-level or cross-sectional studies that occur in contexts where stressors are absent. Accordingly, there is a need for longitudinal, in-situ explorations of resilience emergence in response to naturalistic stressors, coupled with contextually salient assessments of functioning trajectories. Such approaches will benefit from quantitative methods that afford fine-grained insight into the complex dynamics of resilience emergence . Reflecting upon the challenges experienced within the execution of empirical field-based studies within this thesis, I appreciate fully the difficulties of such approaches. Future work therefore may also consider adopting computational approaches to simulate key individual and team level features of emergent resilience. Agent based modelling offers one platform that has gathered attention within the social sciences recently (Miller & Page, 2009). Computational approaches may offer a pragmatic and insightful approach to complement field studies by overcoming the challenges of studying complex adaptive team system (e.g., low statistical power resulting from limited sample size or short temporal exposure to participants). Finally, the inductive approaches to the foundational knowledge developed here represent a logical next step, yet I also call for future work to continue to consider and inspect the influence of contextual features and expand understanding of the boundary conditions of collective resilience theory.

6.5 Conclusion

This thesis advances our understanding of resilience within collective systems by providing a rich examination of current theoretical and empirical standpoints, coupled with the shared perceptions of individuals performing in environments germane to this area. The scoping review of team resilience provided an awareness of the shortcomings within conceptual and

empirical approaches and a foundation upon which to guide future work. In harmony, our narrative review built upon this broad foundation by explicating current understanding of collective experiences of adversity more broadly, and detailing further this central construct underpinning resilience emergence. Finally, qualitative approaches offered new insights and reinforced existing knowledge regarding the core features and boundary conditions of resilience emergence within systems where our understanding is limited (i.e., newly formed teams, multiteam systems). These findings lay important foundations for researchers and practitioners alike. Specifically, researchers might look to build upon the plausible links and explanations reported in this thesis, while remaining cognisant of the potential conceptual and methodological pitfalls outlined above. Practitioners may utilise my findings as a guiding framework to tap into key leverage points that may support resilient functioning and importantly consider the contextual influences at play when adopting intervention-based approaches. In sum, as a measure of contribution to theoretical and applied domains, this thesis advances understanding surrounding the nuances salient to the emergence of resilience within complex systems, and has the potential to stimulate future research in a way that allows significant progress in furthering the clarity and utility of collective resilience theory (Hambrick, 2007).

References

Aguinis, H., & Bakker, R. M. (2020). Time is of the essence: Improving the conceptualization and measurement of time. *Human Resource Management Review*, *31*, 1–15. https://doi.org/10.1016/j.hrmr.2020.100763

Allen, N. J., & O'Neill, T. A. (2015). The trajectory of emergence of shared group-level constructs. *Small Group Research*, *46*, 352–390. https://doi.org/10.1177/1046496415584973

Alliger, G. M., Cerasoli., C. P., Tannenbaum, S. I., & Vessey, W. B. (2015). Team resilience: How teams flourish under pressure. *Organizational Dynamics*, *44*, 176–184. https://doi.org/10.1016/j.orgdyn.2015.05.003

Amaral, A., Fernandez, G., & Varajao, J. (2015). Identifying useful actions to improve team resilience in information systems projects. *Procedia Computer Science*, *64*, 1182–1189. https://doi.org/10.1016/j.procs.2015.08.549

Andras, P., Lazarus, J., & Roberts, G. (2007). Environmental adversity and uncertainty favour cooperation. *BMC Evolutionary Biology*, *7*(1), 240–248. https://doi.org/10.1186/1471-2148-7-240

Angelini, C., Griffin, J. N., Koppel, J., Lamers, L. P., Smolders, A. J., Derksen- Hooijberg, M., & Silliman, B. R. (2016). A keystone mutualism underpins resilience of a coastal ecosystem to drought. *Nature Communications*, *7*(12473), 1–8. https://doi.org/10.1038/ncomms12473

Appelhans, B. M., & Luecken, L. J. (2006). Heart rate variability as an index of regulated emotional responding. *Review of General Psychology*, *10*, 229–240. https://doi.org/10.1037/1089-2680.10.3.229

Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology*, *8*, 19–32. https://doi.org/10.1080/1364557032000119616

Ashkanasy, N. M., & Dorris, A. D. (2017). Emotions in the workplace. *Annual Review of Organizational Psychology and Organizational Behavior*, *4*(1), 67–90. https://doi.org/10.1146/annurev-orgpsych-032516-113231

Australian Army. (2015). *LWP-G 7-0-1: The conduct of training*. https://cove.army.gov.au/article/lwp-g-7-0-1-conduct-training

Australian Army. (n.d.). *Royal Australian Armoured Corps*. https://www.army.gov.au/our-people/organisation-structure/army-corps/royal-australian-armoured-corps

Bamberger, P. A. (2018). AMD—Clarifying what we are about and where we are going. *Academy of Management Discoveries*, *4*, 1–10. https://doi.org/10.5465/amd.2018.0003

Bandura, A. (1997). *Self-efficacy: The exercise of control*. Freeman.

Barrett, L. F. (2006). Are emotions natural kinds? *Perspectives on Psychological Science*, *1*, 28–58. https://doi.org/10.1111/j.1745-6916.2006.00003.x

Barsade, S. G. (2002). The ripple effect: Emotional contagion and its influence on group behavior. *Administrative Science Quarterly*, *47*, 644–675. https://doi.org/10.2307/3094912

Barsade, S. G., Coutifaris, C. G. V., & Pillemer, J. (2018). Emotional contagion in organizational life. *Research in Organizational Behavior*, *38*, 137–151. https://doi.org/10.1016/j.riob.2018.11.005

Barsade, S. G., & Knight, A. P. (2015). Group affect. *Annual Review of Organizational Psychology and Organizational Behavior*, *2*, 21–46. https://doi.org/10.1146/annurev-orgpsych-032414-111316

Basinger, E. D. (2018). Explicating the Appraisal Dimension of the Communal Coping Model. *Health Communication*, *33*(6), 690–699. https://doi.org/10.1080/10410236.2017.1300208

Bastian, B., Jetten, J., & Ferris, L. J. (2014). Pain as social glue: Shared pain increases cooperation. *Psychological Science*, *25*, 2079–2085. https://doi.org/10.1177/0956797614545886

Bastian, B., Jetten, J., Thai, H. A., & Steffens, N. K. (2018). Shared adversity increases team creativity through fostering supportive interaction. *Frontiers in Psychology*, *9*, 1–10. https://doi.org/10.3389/fpsyg.2018.02309

Bell, S. T., Brown, S. G., Colaneri, A., & Outland, N. (2018). Team composition and the ABCs of teamwork. *American Psychologist*, *73*, 349–362. https://doi.org/10.1037/amp0000305

Belzile, J. A., & Öberg, G. (2012). Where to begin? Grappling with how to use participant interaction in focus group design. *Qualitative Research*, *12*(4), 459–472. https://doi.org/10.1177/1468794111433089

Benishek, L. E., & Lazzara, E. H. (2019). Teams in a new era: Some considerations and implications. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.01006

Bennett, J. B., Aden, C. A., Broome, K., Mitchell, K., & Rigdon, W. D. (2010). Team Resilience for Young Restaurant Workers: Research-to-Practice Adaptation and Assessment. *Journal of Occupational Health Psychology*, *15*(3), 223–236. https://doi.org/10.1037/a0019379

Berkes, F., & Ross, H. (2013). Community resilience: Toward an integrated approach. *Society & Natural Resources*, *26*, 5–20. https://doi.org/10.1080/08941920.2012.736605

Bhamra, R., Dani, S., & Burnard, K. (2011). Resilience: The concept, a literature review and future directions. *International Journal of Production Research*, *49*(18), 5375–5393. https://doi.org/10.1080/00207543.2011.563826

Bick, S., Spohrer, K., Hoda, R., Scheerer, A., & Heinzl, A. (2018). Coordination challenges in large-scale software development: A case study of planning misalignment in hybrid settings. *IEEE Transactions on Software Engineering*, *44*(10), 932–950. https://doi.org/10.1109/TSE.2017.2730870

Black, K., & Lobo, M. (2008). A conceptual review of family resilience factors. *Journal of Family Nursing*, *14*(1), 33–55. https://doi.org/10.1177/1074840707312237

Blascovich, J. (2013). Challenge and threat. In A. J. Elliot (Ed.), *Handbook of approach and avoidance motivation* (pp. 431–445). Psychology Press.

Blatt, R. (2009). Resilience in entrepreneurial teams: Developing through the capacity to pull through. *Frontiers of Entrepreneurship Research*, *29*, 1–16.

Bliese, P. D., Edwards, J. R., & Sonnentag, S. (2017). Stress and well-being at work: A century of empirical trends reflecting theoretical and societal influences. *Journal of Applied Psychology*, *102*(3), 389–402. https://doi.org/10.1037/apl0000109

Block, J. (2000). Three tasks for personality psychology. In L. R. Bergman, R. B. Cairns, L. G. Nilsson, & L. Nystedt (Eds.), *Developmental science and the holistic approach* (pp. 155–164). Erlbaum.

Bloom, G. A., Stevens, D. E., & Wickwire, T. L. (2003). Expert coaches' perceptions of team building. *Journal of Applied Sport Psychology*, *15*, 129–143. https://doi.org/10.1080/10413200390213830

Bohnsack, R. (2004). Group discussion and focus groups. In U. Flick, E. von Kardoff, & I. Steinke (Eds.), *A companion to qualitative research* (pp. 214–222). Sage Publications.

Bonanno, G. A. (2004). Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist*, *59*, 20–28. https://doi.org/10.1037/0003-066X.59.1.20

Bonanno, G. A., Romero, S. A., & Klein, S. I. (2015). The temporal elements of psychological resilience: An integrative framework for the study of individuals, families, and communities. *Psychological Inquiry*, *26*, 139–169. https://doi.org/10.1080/1047840X.2015.992677

Bonanno, G. A., Westphal, M., & Mancini, A. D. (2011). Resilience to loss and potential trauma. *Annual Review of Clinical Psychology*, *7*, 511–535. https://doi.org/10.1146/annurev-

Bond, M. (2019). *Commanders' Guide to Resilience: Promoting Unit Resilience* (Part 2; pp. 1–45). Forces Command, Australian Army. https://cove.army.gov.au/sites/default/files/06-07/06/180227-Guide-HQ-FORCOMD-Military-Health-and-Psychology-Commanding-Office...-1.pdf

Bornmann, L. (2011). Scientific peer review. *Annual Review of Information Science and Technology*, *45*, 197–245. https://doi.org/10.1002/aris.2011.1440450112

Bowers, C., Kreutzer, C., Cannon-Bowers, J., & Lamb, J. (2017). Team resilience as a second-order emergent state: A theoretical model and research directions. *Frontiers in Psychology*, *8*, 1–14. https://doi.org/10.3389/fpsyg.2017.01360

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, *11*, 589–597. https://doi.org/10.1080/2159676X.2019.1628806

Braun, V., & Clarke, V. (2020). One size fits all? What counts as quality practice in (reflexive) thematic analysis? *Qualitative Research in Psychology*, 1–25. https://doi.org/10.1080/14780887.2020.1769238

Braun, V., & Clarke, V. (2021). To saturate or not to saturate? Questioning data saturation as a useful concept for thematic analysis and sample-size rationales. *Qualitative Research in Sport, Exercise and Health*, *13*(2), 201–216. https://doi.org/10.1080/2159676X.2019.1704846

Braun, V., Clarke, V., & Weate, P. (2016). Using thematic analysis in sport and exercise research. In B. Smith & A. Sparkes (Eds.), *Routledge handbook of qualitative research methods in sport and exercise* (pp. 191–205). Routledge.

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Harvard University Press.

Broome, K. M., & Bennett, J. B. (2011). Reducing heavy alcohol consumption in young restaurant workers. *Journal of Studies on Alcohol and Drugs*, *72*, 117–124. https://doi.org/10.15288/jsad.2011.72.117

Brosnan, S. F., & Bshary, R. (2010). Cooperation and deception: From evolution to mechanisms. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *365*(1553), 2593–2598. https://doi.org/10.1098/rstb.2010.0155

Brown, D. J., & Fletcher, D. (2017). Effects of psychological and psychosocial interventions on sport performance: A meta-analysis. *Sports Medicine*, *47*, 77–99. https://doi.org/10.1007/s40279-016-0552-7

Brustad, R. J. (1999). Editorial perspective: The contribution of the manuscript-review process to knowledge development in sport and exercise psychology. *Journal of Sport & Exercise Psychology*, *21*, 307–312.

Burke, C. S., Salas, E., Wilson-Donnelly, K., & Priest, H. (2004). How to turn a team of experts into an expert medical team: Guidance from the aviation and military communities. *Quality and Safety in Health Care*, *13*, 96–104. https://doi.org/10.1136/qshc.2004.009829

Burke, C. S., Sims, D. E., Lazzara, E. H., & Salas, E. (2007). Trust in leadership: A multi-level review and integration. *The Leadership Quarterly*, *18*(6), 606–632. https://doi.org/10.1016/j.leaqua.2007.09.006

Burke, S. (2016). Rethinking 'validity' and 'trustworthiness' in qualitative inquiry: How might we judge the quality of qualitative research in sport and exercise sciences? In B. Smith & A. Sparkes (Eds.), *Routledge Handbook of Qualitative Research in Sport and Exercise* (pp. 352–362). Routledge.

Busse, C., Kach, A. P., & Wagner, S. M. (2017). Boundary conditions: What they are, how to explore them, why we need them, and when to consider them. *Organizational Research Methods*, *20*(4), 574–609. https://doi.org/10.1177/1094428116641191

Butler, E. A. (2015). Interpersonal Affect Dynamics: It Takes Two (and Time) to Tango. *Emotion Review*, *7*(4), 336–341. https://doi.org/10.1177/1754073915590622

Cacioppo, J. T., Reis, H. T., & Zautra, A. J. (2011). Social resilience: The value of social fitness with an application to the military. *American Psychologist*, *66*, 43–51. https://doi.org/10.1037/a0021419

Cannon-Bowers, J. A., & Salas, E. (2001). Reflections on shared cognition. *Journal of Organizational Behavior*, *22*(2), 195–202. https://doi.org/10.1002/job.82

Cannon-Bowers, J. A., Salas, E. D., & Converse, S. (1993). Shared mental models in expert team decision making. In N. J. Castellan (Ed.), *Individual and group decision making: Current issues* (pp. 221–246). Lawrence Erlbaum Associates, Inc.

Carmeli, A., Friedman, Y., & Tishler, A. (2013). Cultivating a resilient top management team: The importance of relational connections and strategic decision comprehensiveness. *Safety Science*, *51*, 148–159. https://doi.org/10.1016/j.ssci.2012.06.002

Carron, A. V., Bray, S. R., & Eys, M. A. (2002). Team cohesion and team success in sport. *Journal of Sports Sciences*, *20*(2), 119–126. https://doi.org/10.1080/026404102317200828

Chan, D. (1998). Functional relations among constructs in the same content domain at different levels of analysis: A typology of composition models. *Journal of Applied Psychology*, *83*, 234–246. https://doi.org/10.1037/0021-9010.83.2.234

Chapman, M. T., & Gucciardi, D. F. (2020). Can Adversity Promote Team Functioning in Sport? In R. Wadey, M. Day, & K. Howells (Eds.), *Growth following adversity in sport: A mechanism to positive change* (pp. 107–119). Routledge. https://doi.org/10.4324/9781003058021-8

Chapman, M. T., Lines, R. L. J., Crane, M., Ducker, K. J., Ntoumanis, N., Peeling, P., Parker, S. K., Quested, E., Temby, P., Thøgersen-Ntoumani, C., & Gucciardi, D. F. (2020). Team resilience: A scoping review of conceptual and empirical work. *Work & Stress*, *34*, 57–81. https://doi.org/10.1080/02678373.2018.1529064

Christian, J. S., Christian, M. S., Pearsall, M. J., & Long, E. C. (2017). Team adaptation in context: An integrated conceptual model and meta-analytic review. *Organizational Behavior and Human Decision Processes*, *140*, 62–89. https://doi.org/10.1016/j.obhdp.2017.01.003

Coetzee, C., Van, N. D., & Raju, E. (2016). Disaster resilience and complex adaptive systems theory: Finding common grounds for risk reduction. *Disaster Prevention and Management*, *25*(2), 196–211. https://doi.org/10.1108/DPM-07-2015-0153

Cohen, S., Murphy, M. L. M., & Prather, A. A. (2019a). Ten surprising facts about stressful life events and disease risk. *Annual Review of Psychology*, *70*, 577–597. https://doi.org/10.1146/annurev-psych-010418-102857

Cohen, S., Murphy, M. L. M., & Prather, A. A. (2019b). Ten surprising facts about stressful life events and disease risk. *Annual Review of Psychology*, *70*, 577–597. https://doi.org/10.1146/annurev-psych-010418-102857

Commonwealth of Australia. (2016). *Shaping Defence Science and Technology in the Land Domain 2016-2036.* Department of Defence. https://www.dst.defence.gov.au/sites/default/files/divisions/documents/LandS%26T.pdf

Cooke, N. J. (2015). Team cognition as interaction. *Current Directions in Psychological Science*, *24*, 415–419. https://doi.org/10.1177/0963721415602474

Corley, K. G., & Gioia, D. A. (2011). Building Theory about Theory Building: What Constitutes a Theoretical Contribution? *Academy of Management Review*, *36*(1), 12–32. https://doi.org/10.5465/amr.2009.0486

Cosco, T. D., Kaushal, A., Hardy, R., Richards, M., Kuh, D., & Stafford, M. (2016). Operationalising resilience in longitudinal studies: A systematic review of methodological approaches. *Journal of Epidemiology and Community Health*, *71*, 98–104. https://doi.org/10.1136/jech-2015-206980

Costa, A. C., Fulmer, C. A., & Anderson, N. R. (2018). Trust in work teams: An integrative review, multilevel model, and future directions. *Journal of Organizational Behavior*, *39*, 169–184. https://doi.org/10.1002/job.2213

Crane, M., & Searle, B. J. (2016). Building resilience through exposure to stressors: The effects of challenges versus hindrances. *Journal of Occupational Health Psychology*, *21*, 468–479. https://doi.org/10.1037/a0040064

Crane, M., Searle, B. J., Kangas, M., & Nwiran, Y. (2019). How resilience is strengthened by exposure to stressors: The systematic self-reflection model of resilience strengthening. *Anxiety Stress & Coping*, *32*, 1–17. https://doi.org/10.1080/10615806.2018.1506640

Cronin, M. A., Weingart, L. R., & Todorova, G. (2011). Dynamics in groups: Are we there yet? *The Academy of Management Annals*, *5*(1), 571–612. https://doi.org/10.1080/19416520.2011.590297

Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A., & Sheikh, A. (2011). The case study approach. *BMC Medical Research Methodology*, *11*(1), 100. https://doi.org/10.1186/1471-2288-11-100

De Jong, B. A., Dirks, K. T., & Gillespie, N. (2016). Trust and team performance: A meta-analysis of main effects, moderators, and covariates. *Journal of Applied Psychology*, *101*, 1134–1150. https://doi.org/10.1037/apl0000110

de Wit, F. R. C., Greer, L. L., & Jehn, K. A. (2012). The paradox of intragroup conflict: A meta-analysis. *Journal of Applied Psychology*, *97*(2), 360–390. https://doi.org/10.1037/a0024844

DeChurch, L. A., & Zaccaro, S. J. (2010). Perspectives: Teams won't solve this problem. *Human Factors*, *52*(2), 329–334. https://doi.org/10.1177/0018720810374736

Decroos, S., Lines, R. L. J., Morgan, P. B. C., Fletcher, D., Sarkar, M., Fransen, K., Boen, F., & Vande Broek, G. (2017). Development and validation of the characteristics of resilience in sports teams inventory. *Sport, Exercise, and Performance Psychology*, *6*, 158–178. https://doi.org/10.1037/spy0000089

Defence Science and Technology Group, D. of D. (2016, May 31). *Human Performance Research network*. https://www.dst.defence.gov.au/hprnet

Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology*, *86*(3), 499–512. https://doi.org/10.1037/0021-9010.86.3.499

Denzin, N. K. (1978). *The research act: A theoretical introduction to sociological methods*. Praeger.

Department of Defence. (n.d.). *Land Combat Vehicle System* [Website]. scheme=AGLSTERMS.AglsAgent; corporateName=Commonwealth of Australia, Department of Defence; address=Russell Offices, Russell, ACT, 2600; contact=1300 333 362. https://www1.defence.gov.au/project/land-combat-vehicle-system

Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortisol responses: A theoretical integration and synthesis of laboratory research. *Psychological Bulletin*, *130*, 355–391. https://doi.org/10.1037/0033-2909.130.3.355

Dienstbier, R. A. (1989). Arousal and physiological toughness—Implications for mental and physical health. *Psychological Review*, *96*, 84–100. https://doi.org/10.1037//0033-295x.96.1.84

D'Innocenzo, L., Mathieu, J. E., & Kukenberger, M. R. (2014). A meta-analysis of different forms of shared leadership–team performance relations. *Journal of Management*, *42*, 1964–1991. https://doi.org/10.1177/0149206314525205

Dirks, K. T. (2000). Trust in leadership and team performance: Evidence from NCAA basketball. *Journal of Applied Psychology*, *85*, 1004–1012.

Dobbins, M. I., Thomas, S. A., Stokes Melton, S. L., & Lee, S. (2016). Integrated care and the evolution of the multidisciplinary team. *Primary Care*, *43*, 177–190. https://doi.org/10.1016/j.pop.2016.01.003

Driskell, J. E., Johnston, J., & Salas, E. (2001). Does stress training generalize to novel settings? *Human Factors*, *43*, 99–110. https://doi.org/10.1518/001872001775992471

Driskell, J. E., Salas, E., & Johnston, J. (1999). Does stress lead to a loss of team perspective? *Group Dynamics: Theory, Research, and Practice*, *3*, 291–302. https://doi.org/10.1037/1089-2699.3.4.291

Driskell, J. E., Salas, E., Johnston, J. H., & Wollert, T. N. (2008). Stress exposure training: An event-based approach. In P. A. Hancock & J. L. Szalma (Eds.), *Performance under stress* (pp. 271–286). Ashgate Publishing.

Edmondson, A. C., & Nembhard, I. M. (2009). Product Development and Learning in Project Teams: The Challenges Are the Benefits*. *Journal of Product Innovation Management*, *26*(2), 123–138. https://doi.org/10.1111/j.1540-5885.2009.00341.x

Edson, M. C. (2012). A complex adaptive systems view of resilience in a project team. *Systems Research and Behavioral Science*, *29*, 499–516. https://doi.org/10.1002/sres.2153

Edson, M. C. (2010). Group development: A complex adaptive systems perspective. In J. Wilby (Ed.), *Proceedings of the 54rd Annual Conference of the International Society for the Systems Sciences* (pp. 447-470 ,).

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *The Academy of Management Journal*, *50*. https://doi.org/10.5465/amj.2007.24160888

Elfenbein, H. A. (2014). The many faces of emotional contagion: An affective process theory of affective linkage. *Organizational Psychology Review*, *4*(4), 326–362. https://doi.org/10.1177/2041386614542889

Ellsworth, L. M., Wrobleski, D. W., Kauffman, J. B., & Reis, S. A. (2016). Ecosystem resilience is evident 17 years after fire in Wyoming big sagebrush ecosystems. *Ecosphere*, *7*, 1–12. https://doi.org/10.1002/ecs2.1618

Endsley, M. R. (1995). Measurement of situation awareness in dynamic systems. *Human Factors*, *37*, 65–84. https://doi.org/10.1518/001872095779049499

Endsley, M. R. (2015). Situation awareness misconceptions and misunderstandings. *Journal of Cognitive Engineering and Decision Making*, *9*, 4–32. https://doi.org/10.1177/1555343415572631

Endsley, M. R., & Jones, W. M. (2001). A model of inter and intra team situation awareness: Implications for design, training and measurement. In M. McNeese, E. D. Salas, & M. R. Endsley (Eds.), *New trends in cooperative activities: Understanding system dynamics in complex environments* (pp. 46–67). Human Factors and Ergonomics Society.

Engert, V., Plessow, F., Miller, R., Kirschbaum, C., & Singer, T. (2014). Cortisol increase in empathic stress is modulated by emotional closeness and observation modality. *Psychoneuroendocrinology*, *45*, 192–201. https://doi.org/10.1016/j.psyneuen.2014.04.005

Feitosa, J., Grossman, R., Kramer, W. S., & Salas, E. (2020). Measuring team trust: A critical and meta-analytical review. *Journal of Organizational Behavior*, *41*(5), 479–501. https://doi.org/10.1002/job.2436

Fischer, A. H., & Manstead, A. S. R. (2008). Social Functions of Emotion. In M. Lewis, J. M. Haviland-Jones, & L. F. Barrett (Eds.), *Handbook of emotions handbook of emotions* (3rd ed., pp. 456–468). The Guildford Press.

Fisher, G., & Aguinis, H. (2017). Using theory elaboration to make theoretical advancements. *Organizational Research Methods*, *20*(3), 438–464. https://doi.org/10.1177/1094428116689707

Fletcher, D. (2018). *Psychological resilience and adversarial growth in sport and performance*. Oxford Research Encyclopedia of Psychology. https://doi.org/10.1093/acrefore/9780190236557.013.158

Flin, R., & Maran, N. (2004). Identifying and training non-technical skills for teams in acute medicine. *Quality and Safety in Healthcare*, *13*, 180–184. https://doi.org/10.1136/qshc.2004.009993

Flin, R., O'Connor, P., & Crichton, M. (2008). *Safety at the sharp end: A guide to non-technical skills*. Ashgate.

Flint-Taylor, J., & Cooper, C. L. (2017). *Team resilience: Shaping up the challenges ahead* (M. Crane, Ed.). Routledge.

Forgatch, M. S., & DeGarmo, D. S. (1999). Parenting through change: An effective prevention program for single mothers. *Journal of Consulting and Clinical Psychology*, *67*, 711–724. https://doi.org/10.1037/0022-006X.67.5.711

Fransen, K., Mertens, N., Feltz, D., & Boen, F. (2017). "Yes, we can!" review on team confidence in sports. *Current Opinion in Psychology*, *16*, 98–103. https://doi.org/10.1016/j.copsyc.2017.04.024

Fried, E. I. (2020). Lack of Theory Building and Testing Impedes Progress in The Factor and Network Literature. *Psychological Inquiry*, *31*(4), 271–288. https://doi.org/10.1080/1047840X.2020.1853461

Friedland, N., & Keinan, G. (1982). Patterns of fidelity between training and criterion situations as determinants of performance in stressful situations. *Journal of Human Stress*, *8*, 41–46. https://doi.org/10.1080/0097840X.1982.9936118

Fritz, J., Stochl, J., Fried, E. I., Goodyer, I. M., van Borkulo, C. D., Wilkinson, P. O., & van Harmelen, A.-L. (2019). Unravelling the complex nature of resilience factors and their changes between early and later adolescence. *BMC Medicine*, *17*, 203. https://doi.org/10.1186/s12916-019-1430-6

Fulmer, C. A., & Gelfand, M. J. (2012). At what level (and in whom) we trust: Trust across multiple organizational levels. *Journal of Management*, *38*(4), 1167–1230. https://doi.org/10.1177/0149206312439327

Furniss, D., Back, J., Blandford, A., Hildebrandt, M., & Broberg, H. (2011). A resilience markers framework for small teams. *Reliability Engineering and System Safety*, *96*, 2–10. https://doi.org/10.1016/j.ress.2010.06.025

Gagné, M., & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational Behavior*, *26*(4), 331–362. https://doi.org/10.1002/job.322

Galatzer-Levy, I. R., Huang, S. H., & Bonanno, G. A. (2018). Trajectories of resilience and dysfunction following potential trauma: A review and statistical evaluation. *Clinical Psychology Review*, *63*, 41–55. https://doi.org/10.1016/j.cpr.2018.05.008

Galli, N. (2016). Team resilience. In R. J. Schinke, K. R. McGannon, & B. Smith (Eds.), *Routledge International Handbook of Sport Psychology* (pp. 378–386). Routledge.

Garmezy, N. (1985). Stress-resistant children: The search for protective factors. *Recent Research in Developmental Psychopathology: Journal of Child Psychology and Psychiatry Book Supplement 4*, 213–233.

Garrison, M. E. B., & Sasser, D. D. (2009). Families and disasters: Making meaning out of adversity. In K. E. Cherry (Ed.), *Lifespan perspectives on natural disasters: Coping with Katrina, Rita, and other storms* (pp. 113–130). Springer Publishing.

George, G., Howard-Grenville, J., Joshi, A., & Tihanyi, L. (2016). Understanding and tackling societal grand challenges through management research. *Academy of Management Journal*, *59*(6), 1880–1895. https://doi.org/10.5465/amj.2016.4007

Gersick, C. J. (1988). Time and transition in work teams: Toward a new model of group development. *Academy of Management Journal*, *31*, 9–41. https://doi.org/10.5465/256496

Glowinski, D., Bracco, F., Chiorri, C., & Grandjean, D. (2016). Music ensemble as a resilient system. Managing the unexpected through group interaction. *Frontiers in Psychology*, *7*, 1–7. https://doi.org/10.3389/fpsyg.2016.01548

Godfrey, R. (2016). Soldiering on: Exploring the role of humour as a disciplinary technology in the military. *Organization*, *23*, 164–183. https://doi.org/10.1177/1350508414533164

Gomes, J. O., Borges, M. R. S., Huber, G. J., & Carvalho, P. V. R. (2014). Analysis of the resilience of team performance during a nuclear emergency response exercise. *Applied Ergonomics*, *45*(3), 780–788. https://doi.org/10.1016/j.apergo.2013.10.009

Gorman, J. C. (2014). Team coordination and dynamics: Two central issues. *Current Directions in Psychological Science*, *23*, 355–360. https://doi.org/10.1037/apl0000136

Gottesman, I. I. (1974). Developmental genetics and ontogenetic psychology: Overdue détente and propositions from a matchmaker. In A. D. Pick (Ed.), *Minnesota Symposium on Child Psychology* (Vol. 8, pp. 55–80). University of Minnesota Press.

Grand, J. A., Braun, M. T., Kuljanin, G., Kozlowski, S. W. J., & Chao, G. T. (2016). The dynamics of team cognition: A process-oriented theory of knowledge emergence in teams. *Journal of Applied Psychology*, *101*, 1353–1385. https://doi.org/10.1037/apl0000136

Grossoehme, D., & Lipstein, E. (2016). Analyzing longitudinal qualitative data: The application of trajectory and recurrent cross-sectional approaches. *BMC Research Notes*, *9*(136), 1–5. https://doi.org/10.1186/s13104-016-1954-1

Gucciardi, D. F., Crane, M., Ntoumanis, N., Parker, S. K., Thøgersen-Ntoumani, C., Ducker, K. J., Peeling, P., Chapman, M. T., Quested, E., & Temby, P. (2018). The emergence of team resilience: A multilevel conceptual model of facilitating factors. *Journal of Occupational and Organizational Psychology*, *91*, 729–768. https://doi.org/10.1111/joop.12237

Gucciardi, D. F., Hanton, S., Gordon, S., Mallett, C. J., & Temby, P. (2015). The concept of mental toughness: Tests of dimensionality, nomological network, and traitness. *Journal of Personality*, *83*, 26–44. https://doi.org/10.1111/jopy.12079

Gucciardi, D. F., Lang, J. W., Lines, R. L., Chapman, M. T., Ducker, K. J., Peeling, P., Crane, M., Ntoumanis, N., Parker, S. K., & Thøgersen-Ntoumani, C. (in press). The emergence of resilience: Recovery trajectories in sleep functioning after a major stressor. *Sport, Exercise, and Performance Psychology.* https://doi.org/10.1037/spy0000268

Gucciardi, D. F., Lines, R. L. J., Ducker, K. J., Peeling, P., Chapman, M. T., & Temby, P. (in press). Mental toughness as a psychological determinant of behavioural perseverance in Special Forces selection. *Sport, Exercise, and Performance Psychology*. https://doi.org/10.1037/spy0000208

Gugerty, L. J. (1997). Situation awareness during driving: Explicit and implicit knowledge in dynamic spatial memory. *Journal of Experimental Psychology: Applied*, *3*, 42–66. https://doi.org/10.1037/1076-898X.3.1.42

Hackman, J. R. (2012). From causes to conditions in group research. *Journal of Organizational Behavior*, *33*, 428–444. https://doi.org/10.1002/job.1774

Hackman, J. R., & Oldham, G. R. (1975). Development of the Job Diagnostic Survey. *Journal of Applied Psychology*, *60*(2), 159–170. https://doi.org/10.1037/h0076546

Hambrick, D. C. (2007). The field of management's devotion to theory: Too much of a good thing? *Academy of Management Journal*, *50*, 1346–1352. https://doi.org/10.5465/amj.2007.28166119

Harms, P. D., Credé, M., Tynan, M., Leon, M., & Jeung, W. (2017). Leadership and stress: A meta-analytic review. *The Leadership Quarterly*, *28*(1), 178–194. https://doi.org/10.1016/j.leaqua.2016.10.006

Harrison, D. A., Price, K. H., Gavin, J. H., & Florey, A. T. (2002). Time, teams, and task performance: Changing effects of surface- and deep-level diversity on group functioning. *The Academy of Management Journal*, *45*, 1029–1045. https://doi.org/FILL DOI

Hartmann, S., Weiss, M., Newman, A., & Hoegl, M. (2020). Resilience in the workplace: A multilevel review and synthesis. *Applied Psychology*, *69*, 913–959. https://doi.org/10.1111/apps.12191

Hartwig, A., Clarke, S., Johnson, S., & Willis, S. (2020). Workplace team resilience: A systematic review and conceptual development. *Organizational Psychology Review*, *10*(3–4), 169–200. https://doi.org/10.1177/2041386620919476

Haslam, S. A., & Van Dick, R. (2011). A social identity approach to workplace stress. In D. De Cremer, R. Van Dick, & K. Murnighan (Eds.), *Social psychology and organizations* (pp. 325–352). Routledge. https://doi.org/10.4324/9780203846957-24

Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1994). *Emotional contagion*. Cambridge University Press.

Hawkins, J. D., Catalano, R. F., Kosterman, R., Abbott, R., & Hill, K. G. (1999). Preventing adolescent health-risk behaviors by strengthening protection during childhood. *Archives of Pediatrics & Adolescent Medicine*, *153*(3), 226–234. https://doi.org/10.1001/archpedi.153.3.226

Holland, J. H. (1992). Complex adaptive systems. *American Academy of Arts & Sciences*, *121*(1), 17–30. https://www.jstor.org/stable/20025416

Hollenbeck, J. R., Beersma, B., & Schouten, M. E. (2012). Beyond team types and taxonomies: A dimensional scaling conceptualization for team description. *Academy of Management Review*, *37*, 82–106.

Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics*, *4*, 1–23. https://doi.org/10.1146/annurev.es.04.110173.000245

Hollnagel, E., Pariès, J., Woods, D., & Wreathall, J. (2011). *Resilience engineering perspectives, resilience engineering in practice* (Vol. 3). Ashgate.

Holmes, J. (2000). Politeness, Power and Provocation: How Humour Functions in the Workplace. *Discourse Studies*, *2*, 159–185. https://doi.org/10.1177/1461445600002002002

Hosseini, S., Barker, K., & Ramirez-Marquez, J. E. (2016). A review of definitions and measures of system resilience. *Reliability Engineering & System Safety*, *145*, 47–61. https://doi.org/10.1016/j.ress.2015.08.006

Howells, K., Sarkar, M., & Fletcher, D. (2017). Can athletes benefit from difficulty? A systematic review of growth following adversity in competitive sport. Sport and the Brain: The Science of Preparing, Enduring and Winning. *Pt B*, *234*, 117–159. https://doi.org/10.1016/bs.pbr.2017.06.002

Hudson, B. (2007). Pessimism and optimism in inter-professional working: The Sedgefield integrated team. *Journal of Interprofessional Care*, *21*, 3–15. https://doi.org/10.1080/13561820600991850

Hughes, A. M., Gregory, M. E., Joseph, D. L., Sonesh, S. C., Marlow, S. L., Lacerenza, C. N., & Salas, E. (2016). Saving lives: A meta-analysis of team training in healthcare. *Journal of Applied Psychology*, *101*, 1266–1304. https://doi.org/10.1037/apl0000120

Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Teams in organizations: From input-process-output models to IMOI models. *Annual Review of Psychology*, *56*, 517–543. https://doi.org/10.1146/annurev.psych.56.091103.070250

Iversen, A. C., Fear, N. T., Simonoff, E., Hull, L., Horn, O., Greenberg, N., & Wessely, S. (2007). Influence of childhood adversity on health among male UK military personnel. *The British Journal of Psychiatry*, *191*, 506-511 10 1192 107 039818.

Jackson, D., Firtko, A., & Edenborough, M. (2007). Personal resilience as a strategy for surviving and thriving in the face of workplace adversity: A literature review. *Journal of Advanced Nursing*, *60*, 1–9. https://doi.org/10.1111/j.1365-2648.2007.04412.x

Johns, G. (2006). The essential impact of context on organizational behavior. *Academy of Management Review*, *31*, 386–408. https://doi.org/10.5465/amr.2006.20208687

Johnson, S. K. (2008). I second that emotion: Effects of emotional contagion and affect at work on leader and follower outcomes. *The Leadership Quarterly*, *19*, 1–19. https://doi.org/10.1016/j.leaqua.2007.12.001

Jones, G. R., & George, J. M. (1998). The experience and evolution of trust: Implications for cooperation and teamwork. *The Academy of Management Review*, *23*(3), 531–546. JSTOR. https://doi.org/10.2307/259293

Joseph, S., & Linley, P. A. (2005). Positive adjustment to threatening events: An organismic valuing theory of growth through adversity. *Review of General Psychology*, *9*, 262–280. https://doi.org/10.1037/1089-2680.9.3.262

Juster, R.-P., Bizik, G., Picard, M., Arsenault-Lapierre, G., Sindi, S., Trepanier, L., Marin, M.-F., Wan, N., Sekerovic, Z., Lord, C., Fiocco, A. J., Plusquellec, P., McEwen, B. S., & Lupien, S. J. (2011). A transdisciplinary perspective of chronic stress in relation to psychopathology throughout life span development. *Development and Psychopathology*, *23*(3), 725–776. https://doi.org/10.1017/S0954579411000289

Jüttner, U., & Maklan, S. (2011). Supply chain resilience in the global financial crisis: An empirical study. *Supply Chain Management: An International Journal*, *16*(4), 246–259. https://doi.org/10.1108/13598541111139062

Kalisch, R., Cramer, A. O., Binder, H., Fritz, J., Leertouwer, Ij., Lunansky, G., Meyer, B., Timmer, J., Veer, I. M., & Van Harmelen, A.-L. (2019). Deconstructing and reconstructing resilience: A dynamic network approach. *Perspectives on Psychological Science*, *14*, 765–777. https://doi.org/10.1177/1745691619855637

Kalisch, Raffael., Baker, D., Basten, U., Boks, M., Bonanno, G., Brummelman, E., Chmitorz, A., Fernandez, G., Fiebach, C., Galatzer-Levy, I., Geuze, E., Groppa, S., Helmreich, I., Hendler, T., Hermans, E., Jovanovic, T., Kubiak, T., Lieb, K., Lutz, B., … Kleim, B. (2017). The resilience framework as a strategy to combat stress-related disorders. *Nature Human Behaviour*, *1*, 784–790. https://doi.org/10.17863/CAM.16856

Kanki, B. G. (1996). Stress and aircrew performance- A team-level perspective. In J. E. Driskell & E. Salas (Eds.), *Stress and human performance* (pp. 127–162). Lawrence Erlbaum Associates.

Karatoreos, I. N., & McEwen, B. S. (2013). Annual Research Review: The neurobiology and physiology of resilience and adaptation across the life course. *Journal of Child Psychology and Psychiatry*, *54*, 812–812.

Karlsen, J. T., & Berg, M. E. (2020). A study of the influence of project managers' signature strengths on project team resilience. *Team Performance Management: An International Journal*, *26*(3/4), 247–262. https://doi.org/10.1108/TPM-12-2018-0081

Kennedy, D. M., Landon, L. B., & Maynard, M. T. (2016). Extending the Conversation: Employee Resilience at the Team Level. *Industrial and Organizational Psychology*, *9*, 466–475. https://doi.org/10.1017/iop.2016.41

Kim, H., & Marcouiller, D. W. (2015). Considering disaster vulnerability and resiliency: The case of hurricane effects on tourism-based economies. *The Annals of Regional Science*, *54*, 945–971. https://doi.org/10.1007/s00168-015-0707-8

Kirschbaum, C., & Hellhammer, D. H. (1994). Salivary cortisol in psychoneuroendocrine research—Recent developments and applications. *Psychoneuroendocrinology*, *19*, 313–333. https://doi.org/10.1016/0306-4530(94)90013-2

Klein, Katherine. J., & Kozlowski, S. W. J. (2000). From micro to meso: Critical steps in conceptualization and conducting multilevel research. *Organizational Research Methods*, *3*, 211–236. https://doi.org/10.1177/109442810033001

Kossek, E. E., & Perrigino, M. B. (2016). Resilience: A review using a grounded integrated occupational approach. *Academy of Management Annals*, *10*(1), 729–797. https://doi.org/10.1080/19416520.2016.1159878

Kozlowski, S. W. J., & Chao, G. T. (2018). Unpacking team process dynamics and emergent phenomena: Challenges, conceptual advances, and innovative methods. *American Psychologist*, *73*(4), 576–592. https://doi.org/10.1037/amp0000245

Kozlowski, S. W. J., Chao, G. T., Gr, J. A., Braun, M. T., & Kuljanin, G. (2013). Advancing multilevel research design: Capturing the dynamics of emergence. *Organizational Research Methods*, *16*, 581–315. https://doi.org/10.1177/1094428113493119

Kozlowski, S. W. J., Grand, J. A., Baard, S. K., & Pearce, M. (2015). Teams, teamwork, and team effectiveness: Implications for human systems integration. In D. Boehm-Davis, F. Durso, & J. Lee (Eds.), *The handbook of human systems integration* (pp. 535–552). APA.

Kozlowski, S. W. J., & Ilgen, D. R. (2006). Enhancing the effectiveness of work groups and teams. *Psychological Science in the Public Interest*, *7*, 77–124. https://doi.org/10.1111/j.1529-1006.2006.00030.x

Kozlowski, S. W. J., & Klein, K. J. (2000). A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions* (pp. 3–90). Jossey-Bass.

Kwon, S.-W., & Adler, P. S. (2014). Social capital: Maturation of a field of research. *Academy of Management Review*, *39*, 412–422. https://doi.org/10.5465/amr.2014.0210

Lacerenza, C. N., Marlow, S. L., Tannenbaum, S. I., & Salas, E. (2018). Team development interventions: Evidence-based approaches for improving teamwork. *American Psychologist*, *73*, 517–531. https://doi.org/10.1037/amp0000295

Lambert, V. A., Lambert, C. E., & Yamase, H. (2003). Psychological hardiness, workplace stress and related stress reduction strategies. *Nursing & Health Sciences*, *5*(2), 181–184. https://doi.org/10.1046/j.1442-2018.2003.00150.x

Lawrence, T. B., & Maitlis, S. (2012). Care and possibility: Enacting an ethic of care through narrative practice. *Academy of Management Review*, *37*, 641–663. https://doi.org/10.5465/amr.2010.0466

Layne, C. M., Warren, J. S., Watson, P. J., & Shalev, A. Y. (2007). Risk, vulnerability, resistance, and resilience: Toward an integrative conceptualization of posttraumatic adaptation. In M. Friedman, T. Keane, & P. Resick (Eds.), *Handbook of PTSD: Science and practice* (pp. 497–520). Guilford Press.

Lazarus, R. S., & Folkman, S. (1984). *Stress, Appraisal, and Coping*. Springer Publishing Company. http://ebookcentral.proquest.com/lib/curtin/detail.action?docID=423337

Lepine, J. A., Podsakoff, N. P., & Lepine, M. A. (2005). A meta-analytic test of the Challenge Stressor-Hindrance Stressor framework: An explanation for inconsistent relationships among stressors and performance. *The Academy of Management Journal*, *48*(5), 764–775. JSTOR. https://doi.org/10.2307/20159696

Leppin, A. L., Bora, P. R., Tilburt, J. C., Gionfriddo, M. R., Zeballos-Palacios, C., Dulohery, M. M., Sood, A., Erwin, P. J., Brito, J. P., Boehmer., & Montori, V. M. (2014). The efficacy of resiliency training programs: A systematic review and meta-analysis of randomized trials. *PLoS ONE*, *9*(10), 1–15. https://doi.org/10.1371/journal.pone.0111420

Leprince, C., D'Arripe-Longueville, F., & Doron, J. (2018). Coping in teams: Exploring athletes' communal coping strategies to deal with shared stressors. *Frontiers in Psychology*, *9*(1908), 1–11. https://doi.org/10.3389/fpsyg.2018.01908

Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: Advancing the methodology. *Implementation Science*, *5*(69), 1–9. https://doi.org/10.1186/1748-5908-5-69

Levers, M.-J. D. (2013). Philosophical paradigms, grounded theory, and perspectives on emergence. *SAGE Open*, *3*, 2158244013517243. https://doi.org/10.1177/2158244013517243

Lewicki, R. J., Tomlinson, E. C., & Gillespie, N. (2006). Models of interpersonal trust development: Theoretical approaches, empirical evidence, and future directions. *Journal of Management*, *32*(6), 991–1022. https://doi.org/10.1177/0149206306294405

Lewis, J. (2014). Generalizing from qualitative research. In J. Ritchie, J. Lewis, C. McNaughton Nicholls, & R. Ormston, (Eds.), *Qualitative research practice* (2nd ed., pp. 347–366). SAGE Publications.

Lines, R. L. J., Pietsch, S., Crane, M., Ntoumanis, N., Temby, P., Graham, S., & Gucciardi, D. F. (in press). The effectiveness of team reflexivity interventions: A systematic review and meta-analysis of randomised controlled trials. *Sport, Exercise, and Performance Psychology*. https://doi.org/10.1037/spy0000251

Linley, P. A., & Joseph, S. (2004). Positive change following trauma and adversity: A review. *Journal of Traumatic Stress*, *17*, 11–21. https://doi.org/10.1023/B:JOTS.0000014671.27856.7e

Liu, S., & Liu, Y. (2018). Team stress research: A review and recommendations for future investigations. *Occupational Health Science*, *2*, 99–125. https://doi.org/10.1007/s41542-018-0018-4

Lord, R. G. (1985). An information processing approach to social perceptions, leadership and behavioral measurement in orgaizations. *Research in Organizational Behavior*, *7*, 87–128.

Luhmann, M., Fassbender, I., Alcock, M., & Haehner, P. (2020). A dimensional taxonomy of perceived characteristics of major life events. *Journal of Personality and Social Psychology*, No Pagination Specified-No Pagination Specified. https://doi.org/10.1037/pspp0000291

Luhmann, N. (1988). Familiarity, confidence, trust: Problems and alternatives. In D. G. Gambetta (Ed.), *Trust* (pp. 94–107). Basil Blackwell. /paper/Familiarity%2C-Confidence%2C-Trust%3A-Problems-and-Luhmann/a5ae78f779284090b9cadb9c5b05501c223f9c23

Lurey, J. S., & Raisinghani, M. S. (2001). An empirical study of best practices in virtual teams. *Information & Management, 38*(8), 523–544. https://doi.org/10.1016/S0378-7206(01)00074-X

Luthans, F., Avolio, B. J., Avey, J. B., & Norman, S. M. (2007). Positive psychological capital: Measurement and relationship with performance and satisfaction. *Personnel Psychology*, *60*, 541–572. https://doi.org/10.1111/j.1744-6570.2007.00083.x

Luthar, S. S., & Cicchetti, D. (2000). The construct of resilience: Implications for interventions and social policies. *Development and Psychopathology*, *12*, 857–885. https://doi.org/10.1017/S0954579400004156

Lyons, R. F., Mickelson, K. D., Sullivan, M. J. L., & Coyne, J. C. (1998). Coping as a communal process. *Journal of Social and Personal Relationships*, *15*, 579–605. https://doi.org/10.1177/0265407598155001

Macedo, T., Wilheim, L., Gonçalves, R., Coutinho, E. S. F., Vilete, L., Figueira, I., & Ventura, P. (2014). Building resilience for future adversity: A systematic review of interventions in non-clinical samples of adults. *BMC Psychiatry*, *14*(227), 1–8. https://doi.org/10.1186/s12888-014-0227-6

Magee, J. C., & Tiedens, L. Z. (2006). Emotional ties that bind: The roles of valence and consistency of group emotion in inferences of cohesiveness and common fate. *Personality and Social Psychology Bulletin, 32*, 1703–1715. https://doi.org/10.1177/0146167206292094

Maitlis, S. (2020). Posttraumatic growth at work. *Annual Review of Organizational Psychology and Organizational Behavior, 7*(1), 395–419. https://doi.org/10.1146/annurev-orgpsych-012119-044932

Mallak, L. (1998). Putting organizational resilience process to work. *Industrial Management, 40*, 8–14.

Maloney, M. M., Bresman, H., Zellmer-Bruhn, M. E., & Beaver, G. R. (2016). Contextualization and context theorizing in teams research: A look back and a path forward. *Academy of Management Annals*, *10*, 891–942. https://doi.org/10.1080/19416520.2016.1161964

Malterud, K. (2016). Theory and interpretation in qualitative studies from general practice: Why and how? *Scandinavian Journal of Public Health, 44*, 120–129. https://doi.org/10.1177/1403494815621181

Manyena, S. B. (2006). The concept of resilience revisited. *Disasters, 30*, 434–450. https://doi.org/10.1111/j.0361-3666.2006.00331.x

Marks, M. A., DeChurch, L. A., Mathieu, J. E., Panzer, F. J., & Alonso, A. (2005). Teamwork in multiteam systems. *Journal of Applied Psychology*, *90*(5), 964–971. https://doi.org/10.1037/0021-9010.90.5.964

Martin, R. A., Puhlik-Doris, P., Larsen, G., Gray, J., & Weir, K. (2003). Individual differences in uses of humor and their relation to psychological well-being: Development of the Humor Styles Questionnaire. *Journal of Research in Personality*, *37*, 48–75. https://doi.org/10.1016/S0092-6566(02)00534-2

Martinelli, L., & Day, M. (2020). "It's impacted me too": Where does vicarious growth fit in? In R. Wadey, M. Day, & K. Howells (Eds.), *Growth Following Adversity in Sport* (pp. 47–58). Routledge. https://doi.org/10.4324/9781003058021-4

Maruping, L. M., Venkatesh, V., Thatcher, S. M. B., & Patel, P. C. (2015). Folding under pressure or rising to the occasion? Perceived time pressure and the moderating role of team temporal leadership. *Academy of Management Journal*, *58*(5), 1313–1333. https://doi.org/10.5465/amj.2012.0468

Masten, A. S. (2007). Resilience in developing systems: Progress and promise as the fourth wave rises. *Development and Psychopathology*, *19*, 921–930. https://doi.org/10.1017/S0954579407000442

Masten, A. S. (2013). Competence, risk, and resilience in military families: Conceptual commentary. *Clinical Child and Family Psychology Review*, *16*, 278–281. https://doi.org/10.1007/s10567-013-0150-2

Masten, A. S. (2014). Global perspectives on resilience in children and youth. *Child Development*, *85*, 6–20. https://doi.org/10.1007/s10567-013-0150-2

Masten, A. S., & Cicchetti, D. (2016). Resilience in development: Progress and transformation. In D. Cicchetti (Ed.), *Developmental psychopathology: Vol. IV* (3rd ed., pp. 271–333). Wiley.

Masten, A. S., & Garmezy, N. (1985). Risk, vulnerability, and protective factors in developmental psychopathology. In B. B. Lahey & A. E. Kazdin (Eds.), *Advances in clinical child psychology* (pp. 1–52). Springer US.

Mathieu, J. E., Hollenbeck, J. R., van Knippenberg, D., & Ilgen, D. R. (2017). A century of work teams in the Journal of Applied Psychology. *Journal of Applied Psychology*, *102*(3), 452–467. https://doi.org/10.1037/apl0000128

Mathieu, J. E., Marks, M. A., & Zaccaro, S. J. (2001). Multiteam systems. In N. R. Anderson, D. S. Ones, K. S. Handan, & V. Chockalingam (Eds.), *Handbook of industrial, work and organisational psychology* (Vol. 2, pp. 289–313). SAGE Publications.

Mathieu, J. E., Maynard, M. T., Rapp, T., & Gilson, L. (2008). Team effectiveness 1997-2007: A review of recent advancements and a glimpse into the future. *Journal of Management*, *34*(3), 410–476. https://doi.org/10.1177/0149206308316061

Maynard, M. T., Kennedy, D. M., & Sommer, S. A. (2015). Team adaptation: A fifteen-year synthesis (1998–2013) and framework for how this literature needs to "adapt" going forward. *European Journal of Work and Organizational Psychology*, *24*, 652–677. https://doi.org/10.1080/1359432X.2014.1001376

McComb, S. A. (2008). Shared mental models and their convergence. In N. W. Warner, C. A. P. Smith, & M. P. Letsky (Eds.), *Macrocognition in teams: Theories and methodologies* (pp. 35–52). Ashgate. https://doi.org/10.1201/9781315593166-3

Mccray, J., Palmer, A., & Chmiel, N. (2016). Building resilience in health and social care teams. *Personnel Review*, *45*(6), 1132–1155. https://doi.org/10.1108/PR-04-2014-0095

McCray, J., Palmer, A., & Chmiel, N. (2016). Building resilience in health and social care teams. *Personnel Review*, *45*(6), 1132–1155. https://doi.org/10.1108/PR-04-2014-0095

McCulloch, P., Mishra, A., Handra, A., Dale, T., Hirst, G., & Catchpole, K. (2009). The effects of aviation-style non-technical skills training on technical performance and outcome in the operating theatre. *Quality and Safety in Healthcare*, *18*, 109–115. https://doi.org/10.1136/qshc.2008.032045

McEwen, B. S., & Wingfield, J. C. (2003). The concept of allostasis in biology and biomedicine. *Hormones and Behavior*, *43*(1), 2–15. https://doi.org/10.1016/s0018-506x(02)00024-7

McGrath, J. E., Arrow, H., & Berdahl, J. L. (2000). The study of groups: Past, present, and future. *Personality and Social Psychology Review*, *4*, 95–105. https://doi.org/10.1207/S15327957PSPR0401_8

McNeese, N. J., Cooke, N. J., Fedele, M. A., & Gray, R. (2015). Theoretical and methodical approaches to studying team cognition in sports. *International Conference on Applied Human Factors and Ergonomics and the Affiliated Conferences, Las Vegas*, *3*, 1211–1218. https://doi.org/10.1016/j.promfg.2015.07.201

McVicar, A. (2003). Workplace stress in nursing: A literature review. *Journal of Advanced Nursing*, *44*, 633–642. https://doi.org/10.1046/j.0309-2402.2003.02853.x

Meaney, M. J. (2010). Epigenetics and the biological definition of gene x environment interactions. *Child Development*, *81*, 41–79. https://doi.org/10.1111/j.1467-8624.2009.01381.x

Meneghel, I., Martínez, I. M., & Salanova, M. (2016). Job-related antecedents of team resilience and improved team performance. *Personnel Review*, *45*, 505–522. https://doi.org/10.1108/PR-04-2014-0094

Meneghel, I., Salanova, M., & Martínez, I. M. (2016). Feeling good makes us stronger: How team resilience mediates the effect of positive emotions on team performance. *Journal of Happiness Studies*, *17*, 239–255. https://doi.org/10.1007/s10902-014-9592-6

Mesmer-Magnus, J., Glew, D. J., & Viswesvaran, C. (2012). A meta-analysis of positive humor in the workplace. *Journal of Managerial Psychology*, *27*, 155–190. https://doi.org/10.1108/02683941211199554

Miller, J. H., & Page, S. E. (2009). *Complex adaptive systems: An introduction to computational models of social life*. Princeton University Press.

Mishra, A., K. (1996). Organizational responses to crisis: The centrality of trust. In *Trust in Organizations* (pp. 261–287). SAGE Publications, Inc. https://doi.org/10.4135/9781452243610

Mohammed, S., Hamilton, K., Sánchez-Manzanares, M., & Rico, R. (2017). Team Cognition: Team Mental Models and Situation Awareness. In E. Salas, R. Rico, & J. Passmore (Eds.), *The Wiley-Blackwell handbook of the psychology of team working and collaborative processes* (pp. 369–392). Hoboken Wiley-Blackwell.

Moore, L. J., Young, T., Freeman, P., & Sarkar, M. (2018). Adverse life events, cardiovascular responses, and sports performance under pressure. *Scandinavian Journal of Medicine & Science in Sports*, *28*, 340–347. https://doi.org/10.1111/sms.12928

Moorman, C., Deshpandé, R., & Zaltman, G. (1993). Factors affecting trust in market research relationships. *Journal of Marketing*, *57*, 81–101. https://doi.org/10.1177/002224299305700106

Moran, C. C., & Hughes, L. P. (2006). Coping with stress: Social work students and humour. *Social Work Education*, *25*, 501–517. https://doi.org/10.1080/02615470600738890

Morgan, P., Fletcher, D., & Sarkar, M. (2013). Defining and characterizing team resilience in elite sport. *Psychology of Sport & Exercise*, *14*, 549–559. https://doi.org/10.1016/j.psychsport.2013.01.004

Morgan, P., Fletcher, D., & Sarkar, M. (2015). Understanding team resilience in the world's best athletes: A case study of a rugby union World Cup winning team. *Psychology of Sport & Exercise*, *16*, 91–100. https://doi.org/10.1016/j.psychsport.2014.08.007

Morgan, P., Fletcher, D., & Sarkar, M. (2017). Recent developments in team resilience research in elite sport. *Current Opinion in Psychology*, *16*, 159–164. https://doi.org/10.1016/j.copsyc.2017.05.013

Morgan, P., Fletcher, D., & Sarkar, M. (2019). Developing team resilience: A season-long study of psychosocial enablers and strategies in a high-level sports team. *Psychology of Sport & Exercise*, *45*, 101543. https://doi.org/10.1016/j.psychsport.2019.101543

Morgeson, F. P., & Hofmann, D. A. (1999). The structure and function of collective constructs: Implications for multilevel research and theory development. *The Academy of Management Review*, *24*(2), 249–265. JSTOR. https://doi.org/10.2307/259081

Morgeson, F. P., Mitchell, T. R., & Liu, D. (2015). Event System Theory: An event-oriented approach to the organizational sciences. *Academy of Management Review*, *40*(4), 515–537. https://doi.org/10.5465/amr.2012.0099

Murphy, L. B. (1962). *The widening world of childhood: Paths toward mastery*. Basic Books.

Nicholls, D. (2009). Qualitative research: Part one – Philosophies. *International Journal of Therapy and Rehabilitation*, *16*, 526–533. https://doi.org/10.12968/ijtr.2009.16.10.44562

Nicolaides, V. C., LaPort, K. A., Chen, T. R., Tomassetti, A. J., Weis, E. J., Zaccaro, S. J., & Cortina, J. M. (2014). The shared leadership of teams: A meta-analysis of proximal, distal, and moderating relationships. *The Leadership Quarterly*, *25*, 923–942. https://doi.org/10.1016/j.leaqua.2014.06.006

Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology*, *41*, 127–150. https://doi.org/10.1007/s10464-007-9156-6

Norris, F. H., Tracy, M., & Galea, S. (2009). Looking for resilience: Understanding the longitudinal trajectories of responses to stress. *Social Science and Medicine*, *68*, 2190–2198. https://doi.org/10.1016/j.socscimed.2009.03.043

Okoli, C., Pawlowski, S., & D. (2004). The Delphi method as a research tool: An example, design considerations and applications. *Information & Management*, *42*, 15–29. https://doi.org/10.1016/j.im.2003.11.002

Pangallo, A., Zibarras, L., Lewis, R., & Flaxman, P. (2015). Resilience through the lens of interactionism: A systematic review. *Psychological Assessment*, *27*, 1–20. https://doi.org/10.1037/pas0000024

Pendergraft, J. G., Carter, D. R., Tseng, S., Landon, L. B., Slack, K. J., & Shuffler, M. L. (2019). Learning from the past to advance the future: The adaptation and resilience of NASA's spaceflight multiteam systems across four eras of spaceflight. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.01633

Petree, R. D., Broome, K. M., & Bennett, J. B. (2012). Exploring and reducing stress in young restaurant workers: Results of a randomized field trial. *American Journal of Health Promotion*, *26*, 217–224. https://doi.org/10.4278/ajhp.091001-QUAN-321

Pham, M. T., Rajić, A., Greig, J. D., Sargeant, J. M., Papadopoulos, A., & McEwen, S. A. (2014). A scoping review of scoping reviews: Advancing the approach and enhancing the consistency. *Research Synthesis Methods*, *5*(4), 371–385. https://doi.org/10.1002/jrsm.1123

Phillips, B. D. (2015). *Disaster recovery* (2nd ed.). Taylor and Francis.

Ployhart, R. E., Nyberg, A. J., Reilly, G., & Maltarich, M. A. (2014). Human capital is dead; long live human capital resources! *Journal of Management*, *40*, 371–398. https://doi.org/10.1177/0149206313512152

Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2016). Recommendations for creating better concept definitions in the organizational, behavioural, and social sciences. *Organizational Research Methods*, *19*, 159–203. https://doi.org/10.1177/1094428115624965

Pollock, C., Paton, D., Smith, D., & Violanti, J. (2003). Team resilience. In D. Paton., J. Violanti., & L. Smith (Eds.), *Promoting capabilities to manage posttraumatic stress: Perspectives on resilience* (pp. 74–88). Charles C. Thomas.

Porck, J. P., Matta, F. K., Hollenbeck, J. R., Oh, J. K., Lanaj, K., & Lee, S. M. (2019). Social identification in multiteam systems: The role of depletion and task complexity. *Academy of Management Journal*, *62*, 1137–1162.

Poucher, Z. A., Tamminen, K. A., Caron, J. G., & Sweet, S. N. (2020). Thinking through and designing qualitative research studies: A focused mapping review of 30 years of qualitative research in sport psychology. *International Review of Sport and Exercise Psychology*, *13*(1), 163–186. https://doi.org/10.1080/1750984X.2019.1656276

Prince, C., Ellis, E., Brannick, M. T., & Salas, E. D. (2007). Measurement of team situation awareness in low experience level aviators. *The International Journal of Aviation Psychology*, *17*, 41–57. https://doi.org/10.1080/10508410709336936

QSR International Pty LTD. (2010). *NVivo Qualitative Data Analysis Software* (Version 12) [Computer software].

Rafferty, A. E., & Jimmieson, N. L. (2010). Team change climate: A group-level analysis of the relationships among change information and change participation, role stressors, and well-being. *European Journal of Work and Organizational Psychology*, *19*(5), 551–586. https://doi.org/10.1080/13594320903007869

Razinskas, S., & Hoegl, M. (2020). A multilevel review of stressor research in teams. *Journal of Organizational Behavior*, *41*(2), 185–209. https://doi.org/10.1002/job.2420

Robert, C., & Wilbanks, J. E. (2012). The Wheel Model of humor: Humor events and affect in organizations. *Human Relations*, *65*, 1071–1099. https://doi.org/10.1177/0018726711433133

Rodríguez-Sánchez, A. M., & Vera Perea, M. (2015). The secret of organisation success: A revision on organisational and team resilience. *International Journal of Emergency Services*, *4*, 27–36. https://doi.org/10.1108/IJES-09-2014-0018

Rodwell, M. K. (1987). Naturalistic inquiry: An alternative model for social work assessment. *Social Service Review*, *61*(2), 231–246.

Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological Bulletin*, *86*, 638–641. https://doi.org/10.1037/0033-2909.86.3.638

Rouse, W. B., & Morris, N. M. (1986). On looking into the black box: Prospects and limits in the search for mental models. *Psychological Bulletin*, *100*(3), 349–363. https://doi.org/10.1037/0033-2909.100.3.349

Rutter, M. (1979). Protective factors in children's responses to stress and disadvantage. In M. W. Kent & J. E. Rolf (Eds.), *Primary prevention of psychopathology* (Vol. 3, pp. 49–74). University Press of New England.

Rutter, M. (1985). Resilience in the face of adversity. Protective factors and resistance to psychiatric disorder. *British Journal of Psychiatry*, *147*, 598–611. https://doi.org/10.1192/bjp.147.6.598

Salas, E. D., Cooke, N. J., & Rosen, M. A. (2008). On teams, teamwork, and team performance: Discoveries and developments. *Human Factors: The Journal of Human Factors and Ergonomic Society*, *50*, 540–547. https://doi.org/10.1518/001872008X288457

Salas, E. D., Reyes, D. L., & McDaniel, S. H. (2018). The science of teamwork: Progress, reflections, and the road ahead. *American Psychologist*, *73*, 593–600. https://doi.org/10.1037/amp0000334

Saldaña, J. (2003). *Longitudinal Qualitative Research: Analyzing Change Through Time*. Rowman Altamira.

Salmon, P. M., Stanton, N. A., Walker, G. H., Jenkins, D., Ladva, D., Rafferty, L., & Young, M. (2009). Measuring situation awareness in complex systems: Comparison of measures study. *International Journal of Industrial Ergonomics*, *39*, 490–500. https://doi.org/10.1016/j.ergon.2008.10.010

Savioja, P., Norros, L., Salo, L., & Aaltonen, I. (2014). Identifying resilience in proceduralised accident management activity of NPP operating crews. *Safety Science*, *68*, 258–274. https://doi.org/10.1016/j.ssci.2014.04.008

Scheffer, M., Bolhuis, J. E., Borsboom, D., Buchman, T. G., Gijzel, S. M. W., Goulson, D., Kammenga, J. E., Kemp, B., Leemput, I. A. van de, Levin, S., Martin, C. M., Melis, R. J. F., Nes, E. H. van, Romero, L. M., & Rikkert, M. G. M. O. (2018). Quantifying resilience of humans and other animals. *Proceedings of the National Academy of Sciences*, *115*(47), 11883–11890. https://doi.org/10.1073/pnas.1810630115

Schoenewolf, G. (1990). Emotional contagion: Behavioral induction in individuals and groups. *Modern Psychoanalysis*, *15*, 49–61.

Seery, M. D. (2011). Challenge or threat? Cardiovascular indexes of resilience and vulnerability to potential stress in humans. *Neuroscience and Biobehavioral Reviews*, *35*, 1603–1610. https://doi.org/10.1016/j.neubiorev.2011.03.003

Seery, M. D., & Quinton, W. J. (2016). Understanding resilience: From negative life events to everyday stressors. *Advances in Experimental Social Psychology*, *54*, 181–245. https://doi.org/10.1016/bs.aesp.2016.02.002

Sessa, V. I., London, M., & Wanamaker, M. (2019). How multiteam systems learn. *Team Performance Management: An International Journal*, *25*(1/2), 138–156. https://doi.org/10.1108/TPM-06-2018-0039

Sharma, S., & Sharma, S. K. (2016). Team Resilience: Scale Development and Validation. *Vision*, *20*, 37–53. https://doi.org/10.1177/0972262916628952

Shettleworth, S. J. (2010). *Cognition, Evolution, Behavior*. Oxford University Press.

Shuffler, M. L., & Carter, D. R. (2018). Teamwork situated in multiteam systems: Key lessons learned and future opportunities. *American Psychologist*, *73*, 390–406. https://doi.org/10.1037/amp0000322

Shuffler, M. L., Jiménez-Rodríguez, M., & Kramer, W. S. (2015). The science of multiteam systems: A review and future research agenda. *Small Group Research*, *46*(6), 659–699. https://doi.org/10.1177/1046496415603455

Shuffler, M. L., Pavlas, D., & Salas, E. (2012). Teams in the military: A review and emerging challenges. In J. H. Laurence & M. D. Matthews (Eds.), *The Oxford Handbook of Military Psychology* (pp. 282–310). Oxford University Press.

Siegel, A. W., & Schraagen, J. M. (2017). Team reflection makes resilience-related knowledge explicit through collaborative sensemaking: Observation study at a rail post. *Cognition, Technology and Work, 19*, 127–142. https://doi.org/10.1007/s10111-016-0400-4

Simons, T. L., & Peterson, R. S. (2000). Task conflict and relationship conflict in top management teams: The pivotal role of intragroup trust. *Journal of Applied Psychology*, *85*, 102–111. https://doi.org/10.1037/0021-9010.85.1.102

Sinclair, V. G., & Wallston, K. A. (2004). The development and psychometric evaluation of the Brief Resilient Coping Scale. *Assessment, 11*, 94–101. https://doi.org/10.1177/1073191103258144

Slavich, G. M. (2019). Stressnology: The primitive (and problematic) study of life stress exposure and pressing need for better measurement. *Brain, Behavior, and Immunity*, *75*, 3–5. https://doi.org/10.1016/j.bbi.2018.08.011

Smith, B. (2018). Generalizability in qualitative research: Misunderstandings, opportunities and recommendations for the sport and exercise sciences. *Qualitative Research in Sport, Exercise and Health*, *10*(1), 137–149. https://doi.org/10.1080/2159676X.2017.1393221

Smith, B., & McGannon, K. R. (2018). Developing rigor in qualitative research: Problems and opportunities within sport and exercise psychology. *International Review of Sport and Exercise Psychology*, *11*(1), 101–121. https://doi.org/10.1080/1750984X.2017.1317357

Sparkes, A., & Smith, B. (2014). *Qualitative research methods in sport, exercise and health: From process to product*. Routledge.

Stalder, T., & Kirschbaum, C. (2012). Analysis of cortisol in hair—State of the art and future directions. *Brain Behavior and Immunity*, *26*, 1019–1029. https://doi.org/10.1016/j.bbi.2012.02.002

Stanton, N. A., Salmon, P. M., Walker, G. H., Salas, E. D., & Hancock, P. A. (2017a). State-of-science: Situation awareness in individuals, teams and systems. *Ergonomics*, *60*, 449–466. https://doi.org/10.1080/00140139.2017.1278796

Stanton, N. A., Salmon, P. M., Walker, G. H., Salas, E., & Hancock, P. A. (2017b). State-of-science: Situation awareness in individuals, teams and systems. *Ergonomics*, *60*(4), 449–466. https://doi.org/10.1080/00140139.2017.1278796

Stanton, N. A., Stewart, R., Harris, D., Houghton, R. J., Baber, C., McMaster, R., Salmon, P., Hoyle, G., Walker, G., Young, M. S., Linsell, M., Dymott, R., & Green, D. (2006). Distributed situation awareness in dynamic systems: Theoretical development and application of an ergonomics methodology. *Ergonomics*, *49*, 1288–1311. https://doi.org/10.1080/00140130600612762

Steiner, S., Seiler, R., & Cooke, N. J. (2017). Understanding the successful coordination of team behavior. *Frontiers in Psychology*, *8*(1869), 1–2. https://doi.org/10.3389/fpsyg.2017.01869

Stephens, J. P., Heaphy, E. D., Carmeli, A., Spreitzer, G. M., & Dutton, J. E. (2013). Relationship Quality and Virtuousness: Emotional Carrying Capacity as a Source of Individual and Team Resilience. *The Journal of Applied Behavioral Science*, *49*(1), 13–41. https://doi.org/10.1177/0021886312471193

Stoverink, A. C., Kirkman, B. L., Mistry, S., & Rosen, B. (2020). Bouncing Back Together: Toward a Theoretical Model of Work Team Resilience. *Academy of Management Review*, *45*(2), 395–422. https://doi.org/10.5465/amr.2017.0005

Stoverink, A. C., Kirkman, B. L., Mistry, S., & Rosen, B. (in press). Bouncing back together: Toward a theoretical model of work team resilience. *Academy of Management Review*. https://doi.org/10.5465/amr.2017.0005

Sundstrom, E., Meuse, K. P., & Futrell, D. (1990). Work teams: Applications and effectiveness. *American Psychologist*, *45*, 120–133. https://doi.org/10.1037/0003-066X.45.2.120

Tajfel, H., & Turner, J. C. (1979). An integrative theory of intergroup conflict. In M. J. Hatch. & M. Schultz (Eds.), *Organizational identity: A reader* (pp. 56–65). Oxford University Press.

Talat, A., & Riaz, Z. (2020). An integrated model of team resilience: Exploring the roles of team sensemaking, team bricolage and task interdependence. *Personnel Review*, *49*, 2007–2033. https://doi.org/10.1108/PR-01-2018-0029

Tamminen, K. A., Holt, N. L., & Neely, K. C. (2013). Exploring adversity and the potential for growth among elite female athletes. *Psychology of Sport and Exercise*, *14*, 28–36. https://doi.org/10.1016/j.psychsport.2012.07.002

Tannenbaum, S. I., & Cerasoli, C. P. (2013). Do team and individual debriefs enhance performance? A meta-analysis. *Human Factors*, *55*, 231–245. https://doi.org/10.1177/0018720812448394

Tasa, K., Taggar, S., & Seijts, G. H. (2007). The development of collective efficacy in teams: A multilevel and longitudinal perspective. *Journal of Applied Psychology*, *92*, 17–27. https://doi.org/10.1037/0021-9010.92.1.17

Tedeschi, R. G., Shakespeare-Finch, J., Taku, K., & Calhoun, L. G. (2018). *Posttraumatic growth: Theory, research, and applications*. Routledge.

Teixeira, P., Marques, M., Silva, M., Brunet, J., Duda, J., Haerens, L., La Guardia, J., Lindwall, M., Lonsdale, C., Markland, D., Michie, S., Moller, A., Ntoumanis, N., Patrick, H., Reeve, J., Sebire, S., Standage, M., Vansteenkiste, M., Weinstein, N., & Hagger, M. (2019). Classification of techniques used in self-determination theory-based interventions in health contexts: An expert consensus study. *Motivation Science*. https://doi.org/10.1037/mot0000172

Temby, P., & Vozzo, J. (2017). Understanding team resilience in the Australian Army: A qualitative study. *Journal of Science and Medicine in Sport*, *20*, S51–S52. https://doi.org/10.1016/j.jsams.2017.09.162

Tesluk, P., Mathieu, J. E., Zaccaro, S. J., & Marks, M. (1997). Task and aggregation issues in the analysis and assessment of team performance. In M. T. Brannick, E. D. Salas, & C. W. Prince (Eds.), *Team performance assessment and measurement: Theory, methods, and applications* (pp. 197–224).

Thomson, R., & Holland, J. (2003). Hindsight, foresight and insight: The challenges of longitudinal qualitative research. *International Journal of Social Research Methodology*, *6*(3), 233–244. https://doi.org/10.1080/1364557032000091833

Totterdell, P. (2000). Catching moods and hitting runs: Mood linkage and subjective performance in professional sport teams. *Journal of Applied Psychology*, *85*, 848–859. https://doi.org/10.1037/0021-9010.85.6.848

Tracy, S. J. (2010). Qualitative quality: Eight "big-tent" criteria for excellent qualitative research. *Qualitative Inquiry*, *16*, 837–851. https://doi.org/10.1177/1077800410383121

Tuckman, B. W. (1965). Developmental sequence in small groups. *Psychological Bulletin*, *63*, 384–389. https://doi.org/10.1037/h0022100

Turner, J., Baker, R., Ali, Z., & Thurlow, N. (2020). A new multiteam system (MTS) effectiveness model. *Systems*, *8*(2), 12. https://doi.org/10.3390/systems8020012

Turner, J. C., Hogg, M. A., Turner, P. J., & Smith, P. M. (1984). Failure and defeat as determinants of group cohesiveness. *British Journal of Social Psychology*, *23*, 97–111. https://doi.org/10.1111/j.2044-8309.1984.tb00619.x

Uitdewilligen, S., & Waller, M. J. (2012). Adaptation in multiteam systems: The role of temporal semistructures. In S. J. Zaccaro, M. A. Marks, & L. A. DeChurch (Eds.), *Multiteam systems: An organization form for dynamic and complex environments* (pp. 365–394). Routledge/Taylor & Francis Group.

Van der Beek, D., & Schraagen, J. M. (2015). ADAPTER: Analysing and developing adaptability and performance in teams to enhance resilience. *Reliability Engineering & System Safety*, *141*, 33–44. https://doi.org/10.1016/j.ress.2015.03.019

Van der Kleij, R., Molenaar, D., & Schraagen, J. M. (2011). Making teams more resilient: Effects of shared transformational leadership training on resilience. *Proceedings of the Human Factors and Ergonomics Society*, *55*, 2158–2162.

Van Kessel, G. (2013). The ability of older people to overcome adversity: A review of the resilience concept. *Geriatric Nursing*, *34*, 122–127. https://doi.org/10.1016/j.gerinurse.2012.12.011

van Kleef, G. A., & Fischer, A. H. (2016). Emotional collectives: How groups shape emotions and emotions shape groups. *Cognition and Emotion*, *30*, 3–19. https://doi.org/10.1080/02699931.2015.1081349

Vogus, T. J., & Sutcliffe, K. M. (2007). The Safety Organizing Scale: Development and validation of a behavioural measure of safety culture in hospital nursing units. *Medical Care*, *45*, 46–54. https://doi.org/10.1097/01.mlr.0000244635.61178.7a

Volmer, J., & Sonnentag, S. (2011). The role of star performers in software design teams. *Journal of Managerial Psychology*, *26*(3), 219–234. https://doi.org/10.1108/02683941111112659

von Bertalanffy, L. (1968). *General system theory*. Brazilier.

Walsh, F. (2016). Applying a family resilience framework in training, practice, and research: Mastering the art of the possible. *Family Process*, *55*, 616–632. https://doi.org/10.1111/famp.12260

Wang, D., Waldman, D. A., & Zhang, Z. (2014). A meta-analysis of shared leadership and team effectiveness. *Journal of Applied Psychology*, *99*, 181–198. https://doi.org/10.1037/a0034531

Waring, S., Alison, L., Carter, G., Barrett-Pink, C., Humann, M., Swan, L., & Zilinsky, T. (2018). Information sharing in interteam responses to disaster. *Journal of Occupational and Organizational Psychology*, *91*(3), 591–619. https://doi.org/10.1111/joop.12217

Waring, S., Alison, L., Shortland, N., & Humann, M. (2020). The role of information sharing on decision delay during multiteam disaster response. *Cognition Technology & Work*, *22*(2), 263–279. https://doi.org/10.1007/s10111-019-00570-7

Weckesser, L. J., Dietz, F., Schmidt, K., Grass, J., Kirschbaum, C., & Miller, R. (2019). The psychometric properties and temporal dynamics of subjective stress, retrospectively assessed by different informants and questionnaires, and hair cortisol concentrations. *Scientific Reports*, *9*(1098), 1–12. https://doi.org/10.1038/s41598-018-37526-2

West, B. J., Patera, J. L., & Carsten, M. K. (2009). Team level positivity: Investigating positive psychological capacities and team level outcomes. *Journal of Organizational Behavior*, *30*(2), 249–267. https://doi.org/10.1002/job.593

Whetten, D. A. (1989). What constitutes a theoretical contribution? *The Academy of Management Review*, *14*(4), 490–495. JSTOR. https://doi.org/10.2307/258554

Whetten, D. A. (2009). An examination of the interface between context and theory applied to the study of Chinese organizations. *Management and Organization Review*, *5*, 29–55. https://doi.org/10.1111/j.1740-8784.2008.00132.x

Wijnmaalen, J., Voordijk, H., & Rietjens, B. (2018). MTS coordination in practice: Micro-level insights to increase MTS performance. *Team Performance Management: An International Journal*, *24*(1/2), 64–83. https://doi.org/10.1108/TPM-12-2016-0057

Windschitl, P. D., Kruger, J., & Simms, E. (2003). The influence of egocentrism and focalism on people's optimism in competitions: When what affects us equally affects me more. *Journal of Personality and Social Psychology*, *85*, 389–408. https://doi.org/10.1037/0022-3514.85.3.389

Wright, M. O., Masten, A. S., & Narayan, A. J. (2013). Resilience processes in development: Four waves of research on positive adaptation in the context of adversity. In S. Goldstein & R. B. Brooks (Eds.), *Handbook of Resilience in Children* (pp. 15–37). Springer US. https://doi.org/10.1007/978-1-4614-3661-4_2

Zaccaro, S. J., Dubrow, S., Torres, E. M., & Campbell, L. N. P. (2020). Multiteam systems: An integrated review and comparison of different forms. *Annual Review of Organizational Psychology and Organizational Behavior*, *7*(1), 479–503. https://doi.org/10.1146/annurev-orgpsych-012119-045418

Zaccaro, S. J., Marks, M. A., & DeChurch, L. A. (2012). Multiteam systems: An introduction. In S. J. Zaccaro, M. A. Marks, & L. A. DeChurch (Eds.), *Multiteam systems: An organization form for dynamic and complex environments* (pp. 3–32). Routledge/Taylor & Francis Group. https://books.google.com.au/books?id=OrisAgAAQBAJ&printsec=frontcover#v=onepage&q&f=false

Zaccaro, S. J., Weiss, E. J., Hilton, R. M., & Jeffries, J. (2011). Building resilient teams. In P. Sweeney, M. Matthews, & P. Lester (Eds.), *Leadership in dangerous contexts: A handbook for the armed forces, emergency services, and first responders* (pp. 182–201). Naval Institute Press.

Zelazo, P. D. (2013). Developmental psychology: A new synthesis. In P. D. Zelazo (Ed.), *The Oxford handbook of developmental psychology: Body and mind* (Vol. 1, pp. 3–12).

Zoellner, T., & Maercker, A. (2006). Posttraumatic growth in clinical psychology—A critical review and introduction of a two component model. *Clinical Psychology Review*, *26*, 626–653. https://doi.org/10.1016/j.cpr.2006.01.008

Appendix A: Scoping review supplementary material

Research Question/Aim:

Map the literature on team resilience, with a particular focus on (i) definitional, (ii) theoretical, and (iii) methodological factors, to inform an understanding of the extent, range and nature of research on this concept

Search Terms	Search Engine	Criteria	Results
"resilient team*"	Web of science (core collection)	topic	23
OR	Scopus	title, abstract or keyword	42
"team resilien*"	Embase (OVID)	all fields (multi-field search)	13
	Medline (OVID)	all fields (multi-field search)	6
	PsycINFO (OVID)	all fields (multi-field search)	69
	CINHAL Plus	all text	25
	Business Source Complete	all text	97
			275

	Inclusion Criteria
1	Written in English
2	Peer-reviewed journal article
3	Aim to explore or measure team resilience in occupational settings
4	Research/theory on humans

	Exclusion Criteria
1	Non-English
2	Conference abstract, book, thesis, chapter, newspaper or magazine article
3	Research/theory on non-humans (e.g., computer systems)
4	Full-text unavailable

Item		Excluded	Running N
1	Records identified via databases (January 4th 2017)		275
2	Removed duplicates	73	202
	Abstract and Title Search		
3	Removed (non-English)	1	
4a	Removed (conference abstract, book, thesis, chapter, newspaper/magazine article)	102	< ---------- insert results for each exclusion criterion in column D
4b	Removed (non-human work)	1	< ---------- insert results for each exclusion criterion in column D
4c	Removed (team resilience not a primary focus for the research/theory discussion)	60	< ---------- insert results for each exclusion criterion in column D
5	Full text unavailable	0	< ---------- insert results for each exclusion criterion in column D
Web of science (core collection)			
	Full Text Search		
6a	Removed (non-human work)	1	< ---------- insert results for each exclusion criterion in column D
6b	Removed (team resilience not a primary focus for the research/theory discussion)	18	< ---------- insert results for each exclusion criterion in column D
6c	Removed (conference abstract, book, thesis, chapter, newspaper/magazine article)	2	< ---------- insert results for each exclusion criterion in column D
			#VALUE!
7	Citation searching of eligible articles (February 11th 2017)	10	#VALUE!

Note : If a specific topic is unaddressed or absent from the manuscript, please use "n/a" rather than a blank cell.

MS	Reference/Citation	doi	Year	Article Type (dropdown menu)	Research Question/Aim	Research Setting	Definition of Team Resilience	Participant Characteristics: Size(s)	Age	Sex	Location(s)	Design (dropdown menu)	Dependent Variable(s)	Methodological Features: Independent Variable	Interview Questions	Data Analysis	Results: Primary Findings
1	Alliger, G.M., Cerasoli, C.P., Tannenbaum, S.I., & Vessey, W.B. (2015). Team resilience: How teams flourish under pressure. *Organizational Dynamics, 44,* 176-184.	http://dx.doi.org/10.1016/j.orgdyn.2015.05.003	2015	Conceptual paper	Define team resilience, and distinguish it from individual resilience; discuss how stress and pressure affects teams and what a healthy, resilient team looks like; provide 40 specific behaviours that resilient teams demonstrate; and offer recommendations for building team resilience in any type of team.	n/a	The capacity of a team to withstand and overcome stressors in a manner that enables sustained performance; it helps teams handle and bounce back from challenges that can endanger their cohesiveness and performance (p. 177)	n/a	n/a	n/a	n/a	n/a (conceptual paper)	n/a	n/a	n/a	n/a	Capacity refers to something that a team possesses, regardless of whether or not a challenge is present, yet resilience is observed only when under pressure; conceptualized as a multidimensional continuum; resilient teams demonstrate three broad types of behaviours, namely minimize (anticipating & planning for a challenging event prior to it occurring), manage (actions exhibited during a challenge, i.e., assessment, address chronic stressors, provide back-up and assistance, maintain basic processes, see guidance), and mend (recovering from stress, learning from experience, and adapting); 40 team resilience behaviours described using this tripartite framework. Five markers to identify team resilience; Challenge resolution (speed & effectiveness of this); Health (Handle challenge in way that protects spirit, mood); Resources (Maintain or 'bank' tangible or social resources during challenge); Recovery (Able to bounce back or even enhance effectiveness after challenge); On-going viability (Maintain viability to meet new challenges)
2	Bennett, J.B., Aden, C.A., Broome, K., Mitchell, K., & Rigdon, W.D. (2010). Team resilience for young restaurant workers: Research-to- practice adaptation and assessment. *Journal of Occupational Health Psychology, 15,* 223-236.	http://dx.doi.org/10.1037/a0019397	2010	Empirical (new data)	First, describe procedures for adapting the existing Team Awareness program for use with young adults in the restaurant industry; second, to assess young restaurant workers' initial reactions to the adapted program. Finally examine whether the adapted program is of equal interest to individuals with pre-existing AOD use or depression (Overall; describe generic set of procedures for altering known program to new population	14 restaurants from national restaurant chain in four metropolitan areas of the United States (three in Texas and one in Illinois)	None provided; resilience conceptualized as "resources" encompassing the 5Cs (see independent variables), with the core focus on improving group cohesiveness, stress management skills, and peer referral for co-workers with problems	124	16-34 years (M = 22.2, SD = 3.7)	68 females, 56 males	USA	Intervention	Alcohol and other drug use; depression (measured 1-7 days prior) and awareness judgments, help-seeking intentions, and personal resilience as they related to the session content for that day	team resilience intervention: community, compassion, confidence, commitment and centering (5 Cs) (p. 229)	n/a	Mixed model ANOVA to assess main effect of changes in the session rating scales (self-awareness, help-seeking intentions, and personal resilience) over the course of the three sessions; Main effect of attendance group to test overall difference between participants attending some and all sessions and Interaction to test whether change was different between groups.	Significant main effect for increase of self-awareness, help-seeking intentions, and personal resilience across all 3 sessions. No difference between three measures in groups that attended all three and those that attended one or two sessions. However significant interaction for time and group within measure for personal resilience. Specifically personal resilience did not significantly increase in those attending 1/2 sessions indicating need to attend all three.
3	Broome, K.M., & Bennett, J.B. (2011). Reducing heavy alcohol consumption in young restaurant workers. *Journal of Studies on Alcohol and Drugs, 72,* 117-124.	http://dx.doi.org/10.15288/jsad.2011.72.117	2011	Empirical (new data)	To evaluate the effectiveness of the team resilience program for reducing alcohol consumption and other work-related problems associated with heavy drinking	National restaurant chain in four metropolitan areas of the United States (three in Texas and one in Illinois).	None provided; resilience conceptualized as "resources" encompassing the 5Cs (see independent variables), with the core focus on improving group cohesiveness, stress management skills, and peer referral for co-workers with problems	235 (intervention = 125, control = 110)	16-35 years (M = 22.5, SD = 4)	108 females, 127 males	USA	Intervention	team performance (in-role and extra-role)	team resilience intervention: community, compassion, confidence, commitment and centering (5 Cs)	n/a	Multilevel model to examine changes in dependent variables before and after the intervention, and their maintainence (6 & 12 months)	participants who completed the team resilience program reported greater reductions in heavy drinking than the control group between pre-post intervention but not 6 and 12 months, with sex and age differences in the likelihood of recurring heavy drinking; no differences in work-related alcohol problems from pre-post intervention, but workers who received the team resilience program reported about one-third fewer problems at 12 months than they had reported at 6 months, with age an important factor for these changes in work-related problems
4	Edson, M.C. (2012). A complex adaptive systems view of resilience in a project team. *Systems Research and Behavioral Science, 29,* 499-516.	http://dx.doi.org/10.1002/sres.2153	2012	Empirical (new data)	First, when faced with adversity, how do project teams recognize and acknowledge that their current operating processes (e.g., norms) no longer support the attainment of their objectives? Second, how do project teams renegotiate those processes (change) so new operating processes can emerge that support their progress and objectives? Third, does the project team's adaptive experience follow a pattern of the nested cycle of creative destruction?	Cornell University's Solar Decathlon (CUSD2009) Team (project team), which competed in the United States Department of Energy's Solar Decathlon (2009)	Ability of a system (team/organisation) to adapt its structure while maintaining its function which often entails emergence of new processes (behaviours, norms and hierarchical structures) (Edson, 2010, p.2)	26 students, 4 faculty members	unreported	6 females, 24 males	USA	Mixed methods	n/a	n/a	Designed to elicit interviewee reflections about the team's dynamics at an inflection point, where the questions were grounded in appreciative inquiry (Cooperrider and Whitney, 2005) and group development theories; other data sources included project manual, project team's website, tour guide training manual, and published articles about the team and competition (print and online)	Interviews coded using grounded theory techniques of open coding, axial, and then selective coding;	RQ1: overall team leader communicated the budget gap and its importance to sub-leaders, who in turn conveyed this information to their members; RQ2: Weekly meetings every Friday to review finances; also actions moved towards better bookkeeping through the rest of the project; RQ3: process of transformation combined with innovation at an inflection point. Team's conscious decision to design and create own kitchen (i.e. take adaptive action) resulted in more applicable and cost effective outcome than external supplier (i.e. creative destruction) thus leading to innovation. Four summary statements about the developmental process: (i) exploitation is a process of self- organization during forming and storming, (ii) conservation is a process of building hierarchy during norming, (iii) release is a process of emergence during performing, and (iv) reorganization uses processes of learning as an outcome of adjourning.
5	Glowinski, D., Bracco, F., Chiorri, C., & Grandjean, D. (2016). Music ensemble as a resilient system: Managing the unexpected through group interaction. *Frontiers in Psychology, 7* : 1548.	http://dx.doi.org/10.3389/fpsyg.2016.01548	2016	Conceptual paper	To demonstrate the salience of resilience for music ensembles, particularly with regard to the reciprocal effects of individuals' strategies and group behaviour for adaptation against perturbations and goal	music ensemble as an original social and creative activity. Twp contrasting cornerstones of music ensemble - string quartet and orchestra	the ability of a system to adapt to external perturbations and anticipate future events (Hollnagel et	n/a	n/a	n/a	n/a	n/a (conceptual paper)	n/a	n/a	n/a	n/a	proposed a model in which a resilient system has the capacity to anticipate, monitor, respond, and learn; central to this model is (i) anticipating and monitoring of the ongoing situation, including the type (internal/external) and magnitude of perturbations, (ii) responding to un/expected variations, with the view to identify disturbances that might disrupt task achievement or opportunities that foster it, (iii) learning from challenging or stressful experiences, and (iv) anticipating perturbations that might happen in the future

				attainment		al., 2011).										
6	Kennedy, D.M., Blackwell Landon, L., & Maynard, M.T. (2016). Extending the conversation: Employee resilience at the team level. *Industrial and Organizational Psychology, 9,* 466-475.	https://doi.org/10.1017/iop.2016.4	2016	Conceptual paper	to extend the conversation presented by Britt and colleagues (target article) by including the lessons learned about resilience and adaptation at this higher-level of analysis to provide a more complete picture of the phenomena (To address conceptual overlap between team adaptation adn team resilience further)	Examples provided of teams of astronauts on long-duration spaceflight missions to contextualise the discussion	Shared belief held by the team that it can respond to disruptive and challenging events, recover from setbacks, and thrive as a team under these conditions (p. 468)	n/a	n/a	n/a	n/a	n/a (conceptual paper)	n/a	n/a	n/a	n/a	Rather than a capacity or a demonstration of such a capacity, team resilience is best conceptualised as an emergent state or one of the "cognitive, motivational, and affective states of teams" (Marks, Mathieu, & Zaccaro, 2001, p. 357); in this way, team resilience is one of several outcomes that are included within the team adaptive outcomes category; the association between team resilience and team adaptation is reciprocal; it is important to consider a range of "triggers" for resilience (e.g., team- or task-based); resilient outcomes can be mal/adaptive in nature; temporal dynamics are key to understanding team resilience (e.g., when a trigger occurs in the team's lifecycle)
7	McCray, J., Palmer, A., & Chmiel, N. (2016). Building resilience in health and social care teams. *Personnel Review, 45* , 1132-1155.	https://doi.org/10.1108/PR-04-2014-0089	2016	Empirical (new data)	To capture the views of managers in health and social care organisations to explore the making of resilient teams, identify factors that influence team performance and inform organisational workforce development strategy	Health and social care organisations within the UK	A team's ability to "bounce back" and "maintain" performance under adverse circumstances (West et al., 2009, p. 253).	40	30-40 years (n = 30), 40-50 years (n = 9), 50-60 years (n = 1)	25 females, 15 males	UK	Interviews/focus groups (x-sectional)	n/a	n/a	focus group were asked the following questions: (1) What does the term resilience mean to you? (2) Can you describe the qualities of resilience required for effective team work? and (3) What has worked for you in terms of strategy to build team resilience?	thematic analysis	identified three overarching themes of (i) sustaining effort (resolve to strive to perform in difficult situations), including sub-themes of stamina, resourcefulness and mindfulness; (ii) team learning (learning about how the team and team members work together), including sub-themes of team culture, reflection, processes, education, feedback, and learning from individual and team experiences; and (iii) team work approaches (activity to enable effective interaction for performance), including sub-themes of action, modeling of behavior, interdependency, and type.
8	Meneghel, I., Martínez, I.M., & Salanova, M. (2016). Job-related antecedents of team resilience and improved team performance. *Personnel Review, 45* , 505-522.	https://doi.org/10.1108/PR-04-2014-0024	2016	Empirical (new data)	to investigate the potential role of team resilience as the psychological mechanism that explains how job demands and job social resources are related to and enhance team performance.	small and medium companies in Spain	defined as "the capacity to bounce back from failure, setbacks, conflicts, or any other threat to wellbeing that they may experience" (West et al., 2009, p. 253).	1,633 employees nested in 275 teams from 52 companies	unreported	722 females, 911 males	Spain	Questionnaire (x-sectional)	team performance (in-role and extra-role)	team job demands (quantitaitive overload, role ambiguity, role conflict), team job resources (social support, team coordination), team resilience (7-items based on Mallak's (1998) principles for implementing resilience in organizations)	n/a	Structural equation modelling	(i) Job resources (β = .66) and the interaction between job demands and resources (β = -.20) were salient antecedents of team resilience, (ii) which in turn was an important determinant of team performance (β = .43); (ii) there was an indirect effect from job resources to team performance via team resilience
9	Meneghel, I., Salanova, M., & Martínez, I.M. (2016). Feeling good makes us stronger: How team resilience mediates the effect of positive emotions on team performance. *Journal of Happiness Studies, 17,* 239- 255.	https://doi.org/10.1007/s10902-014-9592-6	2016	Empirical (new data)	To examine the associations between collective positive emotions at work and team resilience at the collective level of analysis.	Small and medium companies in Spain. Team size ranging from 2 to 38 employees (m=4.99, SD=4.2)	Defined as "the capacity to bounce back from failure, setbacks, conflicts, or any other threat to wellbeing that they may experience" (West et al., 2009, p. 253).	1,076 employees nested in 216 teams from 40 companies	unreported	420 females, 656 males	Spain	Questionnaire (x-sectional)	team performance (in-role and extra-role)	Collective positive emotions, team resilience (7-items based on Mallak's (1998) principles for implementing resilience in organizations)	n/a	Structural equation modelling	(i) Collective positive emotions was a salient antecedent of team resilience (β = .71), (ii) which in turn was an important determinant of team in-role performance (β = .20) and extra-role performance (β = .25); (ii) there was an indirect effect from collective positive emotions to team in-role and extra-role performance via team resilience
10	Morgan, P.B.C., Fletcher, D., & Sarkar, M. (2013). Defining and characterizing team resilience in sport. *Psychology of Sport and Exercise, 14,* 549-559.	https://doi.org/10.1016/j.psychsport.2013.01.004	2013	Empirical (new data)	To develop a definition of team resilience and to identify the resilient characteristics of elite sport teams	Elite sporting teams (rowing, field hockey, soccer, handball, futsal)	see results	31 athletes	18-36 years (M = 25.7, SD = 5.2)	17 females, 14 males	UK	Interviews/focus groups (x-sectional)	n/a	n/a	5 sections: (i) housekeeping (e.g., purpose of study), (ii) describe challenges, stressors and adversities team has faced, (iii) generate list of characteristics associated with team resilience; (iv) construct a definition of team resilience, and (v) summarising discussion and reflections of the interview process	inductive thematic analysis	(i) Definition = a dynamic, psychosocial process which protects a group of individuals from the potential negative effect of stressors they collectively encounter. It comprises of processes whereby team members use their individual and collective resources to positively adapt when experiencing adversity (p. 552); (ii) resilience characteristics of sport teams included group structure (formal, norms and values, communication channels), mastery approaches (learning orientation, effective behavioural responses, managing change), social capital (group identity, perceived social support, prosocial interactions), and collective efficacy (past mastery experiences, group cohesion, social persuasion)
11	Morgan, P.B.C., Fletcher, D., & Sarkar, M. (2015). Understanding team resilience in the world's best athletes: A case study of a rugby union World Cup winning team. *Psychology of Sport and Exercise, 16,* 91-100.	https://doi.org/10.1016/j.psychsport.2014.08.007	2015	Empirical (new data)	To explore the psychosocial processes underpinning team resilience in elite sport	2003 England rugby union World Cup winning team	A dynamic, psychosocial process which protects a group of individuals from the potential negative effect of stressors they collectively encounter. It comprises of processes whereby team members use their individual and collective resources to positively adapt	7 elite athletes + 1 Coach	unreported	8 males	UK	Archival analysis	n/a	n/a	n/a	Autobiographies were analysed using three types of narrative analyses: holistic-content analysis, holistic-form (structural) analysis, and categorical-form analysis	Five main psychosocial processes underpinning team resilience: transformational leadership, shared team leadership, team learning, social identity, and positive emotions; an examination of narrative structure within the autobiographies revealed a progressive narrative form characterized by a collective positive evaluation of setbacks. (Split across three phases of time; early team resilience, middle team resilience and later team resilience)

						when experiencing adversity										
12	Petree, R.G., Broome, K.M., & Bennett, J.B. (2012). Exploring and reducing stress in young restaurant workers: Results of a randomized field trial. *American Journal of Health Promotion, 26,* 217-224.	https://doi.org/10.4278/ajhp.091001-QUAN-321	2012	Empirical (new data)	To assess the effectiveness of a psychosocial/health promotion training program designed to reduce these stressors in the context of restaurant work.	national restaurant chain in four metropolitan areas of the United States (three in Texas and one in Illinois)	none reported	947 employees fr 28 restaurants	16-29 years	464 females, 483 males	USA	Intervention	Perceived stress, and extent to which participants encountered problems among co-workers: laziness, irresponsibility, inconsistent managers, arguments, rudeness, and hostility & Stressors outside of work (e.g. budgeting finances, problems with partner, managing time etc.) - Covariates of; full-time work status; school status; job category job tenure; demographics also measured.	Team resilience intervention	n/a	Mixed model ANOVA to assess changes in the dependent variables across 3 time points: (T1) approximately 2 weeks prior to the scheduled training, (T2) 6 months after training, and (T3) 12 months after training.	Team resilience program was successful in decreasing exposure to problem co-workers, and workers who received the intervention were better able to handle personal stressors over time.
13	Rodríguez-Sánchez, A.M., Perea, M.A. (2015). The secret of organization success: A revision on organizational and team resilience. *International Journal of Emergency Services, 4,* 27-36.	https://doi.org/10.1108/IJES-09-2014-0010	2015	Conceptual paper	To examine and review different conceptualisations of team resilience in the management literature, taking into account the common features of resilience capacity in organizations and teams	n/a	A capacity that teams have in order to overcome crisis and difficulties (p. 30)	n/a	n/a	n/a	n/a	n/a (conceptual paper)	n/a	n/a	n/a	(i) resources that underpin a team's capability to overcome crisis and uncertainty situations but become strengthened once they have passed are key; (ii) discussed four key determinants of team resilience, namely collective efficacy, transformational leadership, teamwork, and organizational practices (e.g. work/life balance; skills development; career development; wellbeing)
14	Sharma, S., & Sharma, S.K. (2016). Team resilience: Scale development and validation. *Vision,* 20, 37-53.	https://doi.org/10.1177/0972262916628952	2016	Empirical (new data)	To design and develop a reliable and valid measure to assess the resilience capacity of the teams and to assess the psychometric properties of the team resilience scale	Information technology service industry	A dynamic psychosocial process which protects a group of individuals from the potential negative effect of stressors they collectively encounter. It comprises of processes whereby team members use their individual and collective resources to positively adapt when experiencing adversity	152 employees	21-30 years (n = 72), 31-40 years (n = 57), 41 and above (n = 23)	48 females, 104 males	India	Questionnaire (x-sectional)	n/a	n/a	n/a	Data screening (e.g., normality), internal reliability evidence, and exploratory and confirmation factor analysis	Developed items based on Morgan et al.'s (2015) four factor model; 67 items were reduced to 50 items via exploratory factor analysis; 10 lower-order factors explained by 4 second-order factors, namely mastery approaches (team learning, team flexibility), group structure (composition, design, group norms), social capital (network ties, shared language, trusts) and collective efficacy (perceived efficacy of team members, perceived efficacy for collective team action), and one global latent factor for team resilience
15	Stephens, J.P., Heaphy, E.D., Carmeli, A., Spreitzer, G.M., & Dutton, J.E. (2013). Relationship quality and virtuousness: Emotional carrying capacity as a source of individual and team resilience. *The Journal of Applied Behavioral Science, 49,* 13-41.	https://doi.org/10.1177/0021886312471193	2013	Empirical (new data)	To examine the association between a specific aspect of relationships—the quality of emotional expression—and individual and team resilience	study 2: CEOs and top management teams within Israel (Note: study 1 focused on individual resilience)	The ability of individuals, groups, and organizations to absorb the stress that arises from these challenges and to not only recover functioning back to a "normal" level but also learn and grow from the adversity to emerge stronger than before (Sutcliffe & Vogus, 2003)	study 2: 82 top management teams	study 2: unreported	study 2: unreported	study 2: firms in Israel	Questionnaire (x-sectional)	study 1: team resilience (bespoke, 3-item scale)	team emotional carrying capacity, team trust	n/a	multiple regression	emotional carrying capacity (β = .32) but not trust (β = .12) was a salient determinant of team resilience
	van der Beek, D., & Schraagen, J.M. (2015). ADAPTER: Analysing and developing adaptability and				To develop and validate a questionnaire to assess four abilities of resilience (responding, monitoring, anticipating, and learning)	Gas fitter and chemical process	None provided; system resilience conceptualized as 'normal' system functioning with a	91 employees (50 faults mechanics/gas fitters,15 operational		0 females,				four task-oriented abilities (responding, monitoring, anticipating, and learning) and two relationship-		internal reliability, factor analysis (principal	(i) A pool of 156 items were developed (7–48 items for each dimension), using a 5-point Likert scale ranging from 'strongly disagree' (1) to 'strongly agree' (5); (ii) factor analyses supported a 78-item, multidimensional factor structure consisting of team responding behaviour, collective learning behaviour, psychological

16	performance in teams to enhance resilience. *Reliability Engineering and System Safety, 141* , 33-44.	https://doi.org/10.1016/j.ress.2015.03.019	2015	Empirical (new data)	place these elements within the context of team functioning in an organisational context	companies	focus on the ability of the system to sustain its functioning under both un/expected conditions	network coordinators and 26 chemical proces operators)	unreported	91 males	Netherlands	Questionnaire (x-sectional)	n/a	oriented dimensions (leadership and cooperation)	n/a	components)	safety, preoccupation with failure, situation assessment, heedful interrelating, team factors, cooperation with other departments, and shared leadership.
17	West, B.J., Patera, J.L., & Carsten, M.K. (2009). Team level positivity: Investigating positive psychological capacities and team level outcomes. *Journal of Organizational Behavior, 30,* 249-267.	https://doi.org/10.1002/job.595	2009	Empirical (new data)	To examine the emergence of team level positive psychological capacities and their relationship with team outcomes (e.g., cohesion, cooperation, coordination, and conflict and team satisfaction) during two team sessions	Management students at a Midwestern University	The capacity (of a team) to bounce back from failure, setbacks, conflicts, or any other threat to wellbeing that a team may experience (p. 253)	308 students (divided into 101 x 3-4 person teams)-11 teams excluded due to other reasons (e.g. illness)	M = 23 years	152 females, 156 males	USA	Questionnaire (longitudinal)	cohesion, cooperation, coordination, satisfaction, and conflict	team efficacy, team optimism, and team resilience (captured using PsyCap questionnaire by Luthans et al., 2007)	n/a	within-rater agreement; multiple regression	(i) Within-team rater agreement for team resilience was low-to-moderate at the first project, rwj = .58, but high after the fourth project, rwj = .79); (ii) team resilience was a salient determinant of cohesion (β = .35) and cooperation (β = .52) but not coordination, satisfaction, or conflict after the fourth project; team resilience evidenced small and non- significant associations with the dependent variables at the first project.
18	Amaral, A., Fernandes, G., & Varajão, J. (2015). Identifying useful actions to improve team resilience in information systems projects. *Procedia Computer Science, 64* , 1182-1189.	https://doi.org/10.1016/j.procs.2015.08.549	2015	Empirical (new data)	(i) What are the perceived useful actions to improve project team resilience? (ii) Identify what characterizes the resiliency of a project team and (iii) identify how to assess the project team resilience.	information technologies/information systems projects	interviewee's ability to deal with problems, overcome obstacles, or resist the pressure of adverse situations (e.g. the early leaving of a team member), without entering into rupture, and allowing a positive adjustment to successfully perform particular tasks, increase reliability, longevity and the overall performance (p. 1184)	115 employees from 28 project teams	23-30 years	20 females, 95 males	Portugal	Questionnaire (x-sectional)	n/a	list of actions to improve team resilience	n/a	internal reliability, rankings of perceived usefulness for team resilience	(i) item pool created from a literature review and pre-tested with 5 participants to assess comprehension and completion time; (ii) mean values for perceived usefulness ranged from 4.5 to 6.5 (on a scale of 1-7); (iii) top 10 actions in terms of perceived usefulness included: Promote collaboration among project team members; Promote solidarity between project team members in work development; Promote the recognition, appreciation and use of the talents and competences of each team member; Promote the ability of project team members to learn from mistakes; Align all project team members with the project objectives; Stimulate a positive and loyal project team environment; Promote that all project team members put forward their ideas and that they feel their ideas are taken into account; Develop project team building
19	Blatt, R. (2009). Resilience in entrepreneurial teams: Developing the capacity to pull through. *Frontiers of Entrepreneurship Research, 29* , article 1.	http://digitalknowledge.babson.edu/fer/vol29/iss11/ 1	2009	Empirical (new data)	To develop and test hypotheses about the antecedents and mechanisms for resilience in entrepreneurial teams	entrepreneurial teams	None provided: resilience defined as the capacity to rebound from adversity strengthened and more resourceful (Sutcliffe & Vogus, 2003)	122 young knowledge-based new ventures founded by teams	unreported	unreported	USA	Questionnaire (x-sectional)	contracting practices, communal schemas, trust, creativity	team resilience (6-items: see results)	n/a	structural equation modelling	(i) n indicators of team resilience: we talk about mistakes and ways to learn from them; when unexpected challenges occur; we discuss how we could have prevented them; we look for creative ways to alter difficult situations; regardless of what happens to us; we can control our reaction to it; we can grow in positive ways by dealing with difficult situations; we actively look for ways to overcome the challenges we encounter; (ii) poor model-data fit resulted in the exclusion of trust from the theoretical sequence; and (iii) communal schemas (β = .13), contracting practices (β = .45), and creativity (β = .43) were salient determinants of team resilience
20	Carmeli, A., Friedmand, Y., & Tishler, A. (2013). Cultivating a resilient top management team: The importance of relational connections and strategic decision comprehensiveness. *Safety Science, 51* , 148-159.	https://doi.org/10.1016/j.ssci.2012.06.002	2013	Empirical (new data)	Examine whether and why relational connections marked by connectivity facilitate strategic decision comprehensiveness, and cultivate two forms of top management teams' resilience that capture both efficacious beliefs and adaptive capacity.	Top management teams in service or industrial firms	A team's belief that it can absorb and cope with strain, as well as a team's capacity to cope, recover and adjust positively to difficulties (p. 149)	228 employees (74 CEOs plus 154 senior executives who were members of their top management team)	unreported	unreported	Israel	Questionnaire (x-sectional)	engagement in strategic decision comprehensiveness, connectivity between top management team members	team resilience (resilience efficacious beliefs and resilience as an adaptive capacity)	n/a	regression	(i) Strategic decision comprehensiveness (β = .33) but not connectivity (β = .21) was a salient determinant of team resilience-efficacious beliefs; (ii) strategic decision comprehensiveness (β = .47) but not connectivity (β = .20) was a salient determinant of team resilience-adaptive capacity; (iii) Sobel's test supported an indirect effect of connectivity on both team resilience-efficacious beliefs and team resilience-adaptive capacity via strategic decision comprehensiveness
21	Decroos, S., Lines, R.J., Morgan, P.B.C., Fletcher, D., Sarkar, M., Fransen, K., Boen, F., & Vande Broek, G. (in press). Development and validation of the characteristics of resilience in sports teams' inventory. *Sport, Exercise and Performance Psychology.*		2017	Empirical (new data)	To develop and provide initial validity evidence of an inventory for the Characteristics of Resilience in Sports Teams (CREST)	Sport contexts	A dynamic, psychosocial process which protects a group of individuals from the potential negative effect of stressors they collectively encounter	S1: 15 academic experts and applied sport psychologists, and 6 competitive athletes; S2: 389 athletes; S3: 357 athletes; S4: 473 athletes, 34 coaches	S1: athletes 22-32 years; S2: 16-52 years; S3: 16-45 years; S4: athletes 11-40 years, coaches 21 59 years	S1: unreported; S2: 199 females, 189 males; S3: 188 females, 157 males; S4: 234 females, 239 males (athletes), 6 females, 27 males (coaches)	Belgium and UK	Questionnaire (x-sectional)	S2: collective belief to put effort in an upcoming game, perceived peer mastery climate in the team, and persistence; S3: persistence, intra-team conflicts, collective efficacy, and CD- RISC; S4:	team resilience (group structure, mastery approaches, social capital, collective efficacy)	n/a	confirmatory factor analysis and exploratory structural equation modeling	S1: experts' assessments of the relevance, clarity, and specificity, and cognitive interviews resulted in 38 items being retained for subsequent analysis; S2: factor analyses supported a bi-factor structure of a reduced pool of 20-items that includes a 1 general factor and 4 specific factors; the general factor correlated significantly with the collective belief to put effort in an upcoming game (r = .79), perceived peer mastery climate in the team (r = .69), and persistence (r = .87); S3: factor analyses support a bi-factor structure with 1 general factor and 2 specific factors (method effects of positively and negatively worded items); g-factor correlated with persistence (r = .77), intra-team conflicts (r = -.41), collective efficacy (r = .63), and CD-RISC (r = .25); only the negative method factor correlated with intra-team conflicts and collective efficacy (r >.16); S4: single-level factor analyses support metric and scalar invariance of the two-factor model across gender, level, and age categories; multilevel CFA supported the two factor structure at the individual and team levels; correlation analyses supported the discriminant and concurrent validity as per study 3.
22														Full video recordings of each crew in each condition from four different camera angles;			(i) Introduced a resilience markers framework that has at its core a hierarchy composed of a markers level (high generalisability, low quantity), a strategies level (moderate generalisability, moderate quantity), and an observational level (low

Furniss, D., Back, J., Blandfor, A., Hildebrandt, M., & Broberg, H. (2011). A resilience markers framework for small teams. *Reliability Engineering and System Safety, 96,* 2-10.	https://doi.org/10.1016/j.ress.2010.06.023	201 Empirical (new 1 data)	To introduce notions related to a resilience markers framework for small teams, and relate empirical data from the nuclear power plant domain to the framework.	Nuclear power plant (Halden Man–Machine Laboratory, a full-scale nuclear control room simulator)	None reported: defined resilience broadly as the ability to recover from some unexpected event, or to avoid accidents happening despite the persistence of poor circumstances (p. 2)	14 nuclear operators	unreported	unreported	Norway	Case study	n/a	descriptions of the scenarios that formed the simulations; and crew performance summaries written by process experts who observed the crews, which included their comments on crew performance	n/a	deductive coding of observations	generalisability, high quantity) - these levels differ in their quantity and the extent to which they generalise; (ii) at the strategy level, there are 4 mechanisms or elements that come into play in episodes of resilience and therefore influence what is actually observed in practice, namely resilience repertoire [skills, strategies, and competencies that comprise a system's responses to threats and vulnerabilities which are outside design-basis], mode of operation [the way that the system has organised itself], resources and enabling conditions [hard and soft constraints that influence whether a strategy can be enacted], and vulnerabilities and opportunities [situations where the system needs to respond to some acute or ongoing stress]
23 Gorman, J.C., Martin, M.J., Dunbar, T.A., Stevens, R.H., Galloway, T.L., Amazeen, P.G., & Likens, A.D. (2016). Cross-level effects between neurophysiology and communication during team training. *Human Factors, 58,* 181-199.	https://doi.org/10.1177/0018720815602575	201 Empirical (new 6 data)	(i) Do both neural and communication variables change in response to changes in training segments? (ii) Do neural and communication variables mutually discriminate between teams of different experience (skill) levels? (iii) Assuming cross-level effects occur, how are levels linked?	U.S. Navy Submarine School in Groton, Connecticut	none reported	7 junior officer navigation teams of 6 members (quartermaster on watch, navigator, officer on deck, assistant navigator, contact coordinator, and radar): four from more experienced teams (teams that had recently returned to port) and three from less experienced teams (candidates training to become ship's drivers and navigators)	unreported	unreported	USA	Experiment (lab)	(i) Team neurophysiology measure (neurodynamic entropy) is derived from the EEG-based neurophysiological symbol method; (ii) communication transcripts	Training consisted of four team resilience levels, namely unstressed battle rhythm, leader-dependent battle rhythm, team-based resilience, and advanced team resilience; and five team practices, namely quality of dialogue, decision making, critical thinking, bench strength, and problem-solving capacity.	n/a	latent semantic analysis; 3 (training segment) × 2 (experience) mixed ANOVA	Q1: (i) Neurophysiological distribution across team members was more flexible during briefing and scenario but more fixed during debriefing; (ii) communication content was terser and domain specific during briefing and scenario; and lengthier and domain specific during debriefing; Q2: semantic similarity and neurodynamic entropy both discriminate between more and less experienced teams (mutual discrimination), and mutual discrimination may be specific to more dynamic, real-time aspects of team performance, such as scenario performance; Q3: cross-level effects become "temporally extended," with change in communication pattern preceding change in neurophysiological pattern, in more experienced teams, but that effect is apparent only during the dynamic scenario training segment. By contrast, the peak cross-correlation for less experienced teams appears to be "temporally local" (i.e., correlated only in the present), such that although variations across neural and cognitive-behavioural levels are linked, neither level tends to lead or lag the other.
24 Lawrence, T.B., & Maitlis, S. (2012). Care and possibility: Enacting an ethic of care through narrative practice. *Academy of Management Review, 37,* 641-663.	https://doi.org/10.5465/amr.2010.0466	201 Conceptual 2 paper	To explore how an ethic of care could be enacted in organizations, arguing that it would involve narrative practices embedded in enduring relationships, such as work team resilience	n/a	Capacity to bounce back from failure, setbacks, conflicts, or any other threat to well-being that a team may experience" (West, Patera, & Carsten, 2009, p. 253)	n/a	n/a	n/a	n/a	n/a (conceptual paper)	n/a	n/a	n/a	n/a	Proposed that caring narrative practices build team resilience through the development of an ontology of possibility and, specifically, through building potency, collective agency, and transcendent hope in teams; understanding work team resilience requires careful attention to the beliefs held by team members that allow them to leverage resources in good times and bad; potency - the belief derived from the practice of constructing a history of sparkling moments - foster team resilience by reinforcing team goals and increasing a team's persistence when task performance does not attain aspired levels; contextualizing problems facilitates a sense of agency by positioning people as resourceful and intelligent rather than deficient human beings and through fostering resilience by highlighting the influence, but undermining the determining effects, of external discourses; transcendent hope that stems from constructing polyphonic future-oriented stories fosters resilience by energizing people and providing them with images of a positive future in spite of setbacks
25 Savioja, P., Norros, L., Salo, L., & Aaltonen, I. (2014). Identifying resilience in proceduralized accident management activity of NPP operating crews. *Safety Science, 68,* 258-274.	https://doi.org/10.1016/j.ssci.2014.04.008	201 Empirical (new 4 data)	Identifying and characterising variation in the operating practices of nuclear power plant (NPP) operating crews in conducting proceduralized accident management activity, with the view to understanding the ability of the identified operating practice to increase resilience in the system	Emergency operation in procedures in a nuclear power plant	None provided: resilience is the ability of the system to flourish even in unexpected situations (p. 261)	44 operators (12 teams or crews), where operating crews consist of three operators: shift supervisor (SS), reactor operator (RO), and a turbine operator (TO) in addition to the trainees in crews	unreported	unreported	Finland	Experiment (field)	Sign (any perceivable element or feature in the environment), interpretant (observable behaviour of the actor) and object (idea or object to which the sign can be connected via the interpreting behaviour reveals the objective which is sought for)	Simulated accident scenario: leak in the primary circuit which means that the circulation of the coolant is decreased and thus the cooling of reactor is endangered	n/a	Qualitative similarities and differences in habits according: interpretative (expressing interest on the present situation and urging to own interpretation of situational demands, questioning the observed phenomena, building expectations of future events), reactive (reflects passivity and lack of expectations concerning the situation), and confirmative (taking the situation for granted, acting in a pre-defined way, and over emphasising rules and procedures)	(i) Six different tasks or habits: Information usage, Process situation identification, Dealing with automation, Decision making, Communication, and Leadership; (ii) characteristic for the interpretative habits is that the crew activity is profoundly connected to the process situation so as to observe the possible deviation from the expected process phenomena which is a fundamental pre-requisite for dealing with the unexpected situations; (iii) confirmative habits are less tuned to understanding the process phenomena on a profound functional level and are more concerned with the events that are taking place, in which controlling the events with the pre-defined measures (procedures and practices) becomes the focus and objective of activity; (iv) with reactive habit there is little potential for creating new ways of handling the work if it happened for some reason to be required at one point in time

26	Siegel, A.W., Schraagen, J.M. (in press). Team reflection makes resilience-related knowledge explicit through collaborative sense making: Observation study at a rail post. *Cognition, Technology and Work.*	https://doi.org/10.1007/s10111-016-0400-4	2017	Empirical (new data)	To examine the usefulness of team reflection as a macrocognitive function to make resilience- related knowledge explicit and therefore foster adaptivity with system boundaries in the face of the unexpected and unforeseen	Socio-technical systems (people interacting with technology) in rail control	none provided: resilience defined as the ability to adaptively deal with system boundaries in the face of the unexpected and unforeseen (p. xx)	unreported: each shift included 4 rail signallers	unreported	unreported	Netherlands	Intervention	content of team reflections;	Team reflection conducted at the end of a shift (includes behaviours such as questioning, analysis, making use of knowledge explicitly, reviewing past events with self-awareness and coming to terms over time with a new awareness)	n/a; team reflection questions included: - Did our shift today proceed better than the average of last period? Why? • What were the circumstances for the difference? • Which of the identified circumstances could occur again in the future? • What can we learn from that? • How can we deal with these circumstances and what can we do differently?	Deductive content analysis: (i) adequately dealing with procedures, (ii) communication with counterparties, (iii) reference to similar cases	(i) Case example (suicide attempt/persona approaches the rail) used to showcase how knowledge was made explicit, throughout a reflection session, with help of the data-framing model, and how a team of rail signallers analyse movements towards system boundaries (safety, workload, performance) and share knowledge on these movements; (ii) global analysis showed that the explicit knowledge is related to resilience and that its use indicates a possible increase throughout the observation
27	van der Kleij, R., Molenaar, D., & Schraagen, J.M. (2011). Making teams more resilient: Effects of shared transformational leadership training on resilience. *Proceedings of the Human Factors and Ergonomics Society, 55,* 2158-2162.	https://doi.org/10.1177/1071181311551450	2011	Empirical (new data)	To experimentally demonstrate the utilitiy of a shared leadership training to enhance team resilience.	University: naval command-and-control scenario of the TIDE (Team Interactive Decision Exercise for Teams Incorporating Distributed Expertise) simulation task	Ability of teams to respond to sudden, unanticipated demands for performance quickly and with minimum decrement of performance	105 university students	18-35 years (*M* = 24.4, *SD* = 4.0)	64 females, 41 males	Netherlands	Intervention	(i) Task performance (accuracy), (ii) recovery time (time to recognise and adapt), (iii) rate of adaptation (plotting team performance x time), (iv) perceived resilience (to recognize, adapt to, and handle unanticipated perturbations)	Transformational team resilience (training team members to engage in resilient behaviours) OR transactional team resilience (training in behaviours that negatively correlated with resilience) OR control group	n/a	One-way between-subjects ANOVA	(i) Training did not affect team performance or perceived resilience; (ii) training differences observed for rate of adaptation, such that transformational training (M = 3.80; SD = .53) was significantly different from the transactional training (M = 3.60; SD = .32) and the no-training conditions (M = 3.44; SD = .58), however, transactional training did not significantly differ from the control condition; (iii) training differences observed for recovery, such that transformational training (M = 13.5; SD = 1.90) was significantly faster in recovering from the distortion than teams in the transactional training condition (M = 16.40; SD = 2.76) and the no-training condition (M = 15.40; SD = 2.72), however, transactional training condition did not significantly differ from the no-training condition

Appendix B: Interview Guide

Interviewer: Thanks for taking the time out for your course to sit down with me to share your perceptions of team resilience as it has unfolded over the recent field exercise. By team resilience, we mean sustaining optimal levels of collective functioning or recovering quickly after some degree of deterioration when confronted with adversity. In other words, we're interested in the trajectories of team performance before, during, and after a team has experienced some type of adversity. By adversity, we mean an event or situation that posed substantial threat to the collective functioning of your crew. The adversity might be something that was experienced directly by one member only, like an injury – yet has the potential to affect the functioning of the team. Or, the adversity could be something that the team as a whole experienced simultaneously, like equipment failure resulting in your vehicle being unusable.

Setting the Scene

1. Can you describe for me an adversity that your crew has experienced during the recent field exercise? [If none, then ask about the past 6 months]
    a. Is the experience the same or different for each team member? How so?
2. How did you as an individual / team know there was a substantial threat to the optimal functioning of your team? [*Probes*: what did you see, hear, etc? How did the situation change?]
3. How well did your crew deal with this adversity? [*Probe*: ask them to focus on the objective of the mission – did your crew sustain performance or deteriorate in some way but bounce back quickly?]
4. What factors do you believe played a key role in your crew sustaining performance / bouncing back quickly? [*Note*: refer to the performance trajectory noted in response to Q3]
5. What did you learn from this experience with adversity that will help you as an individual working in teams in the future / your team's future experiences with adversity?

Interviewer: Thanks for your insights so far. You may have noticed some repetition in the surveys you have completed for us. These surveys focus on several key factors that we believe play an important role in team resilience. In the following section of the discussion, we want to gather your perspectives on these factors.

Shine a Spotlight on our Conceptual Model

6. How did your crew make use of the knowledge, skills, and attributes of individual members to deal with the adversity?
7. Was the adversity something your crew expected to occur, or was it unexpected? [*Probe*: in other words, did you consider the adversity as part of your planning?]
    a. If the adversity was expected => how did you plan in advance to deal with that adversity? Did these plans align with what you actually did?
    b. If the adversity was unexpected => did your crew reflect on the adversity experience at some point to gather learning points?
8. Coordination among team members is critical in any sort of group-based activity. How well did your crew coordinate in response to the adversity? [*Probe*: behaviourally, cognitively, emotionally – which type(s) were most important?]
9. With teams, norms represent how members are expected to think and act. To what extent did norms play a role in your crew's response to the adversity?
10. How did leadership play a role in your crew's response to the adversity? [*Probe*: what did he do, say, etc?]
11. There is a classic saying, "great minds think alike", which is super important for team performance. To what extent did each member's knowledge of the situation and task at hand align with other members? [Probe: how did this degree of overlap affect your performance?]
12. Has your team's experience with this adversity affected your belief in your crew's ability to deal effectively with future adversities? How so?

Looking Forward

13. What do you expect will be the main adversities that you will experience on your next field exercise? [*Probe*: you might consider adversities that are experienced directly one member, some but not all, or the entire team]
    a. [*if time permits*] How might your crew go about dealing with these adversities?

Ending Question

14. Is there something I haven't asked you that believe is relevant to team resilience?

Interviewer: Thank the participants for their time and sharing their perspectives of these questions.

Appendix C: Overview of cross-sectional and longitudinal theme structure (Chapter 4)

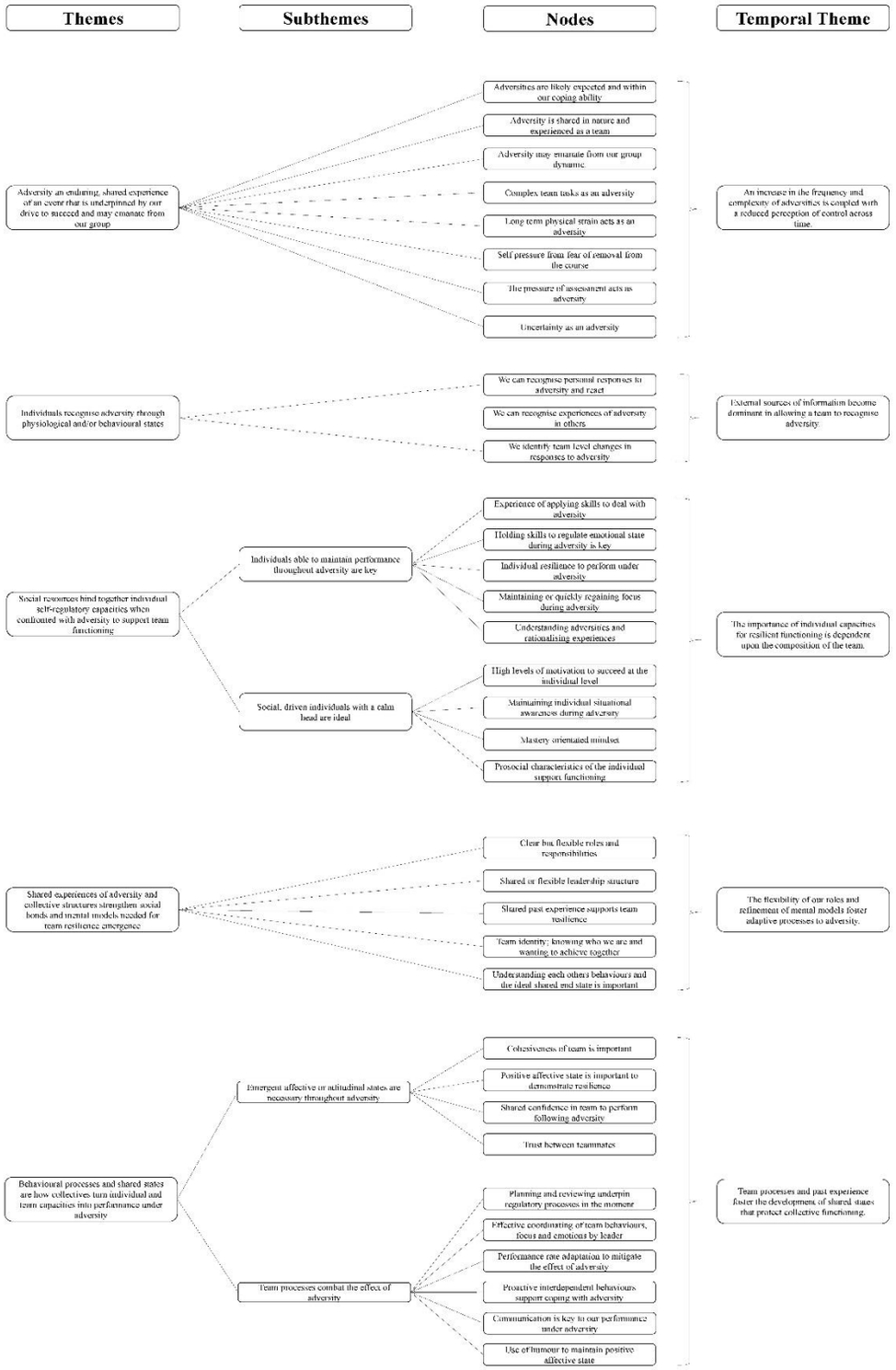

Figure 1. Overview of cross-sectional and longitudinal theme structure

Appendix C: Published journal article.

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Team resilience: A scoping review of conceptual and empirical work

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ABSTRACT

The purpose of this scoping review was to examine the literature on team resilience to gain insight into current thinking regarding its definition and conceptualisation, and to identify how researchers have operationalised and measured this concept. We conducted a systematic scoping review using the 5-phase approach proposed by Arksey and O'Malley. A total of seven databases were searched, followed by a citation search of eligible papers via Google Scholar. Of the 275 articles identified via the search process, 27 papers were deemed eligible for review. Several key findings regarding the literature on team resilience were observed: (i) definitions varied in terms of content (e.g. input or process), breadth (e.g. unidimensional versus multidimensional), and quality (e.g. essential and necessary attributes of key components); (ii) there was a predominance of single-level conceptualisations of team resilience; and (iii) there has been a reliance on cross-sectional research designs in empirical studies, which is incongruent with the dynamic nature of this concept. Key recommendations from this scoping review focus on definitional, theoretical, and methodological issues.

Introduction

Adversity is inherent within most − if not all − occupational contexts in which the performance of individuals and teams is crucial for organisational effectiveness. Adversity encompasses major assaults that can impede human functioning, which can be acute (e.g. equipment malfunction) or chronic (e.g. workplace bullying) in nature (Bonanno, 2004). With its central focus on what enables people to resist, bounce back, or recover from adverse events that threaten their functioning, viability, or development (Masten, 2014), it is unsurprising that the concept of resilience has garnered a substantial and rich body of work over the past 40 years. The majority of this past work has focused on resilience among individuals (e.g. Kossek & Perrigino, 2016; Pangallo, Zibarras,

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Lewis, & Flaxman, 2015). Yet in most occupational (e.g. workplace) or achievement set- tings (e.g. sport, education), individuals complete tasks within teams of two or more individuals who work interdependently for a specified timeframe to achieve a common and valued outcome or objective (Sundstrom, de Meuse, & Futrell, 1990). To this end, goal achievement is dependent on the capacity of team members as a collective to resist, bounce back, or recover from adversity. Therefore, the notion that collective functioning is optimal within complex, dynamic, and uncertain environments when teams are resilient has intuitive and practical appeal. However, the concept of team resi- lience has received much less scholarly attention than the rich literature on individual resilience. In what follows, we first provide a brief review of resilience research focusing on the various waves of scientific work that have emerged over the past 40 years. We then overview key work on team resilience to shed light on the rationale and need for the current study.

Resilience: a brief historical overview

The scientific study of resilience dates back to the 1970s when scholars sought to under- stand the development and prevention of psychopathology among individuals at high risk due to a range of adverse events and issues such as poverty, trauma or disaster (e.g. Garmezy, 1985; Rutter, 1979). Of particular interest in this first wave of research were definitional, conceptual, and measurement issues (Masten, 2007). Given the lifetime prevalence of adverse events among most people (Bonanno, 2004), and the potentially maladaptive psychological and physiological outcomes of these experiences (McVicar, 2003), the notion of adversity was common to all definitions and conceptualisations of resilience. Defined as "disturbances to the function or viability of a system" (Wright, Masten, & Narayan, 2013, p. 17), where a system can range from cellular level to societal or cultural levels, adverse events have been categorised broadly into either acute (e.g. natural disaster) or chronic (e.g. workplace bullying) forms to capture the temporal com- ponent of the adversity experience (Cosco et al., 2017). Researchers observed the effects of adversity to vary across individuals; essentially, the outcomes of adversity experiences could range from inconsequential to significant for their functioning, and the enduring nature of maladaptive effects could be short-lived or long-lasting (Iversen et al., 2007; Linley & Joseph, 2004; Van Kessel, 2013). Those individuals who displayed the absence of maladaptive outcomes, or bounced back quickly after deteriorations in their functioning, were subsequently classified as "resilient" and ignited an interest in the concept. Recent work has underscored the plausibility of nonlinear effects of adversity, in the form of a U-shaped curves where some (moderate) exposure to adversity is better than little or no exposure or very high levels of adversity exposure (for a review, see Seery & Quinton, 2016). Other work also highlighted the potential for particular stressors types (i.e. challenge stressors) to enhance resilience downstream (Crane & Searle, 2016). As such, this first wave of research focused on identifying and understand- ing the individual, family, and environmental characteristics to develop a concise yet relatively robust list of protective resources (e.g. self-esteem; Masten, 2007), neuro- biological dimensions (e.g. autonomic reactivity; Murphy, 1962), and psychosocial factors (e.g. quality of relationships with caregivers; Gottesman, 1974) of resilient individ- uals (Masten, 2014). Ecological resilience was also being explored around this period,

though independent of the work on understanding resilience at the individual level (Holling, 1973). In the mid-1980s, the focus on protective factors broadened to explore those aspects "external" to the individual resulting in the formation of three areas of protective factors, namely; attributes of the individual (as studied in the first wave of research), aspects of their families, and characteristics of the broader social environment (Masten & Garmezy, 1985; Rutter, 1985). This descriptive assessment of protective factors paved the way for the exploration of processes underpinning resilience development, thereby sig- nifying the emergence of a second wave of resilience research. In this wave of research, the focus shifted from the examination of "what" resilience is, towards understanding the process of "how" resilience develops within individuals. Of particular relevance was the salience of social, temporal, contextual, and cultural factors identified as shaping this development, and thus the complex nature of resilience was established (Masten, 2013). The third wave of inquiry, originating around the late-1990's onwards, encompassed the exploration of a range of multifaceted interventions to build individual resilience in order to prevent or ameliorate the maladaptive outcomes associated with experiences of adversity (for reviews, see Leppin et al., 2014; Macedo et al., 2014). A key focus within this wave of research was to test mechanisms and outcome variables of resilience hypoth- esised within earlier waves. For example, Forgatch and DeGarmo (1999) evaluated the effectiveness of a parental training programme consisting of child behaviour management techniques (e.g. non-coercive discipline, contingent encouragement) and personal skills (e.g. emotion regulation) on resilience within young children. In contrast, Hawkins, Cat- alano, Kosterman, Abbott, and Hill (1999) approached the development of resilience within this same demographic through a school-based intervention. This school-based approach comprised teacher training (i.e. fostering proactive class management, interac- tive teaching and cooperative learning), with children and parents receiving training to develop social skills and prosocial behaviour reinforcement skills respectively.

The fourth and most recent wave expanded the study of individual resilience to take into account cross-level interactions among developmental systems such as biological, neurological, and social ecological (Masten, 2014; Masten & Cicchetti, 2016). For example, researchers have examined the roles of genetic structure (Meaney, 2010) and neural function (Karatoreos & McEwen, 2013) within multilevel models of resilience. One important consequence of this fourth wave has been a progression in the definition of resilience. Early definitions focused primarily on coping with adverse events. Contem- porary work, however, aligns with the prevailing acceptance of systems theory within developmental science (Zelazo, 2013), such that there is general agreement among researchers of resilience as the "capacity of a dynamic system to adapt successfully to dis- turbances that threaten its function, viability, or development" (Masten, 2014, p. 10). Thus, the capacity of a system to adapt is typically inferred from salient indicators within and across each of the multiple levels of analysis for that system (e.g. biological, psychological). Also inherent within a systems conceptualisation is the interdependence among individuals, the ecological context within which they operate (i.e. environment, time, culture), and other levels of analysis (e.g. from genes to sociocultural context) (Bron- fenbrenner, 1979; Wright et al., 2013). For example, resilience within the dynamic system of a young child could be seen to be a context-specific capacity emerging from the inter- action of past experience, socio-psychological resources, and genetic make-up. A further

strength of the systems definition is that it can be generalised across different systems or levels within a specific system. With regard to humans, for example, one can hone in on resilience within specific systems (e.g. immune, cardiovascular) or the person as a whole (e.g. resilience in response to failing an important educational test). The integration of two or more humans extends to the resilience of dyads (Thompson & Ravlin, 2016), families (Walsh, 2016), and communities (Berkes & Ross, 2013). Finally, a systems perspective of resilience provides relevance for non-human systems such as ecosystems, economics, and animals (Angelini et al., 2016; Ellsworth, Wrobleski, Kauffman, & Reis, 2016; Kim & Mar- couiller, 2015).

From individual to team resilience

Teams have been defined as "interdependent collections of individuals who share respon- sibility for specified outcomes" (Sundstrom et al., 1990, p. 120). The pervasiveness of team systems within occupational settings reflects the importance of optimising such collabora- tive and interdependent groupings of individuals. Functional interactions between inter- dependent personnel can provide a critical enhancement over the capabilities of individuals when performing within complex and dynamic environments. For example, the demands associated with preparing for and responding to natural (e.g. floods) and technological (e.g. traffic accidents) disasters necessitates the prevalence of highly profi- cient disaster management teams (e.g. firefighters, police, medics) to protect wider society (Phillips, 2015). Teams are also essential in contexts where a range of skill-sets are necessary for the execution of complex procedures (e.g. surgical operations within medical settings; Dobbins, Thomas, Stokes Melton, & Lee, 2016).

Coupled with this potential for enhanced performance capabilities is the paradoxical awareness that dysfunctional team processes may contribute to decrements in organis- ational outcomes (e.g. increases in patient harm events within the medical industry; Hughes et al., 2016). With this recognition in mind, certain industries are predisposed to encountering potential external disruptions to such functioning. Teams within the armed forces, for example, are often susceptible to unanticipated attacks from enemy forces when conducting military operations (Shuffler, Pavlas, & Salas, 2012), whereas aircrew teams on a flight deck may experience malfunctions in computer equipment or severe weather conditions that place extreme demands on their performance (Kanki, 1996). Growing economic, professional, and practical demands upon such teams across occupational settings (McCray, Palmer, & Chmiel, 2016), as well as an increasing com- monality of shared accountability between group members (Hudson, 2007), illustrates the need for a team to be able to recognise and adapt collaboratively to emerging adver- sities. The ability to do so presents potentially unique opportunities to gain both a per- formance advantage within certain contexts (e.g. military, business) and, equally, prevent disastrous outcomes within others (e.g. medicine, aviation).

Research on teams has flourished over the past three decades (for reviews, see Kozlowski, Grand, Baard, & Pearce, 2015; Maloney, Bresman, Zellmer-Bruhn, & Beaver, 2016; Mathieu, Hollenbeck, van Knippenberg, & Ilgen, 2017). This work has sub- stantially enhanced understanding of team-level constructs such as coordination and dynamics (Gorman, 2014), cognition (Grand, Braun, Kuljanin, Kozlowski, & Chao, 2016), and adaptation (Maynard, Kennedy, & Sommer, 2015), just to name a few.

However, in contrast to this body of work on related constructs, research on team resili- ence is still in its infancy, with systematic efforts to investigate and understand this con- struct produced only in the past decade (e.g. Alliger, Cerasoli, Tannenbaum, & Vessey, 2015; Blatt, 2009; Edson, 2012). Building on this emerging body of work, this paper offers several important contributions to the literature on team resilience. Firstly, there has been no attempt to date to systematically scope the body of peer-reviewed research on team resilience with the view to uncover what is currently known about team resilience and how researchers have studied this concept. Secondly, as existing reviews or perspec- tives of team resilience have focussed upon a specific context including sport (Galli, 2016; Morgan, Fletcher, & Sarkar, 2017), organisations (Flint-Taylor & Cooper, 2017; Rodrí- guez-Sánchez & Vera Perea, 2015), and the armed forces, emergency services, and first responders (Zaccaro, Weiss, Hilton, & Jeffries, 2011), there is a need to scope the literature across all occupational settings. Finally, we focus on both conceptual *and* methodological characteristics of past work, thereby shedding light on how researchers have operationa- lised team resilience through measurement and intervention.

Aims of this study

Against this backdrop of past work on resilience, the overarching aim of this study is to review published work on team resilience to synthesise what is currently known about this concept. Given the broad nature of this study objective, we adopted a scoping review methodology. Scoping reviews are used to assess the extent, range, and nature of research on a given topic; they differ from a systematic review or meta-analysis in that the question is much broader and is therefore useful for developing conceptual clarity and/or identifying gaps in knowledge (Arksey & O'Malley, 2005). A scoping review was preferred for the purposes of the present study because systematic reviews and meta- analyses require much greater clarity about a concept than currently exists with respect to team resilience. The systematic approach to the identification of relevant articles, and analysis of retrieved studies with regard to the aims of a study provides an important dis- tinction between narrative and scoping reviews (Levac, Colquhoun, & O'Brien, 2010), and as mentioned previously, provides an important extension upon past reviews of the literature. In this case, a scoping review is timely because there is a need to consider the scope and nature of research and theory on team resilience, with the view to summarise commonalities and discrepancies in substantive and methodological issues. Enriching our understanding of current approaches to conceptualising and operationalising team resilience will shed light on strengths and weaknesses of such work and highlight unique or unchartered avenues that may help shape the next frontier of the science of team resilience.

Methods

This scoping review adhered to the 5-step approach proposed by Arksey and O'Malley (2005) and incorporated the enhancements to scoping reviews recommended by Levac et al. (2010), such as selecting team members with expertise in team resilience and related concepts, systematic reviews, and the inclusion of diverse research methodologies.

Stage 1: Identifying the research question

Consistent with the broad nature of scoping reviews (Arksey & O'Malley, 2005), we aimed to map the peer-reviewed literature on team resilience, with a particular focus on (i) defini- tional, (ii) theoretical, and (iii) methodological factors, to inform an understanding of the extent, range, and nature of research on this concept. The focus on peer-reviewed litera- ture was deemed necessary as research areas within the early stages of development are often driven by such work. Although imperfect in some respects, the peer-review process maximises the scientific community's confidence in the quality and credibility of work that has been subjected to scrutiny by academic peers (Bornmann, 2011; Brustad, 1999). Within the context of this overarching research focus, we honed our mapping of the literature on (i) conceptual and (ii) methodological factors to inform an understanding of the extent, range, and nature of research on team resilience.

Stage 2: Identifying relevant studies

Search procedure

DG performed an electronic search on 4th January 2017 of papers published anytime up until 31st December 2016 using seven databases: (i) Web of Science (core collection), (ii) Scopus, (iii) Embase, (iv) Medline, (R), (v) PsycInfo, (vi) CINHAL Plus, and (vii) Business Source Complete. Search filters were chosen based on common terminology identified in published literature known to the authors: (i) "team resilien*" OR (ii) "resilient team*". Depending on the features of each database, we applied these terms to search topics, abstracts, titles, and/or full texts (see online supplementary file for full details of the search process). We also conducted a citation search of papers that were deemed eligible for data extraction (see processes detailed in Stage 3) using Google Scholar to maximise the reach of our search (e.g. to capture papers that were "in press").

Inclusion and exclusion criteria

We considered papers for inclusion if they were written in English, published in a peer- reviewed outlet, and aimed to explore (e.g. conceptual analysis) and/or directly assessed team resilience (e.g. surveys, interviews). Papers were deemed ineligible if they were a con- ference abstract, book, thesis, book chapter, or popular press article (e.g. magazine, news- paper); excluded humans as part of the team make-up (e.g. computer systems only); were written in languages other than English; and if the full text was unavailable via our Uni- versity library subscriptions.

Stage 3: Study selection

Papers identified in Stage 2 as potentially relevant for this scoping review were screened independently by two reviewers (DG and RL) using a two-step process. First, the reviewers screened the titles and abstracts of studies using the inclusion and exclusion criteria detailed in Stage 2. When it was unclear whether a study was eligible for inclusion based on the information presented in the title or abstract, the paper was retained for further analysis. Second, the assessors screened full texts of papers that passed the initial review using the inclusion and exclusion criteria detailed in Stage 2. Disagreements

(N = 5) were clarified through discussion of the rationale for each analysts' choice to include or exclude an article.

Stage 4: Charting the data

We created an electronic data form to extract key information (e.g. definition of team resi- lience, research setting; see online supplementary material: http://bit.ly/2Ah1L5N) from full-text records that passed the two-step screening process outlined in Stage 3 (see sup- plementary material). To maximise reliable interpretation of key information, we trans- posed raw data as described in the original record. DG and RL conducted the data extraction process of all eligible papers independently; discrepancies (N = 2) were resolved to a consensus through discussion and re-examination of the raw data.

Stage 5: Collating, summarising, and reporting results

We conducted an analysis of the methodological and conceptual features of extracted data. The methodological analysis focused on providing a descriptive account of the types of papers (e.g. conceptual, empirical with new data), occupational settings (e.g. crisis response, sport), geographical distribution, participant characteristics, and methodological features (e.g. design) of eligible studies. With regard to the conceptual analysis, we focused on exam- ining common and unique themes among definitions of team resilience and their operatio- nalisation, as well as primary research findings as they pertained to team resilience.

Results

Overview of article search, retrieval process and retrieved studies

A visual depiction of the full search process is provided in the online supplementary material (http://bit.ly/2Ah1L5N). In total, 275 papers were identified at the initial stage of the search process. After duplicates were removed (n = 73), screening of the titles and abstracts of 202 papers assessed against the inclusion and exclusion criteria excluded 164 papers. A total of 38 full-texts were assessed of which 21 were deemed ineligible against the exclusion criteria. Finally, we conducted a citation search on the 17 retained papers, which resulted in the identification of an additional 10 papers. Reasons for these additional papers escaping our initial search procedure included: (i) papers being "in press" at the time of the search process (n = 3), (ii) authors using unique terms for the target concept within the title or abstract (e.g. resilience in entrepreneurial teams; Blatt, 2009; top management team condensed to TMT; Carmeli, Friedman, & Tishler, 2013) (n = 6), and (iii) papers published within journals that were not indexed within the seven databases of our primary search (n = 1).

The 27 papers identified from the search process were published across an eight year period (2009–2017), with a total of 81% (n = 22) being empirical in nature and the remain- ing 19% (n = 5) providing conceptual reviews of team resilience. With reference to the empirical or conceptual context, team resilience was examined within business (n = 9), education (n = 4), sport (n = 3), information technology (n = 3), natural and nuclear power industries (n = 3), military (n = 2), health and social care (n = 1), music (n = 1),

and space exploration (n = 1) contexts. In terms of geographical location among the empirical work, studies were conducted across three continents, namely: North America (United States, n = 7), Europe (UK, n = 3; Netherlands, n = 3; Spain, n = 2; Belgium, n = 1; Norway, n = 1; Finland, n = 1; Portugal, n = 1) and Asia (Israel, n = 2; India, n = 1). The majority of empirical studies utilised cross-sectional surveys (n = 9, 41%), interventions designed to foster team resilience among participants (n = 5, 23%, of which three studies drew from the same intervention and produced multiple papers), and interview-based approaches (n = 2, 9%). Other designs included a longitudinal survey with two time points, archival analysis, case study, laboratory- and field-based experiments, and a mixed methods approach (i.e. interviews combined with archival data from manuals, websites, and published articles).

Conceptual analysis

Defining team resilience

The definitions of team resilience among the included body of work are detailed in Table 1. An examination of the range of definitions adopted within the scope of studies indicates the absence of a widely accepted definition within the literature. The definition formulated by West et al. (2009) was the most prevalent among the included studies (19%, n = 5); they defined team resilience as "the capacity to bounce back from failure, setbacks, conflicts, or any other threat to well-being that they may experience" (p. 253). The second most preva- lent (15%, n = 4) definition was that of Morgan et al. (2013), who defined team resilience as "a dynamic, psychosocial process which protects a group of individuals from the potential negative effect of stressors they collectively encounter. It comprises of processes whereby team members use their individual and collective resources to positively adapt when experiencing adversity" (p. 552). Of the 27 studies included in the analysis, 9 (33%) papers excluded a formal definition of the concept.

Closer inspection of the definitions reveals several commonalities and unique features of how scholars have defined team resilience. First, an examination of the specific attri- butes within the 11 definitions reveals all but one (Edson, 2012) to encompass the presence of stressors, setbacks, pressure, challenge or adversity. From this finding, we can see that there is shared agreement that team resilience involves addressing disturbances of some sort. Inherent within the majority of definitions was the notion that such disturbances can originate from external or internal factors; however, the definition adopted by Glo- winski et al. (2016) explicitly acknowledges the external nature of these perturbations. Second, the majority of definitions spoke to the nature of team functioning in the midst of such demands. Team functioning was operationalised predominantly through refer- ences to the maintenance of team performance, either explicitly or inferred through notions such as to "overcome crisis", "positively adapt", "increase reliability" and display "minimum decrement of team performance." The exact nature of such team per- formance remained unclear, with only one definition specifically citing the ability to "suc- cessfully perform particular tasks" (Amaral et al., 2015, p. 1184). Further inspection reveals alternate conceptualisations including a more holistic perspective, such as well- being, longevity and thriving to be indicative of team functioning (Amaral et al., 2015; Kennedy et al., 2016; West et al., 2009). Third, inferences regarding the overarching nature of the concept within these definitions predominantly suggest team resilience to

be either an ability or capacity, thus referencing the inputs into the system that exist prior to experiencing stress or adversity. However, there were exceptions to this general finding; Kennedy et al. (2016) likened team resilience to a shared belief, whereas Morgan et al. (2013) expressed the nature of team resilience as a psychosocial process.

There were several unique findings within these definitions of team resilience. Only one definition within these results made explicit reference to the temporal nature of team resi- lience, albeit with minimal specificity as to the temporal boundaries. Van der Kleij et al. (2011, p. 2158) defined team resilience as an "ability of teams to respond to sudden, unan- ticipated demands for performance *quickly*." This unique definition speaks to a general conceptual assumption within past work, that is, the temporal nature of team resilience is conceptualised implicitly rather than explicitly in available definitions. Several examples of this implicit recognition include the notion of "bouncing back" inferring an immediate or short-term return to optimal functioning, whereas "recovery" and "growth" were also cited, inferring an extended or continued period until such a point is realised.

Quality assessment of definitions of team resilience

The criteria set out by Podsakoff, MacKenzie, and Podsakoff (2016) for the development of high quality concept definitions were used to assess the quality of the definitions included in this review, namely: (i) identify the essential *property* or nature of the concept and the *entity* to which it applies; (ii) detail the necessary (i.e. essential that all exemplars must possess) and sufficient (i.e. unique features of the exemplars) attributes; (iii) specify the dimensional properties (i.e. unidimensional or multidimensional); (iv) stipulate the robustness of the concept in terms of temporal (i.e. stability over time) and contextual (i.e. generalises across situations, contexts, cases, etc.) factors; and (v) delineate how the conceptual features of the construct differ from related concepts, and if possible, provide an initial description of the nomological network (e.g. antecedents, outcomes). An overview of our assessment of the definitions provided within the retained studies against these criteria is detailed in Table 1. Below we provide a narrative assessment of the two most commonly utilised definitions against these criteria. Overall, none of the existing definitions completely satisfied all criteria for high quality definitions, as proposed by Podsakoff et al. (2016).

The most commonly occurring conceptualisation of team resilience reported within the studies identified in this scoping review, that of West et al. (2009), partially satisfies the criteria for high-quality concept definition proposed by Podsakoff et al. (2016). Strengths of this definition include the specification of the essential *property* or nature of the concept (i.e. "a capacity" or input into the system) and the *entity* to which it applies (i.e. "team"). There is also reference to the essential attributes of team resilience within this definition, namely the capacities that foster the ability of teams to either thrive, improvise, adapt or recover from significant change or stress. However, this definition is silent on those attri- butes unique to this concept within these contexts. Key limitations of this definition and conceptualisation of team resilience include: (i) the absence of critical differentiation from similar concepts; (ii) limited justification for the integration of team resilience within a nomological network of related constructs, and the exclusion of others; (iii) absence of information regarding the contextual stability of team resilience, though brief mention is made of the temporal dimensions (i.e. "emerge … [sic] as teams develop"; West et al., 2009, p. 262); and (iv) no formal specification of the dimensionality of team resilience.

Morgan et al.'s (2013) definition of team resilience represented an advancement in terms of satisfying Podsakoff et al.'s (2016) definitional criteria. The strengths of their definition include: (i) explicit reference to the essential property of team resilience as a "psychosocial process" and "a group of individuals" as the entity to which it applies; (ii) establishment of the concept as "dynamic" in nature (i.e. temporally and contextually specific); and (iii) the provision of four distinct dimensions (i.e. mastery approaches, social capital, collective efficacy and group structure) that capture the multidimensionality of the concept. However, there was ambiguity regarding why or how the four essential attributes of group structure, mastery approaches, social capital, collective efficacy are unique to team resilience. In other words, as the four attributes are established concepts each

backed by their own theory and research, it is unclear why these dimensions and not others coalesce to characterise team resilience. Two further weaknesses can also be found in this definition; first, the ambiguity as to the specific dynamics between team resi- lience and other concepts (e.g. team adaptation, collective efficacy) within the nomological network discussed (i.e. sub-dimensions of model); and second, the absence of critical differentiation of team resilience from these conceptually similar constructs.

Conceptual models of team resilience

Alliger et al. (2015) acknowledged three behavioural strategies to underpin a team's capacity to deal with pressure, stressors, or difficult situations. *Minimising* actions were proactive in nature and said to involve processes of pre-empting challenges, contingency planning, and continual self-assessment of readiness. *Managing* actions were described as reflexive and included strategies to assess and address stressors within "real-time"
situations, whereas *mending* strategies included differing reflection strategies adopted to facilitate recovery and thus a reactive element of the model. Alliger and colleagues further proposed five markers of team resilience, namely: challenge resolution (i.e. addres- sing problems quickly and effectively), health (i.e. maintain function in a way that facili- tates team spirit, and mood), resources (i.e. maintain social emotional resources during challenge resolution), recovery (i.e. ability to "bounce back" to previous levels), and on-going viability (i.e. maintain ability to meet future challenges optimally).

Glowinski et al. (2016) proposed a multidimensional model made up of four temporally defined features. These included *monitoring* ongoing situations and the existence of internal or external perturbations to team functioning; *responding* to variations in the levels of disturbances to functioning; *learning* from experiences of perturbations to func- tioning; and *anticipating* changes and demands within future situations. Combinations of the magnitude of perturbations, and levels of cognitive efforts (i.e. automaticity) and team coordination (i.e. individual or team centred) were proposed to predict collectively whether or not a team was enacting either of the four features and consequently its level of team resilience.

Kennedy et al. (2016) conceptualised team resilience as an emergent state rather than a capacity or ability of a team, identifying temporal dynamics in the form of team life-cycle as a key factor. Represented across cognitive, motivational, and affective states, Kennedy and colleagues highlighted the importance of a multilevel perspective, emphasising the need to consider the nature of triggers (i.e. team- or task-based) and adaptive outcomes (i.e. maintenance, meritorious or maladaptive) of team resilience. Finally, they noted team resilience to be distinct from, but a demonstration of, team adaptability and to poten- tially hold a reciprocal relation with this concept.

Within their review, Rodríguez-Sánchez and Vera Perea (2015) adopted a multidimen- sional perspective of team resilience highlighting it as a capacity that is malleable in nature. Adopting a psycho-behavioural perspective, key determinants of team resilience encom- passed collective efficacy, transformational leadership, teamwork at the team level, and organisational practices at the organisational level. Lawrence and Maitlis (2012) proposed three sets of beliefs engendered within caring narrative practices to underpin the develop- ment of a team resilience capacity. *Potency* or a collective belief arising from positive past experiences purportedly facilitated development through reinforcing team goals and increasing team persistence; *contextualising people's struggles* fostered a sense of agency and enhanced team responses to problems; and *transcendent hope* maximised team resi- lience through energising team members and providing belief of positive future experiences.

Operationalisations of team resilience

It is important to consider how researchers have translated theoretical definitions of team resilience into measurable concepts using different empirical methods and approaches. Of particular relevance here are those studies that assessed team resilience through surveys (n = 10, 37%), observations (n = 3, 11%), and intervention (n = 5, 19%). Differences in the

dimensionality of team resilience were observed within survey methods; for example, five studies assessed team resilience as a unidimensional concept, whereas five others adopted a multidimensional perspective. A variety of characteristics or hypothesised pro- tective factors were also assessed within the multidimensional approach to survey assessments. West et al. (2009) adapted items from the PsyCap questionnaire (Luthans, Avolio, Avey, & Norman, 2007) using a referent-shift approach (i.e. adapted items from the individual to the collective level; Chan, 1998) to capture resilience at the team level; they reported adequate internal reliability evidence (α = .76), yet no factor analysis was conducted to assess the structural properties of the scale in their sample. Decroos et al. (2017) and Sharma and Sharma (2016) both leveraged findings from Morgan et al. (2013) to create items that assess four dimensions of mastery approaches, social capital, collective efficacy, and group structure via a lower-order measurement model. Through a series of factor analyses, Decroos et al. reduced the item pool into two broad dimensions related to a team's ability to display resilient characteristics and vulnerabilities under pressure, and reported excellent internal reliability evidence at the within-team (ω = .90) and between-team levels (ω = .99). Sharma and Sharma (2016) conducted an exploratory factor analysis, which supported a 10-factor model for the 50 items, and which demon- strated adequate internal reliability evidence for each factor (α > .72). Carmeli et al. (2013) constructed six questions and conducted exploratory factor analysis to support the two dimensions of efficacious beliefs (α = .82) and resilience as adaptive capacity (α = .86) to operationalise team resilience. Finally, Van der Beek and Schraagen (2015) developed a scale for analysing and developing adaptability and performance in teams to enhance resilience (ADAPTER). Factor analysis support six-factors consisting of items characteristic of responding, learning, anticipating, monitoring, cooperation with departments, and shared leadership; internal reliability evidence was mixed, with Cron- bach's alpha ranging between .49 and .94.

With regard to unidimensional survey approaches, three studies adapted measures uti- lised in previous research. Blatt (2009) utilised a referent shift approach (Chan, 1998) to modify two items from the Safety Organising Survey (Vogus & Sutcliffe, 2007) and four from the Brief Resilient Coping Scale (Sinclair & Wallston, 2004) in order to measure reac- tions and preparedness for "challenges"; however, neither internal reliability estimates nor factor analyses results were reported. In contrast, Meneghel, Martínez, et al. (2016) and Meneghel, Salanova, et al. (2016) adapted seven items from Mallak's (1998) principles of organisational resilience, including perceptions of experiences, tolerance for uncertainty and ability to perform adaptive behaviours. They did not report a factor analysis of the structural properties of the scale, yet reported adequate internal reliability evidence for the unidimensional factors (α = .83). Finally, two unidimensional surveys assessed team resilience via bespoke scales. Stephens et al. (2013) constructed three items to assess a team's capacity to bounce back from challenges (α = .92) and confirmed the unidimen- sional structure via exploratory factor analysis, whereas Amaral et al. (2015) assessed per- ceptions of the usefulness of 48 predefined actions (α = .96) in developing team resilience.

In terms of observational work, Savioja et al. (2014) assessed habitual behaviours within a "perception-action" cycle (i.e. the flow of information that takes place between an organ- ism and its environment) as interpretative (e.g. attending to processes of a situation), confirmative (e.g. double checking), or reactive (e.g. lagging behind events). In an alterna- tive approach, Furniss, Back, Blandford, Hildebrandt, and Broberg (2011) developed a fra- mework of markers based upon the extent to which they generalise across situational domains, within which four key elements (resilience repertoire, mode of operation, resources and enabling conditions and vulnerabilities and opportunities) were used to assess team resilience. Finally, an inspection of the content of intervention programmes

provided insight into the hypothesised features or antecedents of team resilience: an awareness of potential sources of disruption (Bennett et al., 2010; Broome & Bennett, 2011; Petree, Broome & Bennett, 2012), confidence (Bennett et al., 2010; Broome & Bennett, 2011; Petree et al., 2012; Van der Kleij et al., 2011), communication (Siegel & Schraagen, 2017; Van der Kleij et al., 2011), and leadership style (Van der Kleij et al., 2011). These psychosocial factors were targeted using a range of techniques (e.g. group discussion, group reflection), strategies (e.g. behavioural training, role playing), and skills (e.g. centring, communication skills).

Discussion

The aim of this scoping review was to examine the existing literature on team resilience to identify and assess the available evidence in terms of definitional, conceptual, and meth- odological issues. Of particular relevance was to assess the scope and nature of conceptual and empirical work on team resilience, with the view to summarise commonalties, unique perspectives, and discrepancies in substantive and methodological issues. Three key obser- vations can be made of the existing literature on team resilience on the basis of the findings of this scoping review. First, our critical assessment of existing definitions of team resili- ence revealed a broad array of strengths and weaknesses, yet in most cases the limitations outweighed the positive features. Second, methodological approaches to operationalise and measure team resilience varied, and often relied on cross-sectional snapshots of teams that are inadequate for the study of team resilience due to its dynamic nature. Third, team resilience has been conceptualised in diverse ways such as an *input* to the system, a *process* by which individuals interact with each other, and an *outcome* of dynamic interactions among team members. Such conceptualisations often exclude direct reference to the multilevel nature of this concept (e.g. individuals embedded within a team, bottom-up and top-down processes).

Assessing existing definitions and conceptual models is an important first step for any effort designed to clarify the substantive features of team resilience. Although the definitions proposed by West et al. (2009) and Morgan et al. (2013) were among the most commonly adopted, there was an absence of a universally recognised definition of team resilience, with researchers often proposing bespoke definitions within the context of their study. Unsurprisingly, the majority of definitions referred directly to the "team" as the specific entity to which team resilience relates; however, some variation existed in the specific classification with two definitions seemingly vague on the entity (i.e. a system) (Edson, 2010; Hollnagel et al., 2011), and another generalising the definition to multiple systems including individuals, teams and organisations (Sutcliffe & Vogus, 2003). Existing definitions of team resilience can be understood within the context of the input, processes, and output model (I-P-O; Ilgen, Hollenbeck, Johnson, & Jundt, 2005) of systems within organisational settings. Predominantly, definitions of team resi- lience encapsulated the concept as an input, specifically in the form of a predefined capacity or ability of the team (e.g. Alliger et al., 2015; West et al., 2009). In contrast, Morgan et al. (2013) defined team resilience as a psychosocial "process," whereas Kennedy et al. (2016) described it as an output in the form of a shared belief among team members (Kennedy et al., 2016). Finally, Carmeli et al. (2013, p. 149) defined team resilience as encompassing multiple elements, namely an input ("capacity to cope,

recover and adjust") and output (a "team's belief"). Collectively, these results indicate that there are discrepancies in terms of the defining features of team resilience, and therefore efforts are required to work towards consensual agreement on the unique nature of this concept in future work. These discrepancies and opportunities for advancement in defini- tional quality may be addressed through divergent methods to those currently adopted within the literature on team resilience. For example, a Delphi study of academic experts may be required to fast-track the evolution and consensus surrounding a definition of team resilience (Okoli & Pawlowski S 2004).

Podsakoff et al. (2016) described problems at two levels that arise from poor conceptual definitions. At the first level, poor concept definitions may impede the ability to compare and discriminate accurately the focal concept with similar and related concepts. Although headway has been made to uncover key aspects of the nomological network of team resi- lience (Meneghel, Martínez, et al., 2016; Stephens et al., 2013), conceptual ambiguity may impede the understanding of related concepts within this network and also the specific nature of these associations (i.e. antecedents, consequences or correlates of team resili- ence). At the second level, issues could potentially ensue including deficient (i.e. failure to articulate all essential properties) or contaminated (i.e. lacking precision resulting in other construct elements being involved) characteristics of subsequent operationalisations of team resilience. With few exceptions (Kennedy et al., 2016), researchers offered little insight into the overlap and distinction between team resilience and related concepts with the absence of attention paid to construct validity of team resilience further highlight- ing this point. This omission is particularly important for conceptual clarity, as several definitions of team resilience shared similarities with the related concepts of team adap- tation and adaptability (for reviews, Christian, Christian, Pearsall, & Long, 2017; Maynard et al., 2015). Clarification of the overlap and distinctions between team resili- ence, team adaptation, and other concepts (e.g. collective efficacy, team effectiveness) is necessary to prevent the occurrence of construct proliferation or the jangle (i.e. the use of several names to describe conceptually overlapping constructs) and jingle fallacies (i.e. the use of the same term with differing meanings to refer to divergent constructs) (Block, 2000) and, ultimately, to establish the discriminant validity of the concept. In addition to the clarification of the necessary and sufficient conditions of the concept, expo- sitions of how and why team resilience is distinct from related concepts also represents a priority for future work, that is, to conceptually and empirically disentangle team resili- ence from related concepts, and clarify the relevance and usefulness of this concept. Taking into consideration these substantive issues, Gucciardi et al. (in press) recently defined team resilience as "as an emergent outcome characterised by the trajectory of a team's functioning, following adversity exposure, as one that is largely unaffected or returns to normal levels after some degree of deterioration in functioning" (p. 7).

Conceptual models of team resilience also varied with reference to the I-P-O frame- work (Ilgen et al., 2005). Some researchers have focused their efforts on conceptualising team resilience as an input (Rodríguez-Sánchez & Vera Perea, 2015) or process (Glowinski et al., 2016), however, predominant among conceptual models is the conceptualisation of team resilience in terms of key outputs or characteristics (e.g. Alliger et al., 2015; Lawrence & Maitlis, 2012; Morgan et al., 2013). Absent from these models is an explicit recognition of how team resilience as an outcome emerges from the dynamic interactions among indi- vidual members. For example, Glowinski et al. (2016) and Morgan et al. (2013) attributed

broad dimensions of monitoring situations and group structure as higher level properties of resilient teams, respectively, without delineating the processes underpinning their emer- gence. An exception to this finding is the work of Kennedy et al. (2016), who paid homage to the emergent nature of team resilience; however, specific detail regarding the dynamics of this emergence was absent within their article. It is generally accepted that teams are best viewed as complex and dynamic in nature (McGrath, Arrow, & Berdahl, 2000); there- fore, the predominance of single level approaches within the conceptual models of team resilience is incongruent with this perspective and highlights a key limitation of existing literature. Future work is required to articulate the conceptual details of these multilevel dynamics, including bottom-up (i.e. how lower-level processes facilitate the emergence of team resilience at a higher level, such as the team) and top-down (i.e. how higher- level factors influence lower-level attributes) processes (Kozlowski, Chao, Grand, Braun, & Kuljanin, 2013).

Concept definitions and conceptual models are important because they inform the operationalisation of constructs through measures and study designs. Of particular rel- evance is congruence between definition and operationalisation. For example, if defined as a capacity or input into the system, the assessment of team resilience requires indicators that capture these elements at the appropriate level of the system (e.g. individual or team level factors). This congruence was evident among the majority of work reviewed, primar- ily with regard to conceptualisations of team resilience as a capacity or input (e.g. Mene- ghel, Martínez, et al., 2016; West et al., 2009). Nevertheless, there were instances of incongruence between definition and operationalisation. For example, Morgan et al. (2013) defined team resilience as a psychosocial process, yet their findings provided clarity on four key characteristics or inputs of this concept rather than the processes by which teams are protected from the potentially detrimental effects of stressors. Stress and adversity and the capacity of teams and processes by which they overcome these potentially detrimental circumstances are also central to most definitions of team resili- ence. However, with few exceptions (Savioja et al., 2014), researchers assumed rather than tested directly the resilience enhancing nature of inputs and processes. To observe directly the influence of inputs and processes on the emergence of team resilience requires longitudinal or experimental designs in which the temporal dynamics of team resilience can be examined and understood within the context of stress and adversity. The reliance on cross-sectional designs to date is likely a reflection of the limited attention paid to tem- poral aspects within definitions and conceptual models of team resilience.

Bonanno, Romero, and Klein (2015) described the importance of paying close attention to the temporal elements of resilience. Specifically, they described the necessity of defining and integrating four essential components within any study of resilience: (i) system func- tioning prior to the onset of an adverse experience (i.e. baseline measurement); (ii) the specific nature of the adverse experience; (iii) system functioning post-adversity; and (iv) the determinants of functioning during the course of this sequence. With reference to the analysis of methodologies adopted within the studies of this review, the specific characteristics of the adverse experience at play were often absent from the methodological detail and, therefore, offered little insight into key information regarding the central ques- tion of "resilience to what". As an exception to this general finding, Savioja et al. (2014) provided details on the simulated accident scenario in their investigation of team resilience among nuclear power plant operators. In terms of details regarding the adverse event,

Bonanno and colleagues also underscored the importance of understanding its severity (i.e. adverse event is chronic or acute), level of exposure (i.e. individual differences in response to adversity), and trajectory of impact (i.e. immediate or longer term). It is there- fore important that future work on team resilience provide this degree of clarity when con- textualising adverse experiences.

Central to the operationalisation of resilience for any type of system (e.g. individual, team, family) is clarity regarding the nature of functioning and its trajectory over time within the context of adverse events (Bonanno et al., 2015). With regard to individual resi- lience, for example, health (e.g. mental, physical) and well-being have been proposed as exemplars of functioning (Kalisch et al., 2017). Primary indicators of functioning for social resilience, in contrast, are concerned with meaningful relationships with others or a sense of connectedness (Cacioppo, Reis, & Zautra, 2011). Clarity on this critical aspect of the conceptualisation of team resilience was absent within the work we identified in this review. Teams are often formed with the purpose of achieving a common objective or shared goal (Sundstrom et al., 1990) that involve performing tasks outside the capability of individuals (Dobbins et al., 2016). For this reason, it seems appropriate that the extent to which shared and valued objectives are met (e.g. efficiency, quantity and quality) rep- resents the defining indicator by which to assess functioning for the purposes of team resi- lience. In contrast, a focus on individual level performance may result in erroneous inferences regarding the demonstration of team resilience. For example, situations may occur where the functioning of one or two individual members deteriorates after exposure to adversity, yet appropriate contingencies from other individuals (e.g. another teammate takes on an increased workload) may offset the potential ramifications of these individual member reductions in functioning for the accomplishment of team objectives. Assessment of functioning at the team level therefore represents an important feature for future research on team resilience.

Past work on resilience suggests that there are three broad possible trajectories of func- tioning for a system following some type of adversity (e.g. Bonanno, Westphal, & Mancini, 2011; Layne, Warren, Watson, & Shalev, 2007; Norris, Tracy, & Galea, 2009). Systems may *withstand or resist* the effects of adversity in that functioning is minimally affected, (ii) *bounce back* quickly to normal or healthy levels of functioning after a significant deterio- ration, or (iii) *recover* to competent functioning gradually over an extended period of time. Such trajectories allow resilience to be distinguished from related yet different concepts, such as post traumatic growth where enhanced functioning is expected post-adversity (for a review, see Zoellner & Maercker, 2006).

Contextual and team type factors represent important issues for team resilience, yet they have received little attention among the work reviewed here. Most notably, team size, team composition (e.g. gender, personality makeup), the level of task interdepen- dence (i.e. the amount individuals rely upon others for team performance), skill differen- tiation (i.e. who does what), team lifespan, virtuality (i.e. proportion a team is face-to-face or remotely connected), and authority differentiation (i.e. the degree to which decision making is distributed across members) are important considerations (Salas, Reyes, & McDaniel, 2018). For example, recovering to competent functioning after several hours may be indicative of resilience for a top management team of an investment firm acquiring another firm, yet would not be the case for a surgical team conducting an operation on a patient with a life-threating ailment. This example further illustrates divergence in the

nature (e.g. type or magnitude) of adversities experienced across team type and the need to consider the adversity when comparing resilience trajectories across teams of those experi- ences that would be considered normative and those that would likely cause significant perturbation to the system. Future empirical work on team resilience would do well to take into consideration these contextual and team type factors.

Several of the findings reported in this review of the team resilience literature parallel other areas of resilience inquiry. In particular, definitional and conceptual disharmony is prevalent in past work on resilience within individuals, communities, and ecologies, such that it is often the case that there is a mismatch between definition and operationalisation (Kalisch et al., 2017). Within the context of community resilience, for example, some scholars define it as an *ability* to adapt (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008), and others as an *outcome* or quality (Manyena, 2006). Such definitional inconsistencies are also observed within the domains of engineering (Hosseini, Barker, & Ramirez-Marquez, 2016) and ecological systems (Angelini et al., 2016). There are also parallels noticed between proposed protective processes within team resilience literature and other systems. For example, although unique processes of team resilience have been uncovered (e.g. trans- formational leadership, Morgan et al., 2015; emotional carrying capacity, Stephens et al., 2013), many protective processes identified (e.g. hope, positive emotions, leadership and col- lective efficacy) mirror those prevalent within the family (Black & Lobo, 2008) and individual resilience domains (Pangallo et al., 2015). These parallels among the various areas of resili- ence research are likely representative of the complexities and challenges associated with conceptualising and measuring dynamic systems and emergent concepts. Given the rela- tively early stage of theory and research on team resilience, there is an opportunity for scho- lars to foster consistency between definition and operationalisation in future work in ways that could inspire scholars who study resilience in other systems.

Strengths and limitations

A key strength of this scoping review included a systematic approach to the search method and data extraction, including multiple databases and strategies (e.g. citation search of included articles). Nevertheless, it is important to acknowledge two key limitations of this scoping review when considering the conclusions drawn from the reviewed body of work. First, as is often the case with scoping reviews where the primary focus is on collating evidence regarding a broad topic of interest (Levac et al., 2010), we did not assess the meth- odological quality or rigour of studies identified via our search strategy. Second, only articles published within peer reviewed academic journals were included within the current review. As a result, unpublished research (e.g. dissertations, conference abstracts, book chapters) was excluded, thereby representing a potential source of bias (Rosenthal, 1979).

Conclusions

Through a systematic scoping review of the published literature on team resilience, we uncovered what is currently known about this concept and how researchers have gone about generating this information. These findings have the potential to inform future work on team resilience in several ways. First, there is a need for enhanced conceptual clarity of team resilience through the development of definitional consensus using

recommendations for high quality definitions (Podsakoff et al., 2016), specifically with regard to the essential and unique characteristics. Enhanced conceptual clarity is likely to optimise the means by which team resilience is observed and operationalised within subsequent studies as well as foster the distinction and comparison of team resilience from related concepts (e.g. team adaptation). Second, the diverse range of research methods is a strength of the current literature, yet there is a need for an overarching theor- etical framework that fosters integration of such findings. Specifically, the development of a conceptual framework may look to align with the generally agreed upon systems per- spective and would provide a reference for the systematic testing of individual and team level factors and processes important to the successful trajectory of functioning fol- lowing adversity. Third, there is a need to balance the current wealth of cross-sectional approaches with longitudinal and experimental studies to disentangle information regard- ing the temporal nature of team resilience. Of particular relevance in this regard is the examination post-adversity functioning relative to functioning prior to the onset of adver- sity and characterisation of the specific context of such adverse experiences (e.g. positive/ negative valence, chronicity, severity etc.). Future work should also look at how resilience develops or declines over time (i.e. across multiple adverse experiences). Finally, it is important that investigations into the dynamic nature of team resilience draw from multilevel theory (Kozlowski et al., 2013) in which researchers clarify the inputs, bottom-up and top-down processes, as well as the outcomes of the emergence of team resi- lience (see Gucciardi et al., in press). There is also a need for multidisciplinary integration across relevant cognate areas such as psychology (e.g. stress appraisals), sociology (e.g. social, economic, and political pressures), organisational behaviour (e.g. work design factors), biological systems (e.g. physiological indices of stress exposure), and computation (e.g. virtual simulations and experiments). This multilevel and integrative perspective is consistent with the fourth wave of resilience research that works towards understanding cross-level interactions among developmental systems.

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References

Alliger, G. M., Cerasoli, C. P., Tannenbaum, S. I., & Vessey, W. B. (2015). Team resilience: How teams flourish under pressure. *Organizational Dynamics*, *44*, 176–184.
Amaral, A., Fernandes, G., & Varajão, J. (2015). Identifying useful actions to improve team resili- ence in information systems projects. *Procedia Computer Science*, *64*, 1182–1189.
Angelini, C., Griffin, J. N., van de Koppel, J., Lamers, L. P., Smolders, A. J., Derksen-Hooijberg, M., … Silliman, B. R. (2016). A keystone mutualism underpins resilience of a coastal ecosystem to drought. *Nature Communications*, *7*(12473), 1–8.
Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology*, *8*, 19–32.
Bennett, J. B., Aden, C. A., Broome, K., Mitchell, K., & Rigdon, W. D. (2010). Team resilience for young restaurant workers: Research-to-practice adaptation and assessment. *Journal of Occupational Health Psychology*, *15*, 223–236.
Berkes, F., & Ross, H. (2013). Community resilience: Toward an integrated approach. *Society & Natural Resources*, *26*, 5–20.
Black, K., & Lobo, M. (2008). A conceptual review of family resilience factors. *Journal of Family Nursing*, *14*, 33–55. doi:10.1177/1074840707312237
Blatt, R. (2009). Resilience in entrepreneurial teams: Developing through the capacity to pull through. *Frontiers of Entrepreneurship Research*, *29*, 1–16.
Block, J. (2000). Three tasks for personality psychology. In L. R. Bergman, R. B. Cairns, L.-G. Nilsson, & L. Nystedt (Eds.), *Developmental science and the holistic approach* (pp. 155–164). Mahwah, NJ: Erlbaum.
Bonanno, G. A. (2004). Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist*, *59*, 20–28.
Bonanno, G. A., Romero, S. A., & Klein, S. I. (2015). The temporal elements of psychological resi- lience: An integrative framework for the study of individuals, families, and communities. *Psychological Inquiry*, *26*, 139–169.
Bonanno, G. A., Westphal, M., & Mancini, A. D. (2011). Resilience to loss and potential trauma. *Annual Review of Clinical Psychology*, *7*, 511–535.
Bornmann, L. (2011). Scientific peer review. *Annual Review of Information Science and Technology*, *45*, 197–245.
Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge, MA: Harvard University Press.
Broome, K. M., & Bennett, J. B. (2011). Reducing heavy alcohol consumption in young restaurant workers. *Journal of Studies on Alcohol and Drugs*, *72*, 117–124.
Brustad, R. J. (1999). Editorial perspective: The contribution of the manuscript-review process to knowledge development in sport and exercise psychology. *Journal of Sport & Exercise Psychology*, *21*, 307–312.
Cacioppo, J. T., Reis, H. T., & Zautra, A. J. (2011). Social resilience: The value of social fitness with an application to the military. *American Psychologist*, *66*, 43–51.
Carmeli, A., Friedman, Y., & Tishler, A. (2013). Cultivating a resilient top management team: The importance of relational connections and strategic decision comprehensiveness. *Safety Science*, *51*, 148–159.
Chan, D. (1998). Functional relations among constructs in the same content domain at different levels of analysis: A typology of composition models. *Journal of Applied Psychology*, *83*, 234–246. Christian, J. S., Christian, M. S., Pearsall, M. J., & Long, E. C. (2017). Team adaptation in context: An integrated conceptual model and meta-analytic review. *Organisational Behaviour and Human Decision Processes*, *140*, 62–89.

Cosco, T. D., Kaushal, A., Hardy, R., Richards, M., Kuh, D., & Stafford, M. (2017). Operationalising resilience in longitudinal studies: A systematic review of methodological approaches. *Journal of Epidemiology and Community Health*, *71*, 98–104.
Crane, M. F., & Searle, B. J. (2016). Building resilience through exposure to stressors: The effects of challenges versus hindrances. *Journal of Occupational Health Psychology*, *21*, 468–479.
Decroos, S., Lines, R. L. J., Morgan, P. B. C., Fletcher, D., Sarkar, M., & Vande Broek, G. (2017). Development and validation of the characteristics of resilience in sports teams inventory. *Sport, Exercise and Performance Psychology*, *6*, 158–178.
Dobbins, M. I., Thomas, S. A., Stokes Melton, S. L., & Lee, S. (2016). Integrated care and the evol- ution of the multidisciplinary team. *Primary Care: Clinics in Office Practice*, *43*, 177–190.
Edson, M. C. (2010). Group development: A complex adaptive systems perspective. In J. Wilby (Ed.), *Proceedings of the 54rd annual conference of the international society for the systems sciences* (pp. 447–470). Waterloo: International Society for the Systems Sciences.
Edson, M. C. (2012). A complex adaptive systems view of resilience in a project team. *Systems Research and Behavioural Science*, *29*, 499–516. doi:10.1002/sres.2153
Ellsworth, L. M., Wrobleski, D. W., Kauffman, J. B., & Reis, S. A. (2016). Ecosystem resilience is evident 17 years after fire in Wyoming big sagebrush ecosystems. *Ecosphere (washington, D C)*, *7*, 1–12.
Flint-Taylor, J., & Cooper, C. L. (2017). Team resilience: Shaping up the challenges ahead. In M. Crane (Ed.), *Managing for resilience: A practical guide for employee well-being and organizational performance* (pp. 129–149). New York, NY: Routledge.
Forgatch, M. S., & DeGarmo, D. S. (1999). Parenting through change: An effective prevention program for single mothers. *Journal of Consulting and Clinical Psychology*, *67*, 711–724.
Furniss, D., Back, J., Blandford, A., Hildebrandt, M., & Broberg, H. (2011). A resilience markers framework for small teams. *Reliability Engineering & System Safety*, *96*, 2–10.
Galli, N. (2016). Team resilience. In R. J. Schinke, K. R. McGannon, & B. Smith (Eds.), *Routledge international handbook of sport psychology* (pp. 378–386). New York, NY: Routledge.
Garmezy, N. (1985). Stress-resistant children: The search for protective factors. In J. E. Stevenson (Ed.), *Recent research in developmental psychopathology: Journal of child psychology and psychia- try book supplement 4* (pp. 213–233). Oxford: Pergamon Press.
Glowinski, D., Bracco, F., Chiorri, C., & Grandjean, D. (2016). Music ensemble as a resilient system. Managing the unexpected through group interaction. *Frontiers in Psychology*, *7*(1548), 1–7.
Gorman, J. C. (2014). Team coordination and dynamics: Two central issues. *Current Directions in Psychological Science*, *23*, 355–360.
Gorman, J. C., Martin, M. J., Dunbar, T. A., Stevens, R. H., Galloway, T. L., Amazeen, P. G., & Likens, A. D. (2016). Cross-level effects between neurophysiology and communication during team train- ing. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, *58*, 181–199.
Gottesman, I. I. (1974). Developmental genetics and ontogenetic psychology: Overdue détente and propositions from a matchmaker. In A. D. Pick (Ed.), *Minnesota symposium on child psychology* (Vol. 8, pp. 55–80). Minneapolis, MN: University of Minnesota Press.
Grand, J. A., Braun, M. T., Kuljanin, G., Kozlowski, S. W., & Chao, G. T. (2016). The dynamics of team cognition: A process-oriented theory of knowledge emergence in teams. *Journal of Applied Psychology*, *101*, 1353–1385.
Gucciardi, D. F., Crane, M., Ntoumanis, N., Parker, S. K., Thøgersen-Ntoumani, C., Ducker, K. J., … Temby, P. (in press). The emergence of team resilience: A multilevel conceptual model of facilitating factors. *Journal of Occupational and Organisational Psychology*. doi:10.1111/joop. 12237
Hawkins, J. D., Catalano, R. F., Kosterman, R., Abbott, R., & Hill, K. G. (1999). Preventing adoles- cent health-risk behaviors by strengthening protection during childhood. *Archives of Pediatrics & Adolescent Medicine*, *153*(3), 226–234.
Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics*, *4*, 1–23.
Hollnagel, E., Pariès, J., Woods, D., & Wreathall, J. (2011). *Resilience engineering perspectives, resi- lience engineering in practice (volume 3)*. Farnham: Ashgate.

Hosseini, S., Barker, K., & Ramirez-Marquez, J. E. (2016). A review of definitions and measures of system resilience. *Reliability Engineering & System Safety*, *145*, 47–61.
Hudson, B. (2007). Pessimism and optimism in inter-professional working: The Sedgefield inte- grated team. *Journal of Interprofessional Care*, *21*, 3–15.
Hughes, A. M., Gregory, M. E., Joseph, D. L., Sonesh, S. C., Marlow, S. L., Lacerenza, C. N., … Salas, E. (2016). Saving lives: A meta-analysis of team training in healthcare. *Journal of Applied Psychology*, *101*, 1266–1304.
Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Teams in organizations: From input-process-output models to IMOI models. *Annual Review of Psychology*, *56*, 517–543.
Iversen, A. C., Fear, N. T., Simonoff, E., Hull, L., Horn, O., Greenberg, N., … Wessely, S. (2007). Influence of childhood adversity on health among male UK military personnel. *The British Journal of Psychiatry*, *191*, 506–511.
Kalisch, R., Baker, D. G., Basten, U., Boks, M. P., Bonanno, G. A., Brummelman, E., … Fernandez, G. (2017). The resilience framework as a strategy to combat stress-related disorders. *Nature Human Behaviour*, *1*, 784–790.
Kanki, B. G. (1996). Stress and aircrew performance- A team-level perspective. In J. E. Driskell, & E. Salas (Eds.), *Stress and human performance* (pp. 127–162). Mahwah, NJ: Lawrence Erlbaum Associates.
Karatoreos, I. N., & McEwen, B. S. (2013). Annual research review: The neurobiology and physi- ology of resilience and adaptation across the life course. *Journal of Child Psychology and Psychiatry*, *54*, 812–812.
Kennedy, D. M., Landon, L. B., & Maynard, M. T. (2016). Extending the conversation: Employee resilience at the team level. *Industrial and Organizational Psychology*, *9*, 466–475.
Kim, H., & Marcouiller, D. W. (2015). Considering disaster vulnerability and resiliency: The case of hurricane effects on tourism-based economies. *The Annals of Regional Science*, *54*, 945–971.
Kossek, E. E., & Perrigino, M. B. (2016). Resilience: A review using a grounded integrated occu- pational approach. *The Academy of Management Annals*, *10*, 729–797.
Kozlowski, S. W., Chao, G. T., Grand, J. A., Braun, M. T., & Kuljanin, G. (2013). Advancing multi- level research design: Capturing the dynamics of emergence. *Organizational Research Methods*, *16*, 581–615.
Kozlowski, S. W., Grand, J. A., Baard, S. K., & Pearce, M. (2015). Teams, teamwork, and team effec- tiveness: Implications for human systems integration. In D. Boehm-Davis, F. Durso, & J. Lee (Eds.), *The handbook of human systems integration* (pp. 535–552). Washington, DC: APA.
Lawrence, T. B., & Maitlis, S. (2012). Care and possibility: Enacting an ethic of care through nar- rative practice. *Academy of Management Review*, *37*, 641–663.
Layne, C. M., Warren, J. S., Watson, P. J., & Shalev, A. Y. (2007). Risk, vulnerability, resistance, and resilience: Toward an integrative conceptualization of posttraumatic adaptation. In M. Friedman, T. Keane, & P. Resick (Eds.), *Handbook of PTSD: Science and practice* (pp. 497–520). New York: Guilford Press.
Leppin, A. L., Bora, P. R., Tilburt, J. C., Gionfriddo, M. R., Zeballos-Palacios, C., Dulohery, M. M., … Montori, V. M. (2014). The efficacy of resiliency training programs: A systematic review and meta-analysis of randomized trials. *PLoS ONE*, *9*(10), 1–15.
Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: Advancing the methodology. *Implementation Science*, *5*(69), 1–9.
Linley, P. A., & Joseph, S. (2004). Positive change following trauma and adversity: A review. *Journal of Traumatic Stress*, *17*, 11–21. doi:10.1023/B:JOTS.0000014671.27856.7e
Luthans, F., Avolio, B. J., Avey, J. B., & Norman, S. M. (2007). Positive psychological capital: Measurement and relationship with performance and satisfaction. *Personnel Psychology*, *60*, 541–572.
Macedo, T., Wilheim, L., Gonçalves, R., Coutinho, E. S. F., Vilete, L., Figueira, I., & Ventura, P. (2014). Building resilience for future adversity: A systematic review of interventions in non-clini- cal samples of adults. *BMC Psychiatry*, *14*(227), 1–8.
Mallak, L. (1998). Putting organizational resilience process to work. *Industrial Management*, *40*, 8–14.

Maloney, M. M., Bresman, H., Zellmer-Bruhn, M. E., & Beaver, G. R. (2016). Contextualization and context theorizing in teams research: A look back and a path forward. *Academy of Management Annals*, *10*, 891–942.
Manyena, S. B. (2006). The concept of resilience revisited. *Disasters*, *30*, 434–450.
Masten, A. S. (2007). Resilience in developing systems: Progress and promise as the fourth wave rises. *Development and Psychopathology*, *19*, 921–930.
Masten, A. S. (2013). Competence, risk, and resilience in military families: Conceptual commentary. *Clinical Child and Family Psychology Review*, *16*, 278–281.
Masten, A. S. (2014). Global perspectives on resilience in children and youth. *Child Development*, *85*, 6–20.
Masten, A. S., & Cicchetti, D. (2016). Resilience in development: Progress and transformation. In D. Cicchetti (Ed.), *Developmental psychopathology* (3rd ed., Vol. IV, pp. 271–333). New York, NY: Wiley.
Masten, A. S., & Garmezy, N. (1985). Risk, vulnerability, and protective factors in developmental psychopathology. In B. B. Lahey, & A. E. Kazdin (Eds.), *Advances in clinical child psychology* (pp. 1–52). New York, NY: Springer US.
Mathieu, J. E., Hollenbeck, J. R., van Knippenberg, D., & Ilgen, D. R. (2017). A century of work teams in the Journal of Applied Psychology. *Journal of Applied Psychology*, *102*, 452–467.
Maynard, M. T., Kennedy, D. M., & Sommer, S. A. (2015). Team adaptation: A fifteen-year syn- thesis (1998–2013) and framework for how this literature needs to "adapt" going forward. *European Journal of Work and Organizational Psychology*, *24*, 652–677.
McCray, J., Palmer, A., & Chmiel, N. (2016). Building resilience in health and social care teams. *Personnel Review*, *45*, 1132–1155.
McGrath, J. E., Arrow, H., & Berdahl, J. L. (2000). The study of groups: Past, present, and future. *Personality and Social Psychology Review*, *4*, 95–105.
McVicar, A. (2003). Workplace stress in nursing: A literature review. *Journal of Advanced Nursing*, *44*, 633–642.
Meaney, M. J. (2010). Epigenetics and the biological definition of gene x environment interactions. *Child Development*, *81*, 41–79.
Meneghel, I., Martínez, I. M., & Salanova, M. (2016). Job-related antecedents of team resilience and improved team performance. *Personnel Review*, *45*, 505–522.
Meneghel, I., Salanova, M., & Martínez, I. M. (2016). Feeling good makes us stronger: How team resilience mediates the effect of positive emotions on team performance. *Journal of Happiness Studies*, *17*, 239–255.
Morgan, P. B., Fletcher, D., & Sarkar, M. (2013). Defining and characterising team resilience in elite sport. *Psychology of Sport and Exercise*, *14*, 549–559.
Morgan, P. B., Fletcher, D., & Sarkar, M. (2015). Understanding team resilience in the world's best athletes: A case study of a rugby union world cup winning team. *Psychology of Sport and Exercise*, *16*, 91–100.
Morgan, P. B., Fletcher, D., & Sarkar, M. (2017). Recent developments in team resilience research in elite sport. *Current Opinion in Psychology*, *16*, 159–164.
Murphy, L. B. (1962). *The widening world of childhood: Paths toward mastery*. New York: Basic Books.
Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology*, *41*, 127–150.
Norris, F., Tracy, M., & Galea, S. (2009). Looking for resilience: Understanding the longitudinal tra- jectories of responses to stress. *Social Science and Medicine*, *68*, 2190–2198.
Okoli, C., & Pawlowski S, D. (2004). The Delphi method as a research tool: An example, design considerations and applications. *Information & Management*, *42*, 15–29.
Pangallo, A., Zibarras, L., Lewis, R., & Flaxman, P. (2015). Resilience through the lens of interac- tionism: A systematic review. *Psychological Assessment*, *27*, 1–20.

Petree, R. D., Broome, K. M., & Bennett, J. B. (2012). Exploring and reducing stress in young res- taurant workers: Results of a randomized field trial. *American Journal of Health Promotion*, *26*, 217–224.
Phillips, B. D. (2015). *Disaster recovery* (2nd ed.). Boca Raton, FL: Taylor and Francis.
Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2016). Recommendations for creating better concept definitions in the organizational, behavioural, and social sciences. *Organizational Research Methods*, *19*, 159–203.
Rodríguez-Sánchez, A. M., & Vera Perea, M. (2015). The secret of organisation success: A revision on organisational and team resilience. *International Journal of Emergency Services*, *4*, 27–36.
Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological Bulletin*, *86*, 638–641.
Rutter, M. (1979). Protective factors in children's responses to stress and disadvantage. In M. W. Kent, & J. E. Rolf (Eds.), *Primary prevention of psychopathology: Vol. 3. Social competence in chil- dren* (pp. 49–74). Hanover, NH: University Press of New England.
Rutter, M. (1985). Resilience in the face of adversity. Protective factors and resistance to psychiatric disorder. *British Journal of Psychiatry*, *147*, 598–611.
Salas, E., Reyes, D. L., & McDaniel, S. H. (2018). The science of teamwork: Progress, reflections, and the road ahead. *American Psychologist*, *73*, 593–600.
Savioja, P., Norros, L., Salo, L., & Aaltonen, I. (2014). Identifying resilience in proceduralised acci- dent management activity of NPP operating crews. *Safety Science*, *68*, 258–274.
Seery, M. D., & Quinton, W. J. (2016). Understanding resilience: From negative life events to every- day stressors. *Advances in Experimental Social Psychology*, *54*, 181–245.
Sharma, S., & Sharma, S. K. (2016). Team resilience: Scale development and validation. *Vision: The Journal of Business Perspective*, *20*, 37–53.
Shuffler, M. L., Pavlas, D., & Salas, E. (2012). Teams in the military: A review and emerging chal- lenges. In J. H. Laurence, & M. D. Matthews (Eds.), *The Oxford handbook of military psychology* (pp. 282–310). New York, NY: Oxford University Press.
Siegel, A. W., & Schraagen, J. M. (2017). Team reflection makes resilience-related knowledge expli- cit through collaborative sensemaking: Observation study at a rail post. *Cognition, Technology and Work*, *19*, 127–142.
Sinclair, V. G., & Wallston, K. A. (2004). The development and psychometric evaluation of the brief resilient coping scale. *Assessment*, *11*, 94–101.
Stephens, J. P., Heaphy, E. D., Carmeli, A., Spreitzer, G. M., & Dutton, J. E. (2013). Relationship quality and virtuousness: Emotional carrying capacity as a source of individual and team resili- ence. *The Journal of Applied Behavioral Science*, *49*, 13–41.
Sundstrom, E., de Meuse, K. P., & Futrell, D. (1990). Work teams: Applications and effectiveness. *American Psychologist*, *45*, 120–133.
Sutcliffe, K. M., & Vogus, T. (2003). Organizing for resilience. In K. Cameron, J. E. Dutton, & R. Quinn (Eds.), *Positive organizational scholarship* (pp. 94–121). San Francisco, CA: Berrett- Koehler.
Thompson, B., & Ravlin, E. (2016). Protective factors and risk factors: Shaping the emergence of dyadic resilience at work. *Organizational Psychology Review*, *7*, 143–170.
Van der Beek, D., & Schraagen, J. M. (2015). ADAPTER: Analysing and developing adaptability and performance in teams to enhance resilience. *Reliability Engineering & System Safety*, *141*, 33–44. Van der Kleij, R., Molenaar, D., & Schraagen, J. M. (2011). Making teams more resilient: Effects of shared transformational leadership training on resilience. *Proceedings of the Human Factors and Ergonomics Society*, *55*, 2158–2162.
Van Kessel, G. (2013). The ability of older people to overcome adversity: A review of the resilience concept. *Geriatric Nursing*, *34*, 122–127.
Vogus, T. J., & Sutcliffe, K. M. (2007). The safety organizing scale: Development and validation of a behavioural measure of safety culture in hospital nursing units. *Medical Care*, *45*, 46–54.
Walsh, F. (2016). Applying a family resilience framework in training, practice, and research: Mastering the art of the possible. *Family Process*, *55*, 616–632.

West, B. J., Patera, J. L., & Carsten, M. K. (2009). Team level positivity: Investigating positive psycho- logical capacities and team level outcomes. *Journal of Organizational Behavior, 30*, 249–267.
Wright, M. O., Masten, A., & Narayan, A. (2013). Resilience processes in development: Four waves of research on positive adaptation in the context of adversity. In S. Goldstein, & R. B. Brooks (Eds.), *Handbook of resilience in children* (2nd ed., pp. 15–38). New York, NY: Springer Science & Business Media.
Zaccaro, S. J., Weiss, E. J., Hilton, R. M., & Jeffries, J. (2011). Building resilient teams. In P. Sweeney, M. Matthews, & P. Lester (Eds.), *Leadership in dangerous contexts: A handbook for the armed forces, emergency services, and first responders* (pp. 182–201). Annapolis, MD: Naval Institute Press. Zelazo, P. D. (2013). Developmental psychology: A new synthesis. In P. D. Zelazo (Ed.), *The Oxford handbook of developmental psychology: Body and mind* (Vol. 1, pp. 3–12). New York, NY: Oxford University Press.
Zoellner, T., & Maercker, A. (2006). Posttraumatic growth in clinical psychology—A critical review and introduction of a two component model. *Clinical Psychology Review, 26*, 626–653.

Appendix D: Published book chapter

CHAPTER 8

Can Adversity Promote Team Functioning In Sport?

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Abstract

There has been limited attention devoted to exploring the links between adversity and collective functioning. Given the nascent stage of this research agenda, our purpose with this book chapter is to discuss important considerations for understanding team functioning when adverse events occur and offer a foundation to guide future work. We first explore the ways in which adversity is experienced by individuals and collectives. The nature of adverse experiences provides an important foundation for our consideration of team functioning following adversity. We conclude by examining how experiences of adversity may enhance the collective functioning. Throughout chapter, we consider avenues of future research.

Introduction

Sport teams across all competitive levels are likely to experience adversity at some point within the performance cycle. For sporting teams, adversities can be characterised as events that have the potential to derail the collective functioning of the group, such as the loss of a key team member through major injury, the sudden change in management personnel (e.g., coach being fired), or an unexpected loss to a much lower ranked side. Typically, adversities are characterised negatively in light of the potentially deleterious effects for team functioning and ultimately destabilisation of performance. For example, as a result of the ball tampering scandal in 2018, the Australian cricket team lost three key members midway through a test series against South Africa, and subsequently suffered their second largest defeat in history in the following match and went on to lose their following two test series. However, teams can also withstand potentially deleterious effects or even develop positively following the experience of adverse events (e.g., enhanced focus and motivation following the feeling of injustice from an erroneous refereeing decision). Regardless of the immediate outcomes of such experiences, one important consideration for theory and practice is the implications of collective experiences of adversity for the future functioning of the team. In other words, can collective experiences of adversity promote the future functioning of a sporting team? Given the paucity of empirical work that has addressed this proposition, our goal in this chapter is to consider several key questions that might inspire others and guide efforts to study this proposition empirically.

Literature Review

What is Adversity?

The use of the term adversity is widespread across the literature within areas such as resilience, post-traumatic growth, and coping (Linley & Joseph, 2004). The ubiquity of this term and implicit assumptions regarding its definition has caused discrepancies in the operationalisation of adversity. For example, some scholars have defined adversity as "life circumstances that are known to be statistically associated with adjustment difficulties" (Luthar & Cicchetti, 2000, p. 858), whereas others have defined the term as a "state of hardship or suffering" (Jackson, Firtko, & Edenborough, 2007, p. 3). Within the biological literature, adversity is defined as a level within the environment that may vary in magnitude depending upon qualities such as resources, physical structure, climate, and competitors (Andras, Lazarus, & Roberts, 2007). Despite dissimilarities within the literature, and the observed conceptual proliferation with terms such as stressor and traumatic events, certain salient observations can be drawn from those definitions available across systems. For example, characteristics considered jointly necessary to differentiate adversity from related terms (i.e., trauma, stressor) have included the event to be external to the perceiver (Andras et al., 2007; Gucciardi et al., 2018), contextually meaningful to the perceiver (Fletcher, 2018), statistically associated with changes to the functioning of a system (Luthar & Cicchetti, 2000), and low to moderate in probability of occurrence (Gucciardi et al., 2018). Applicable to the domain of sporting teams,, we define adversity as a "temporally bound, low-to-moderate probability event external to the perceiver that represents a major assault on the functioning of a system" (Gucciardi et al., 2018, p. 742).

How Do Individuals Experience Adversity?

As team experiences are borne out of individual perspectives, we briefly consider individuals' experiences of adversity across cognitive, emotional, behavioral, and biological domains. The biopsychosocial model of challenge and threat (BPM; Blascovich, 2013) provides a useful framework for appreciating individuals' experiences of stress and adversity occurring within contexts where people are motivated to perform, that is, when striving to attain a personally relevant and meaningful goal. Within the context of the BPM, individuals experience psychological states of challenge or threat that are characterised by patterns of physiological responses. As these physiological responses occur rapidly, often within the matter of seconds, and can be assessed non-invasively, they can be used to make inferences about two key psychological states that represent opposite ends of a bipolar continuum. Specifically, individuals experience a state of challenge if they appraise their personal resources outweigh the demands of the situations, or a state of threat when they appraise the demands of the situations outweigh their personal resources. As adversity is characterised by unique experiences where situational demands are high, it is unsurprising that cognitive (e.g., intrusive thoughts, shift in attention), emotional (e.g., anger, emotional suppression), physical (e.g., illness, loss of fitness), and behavioral (e.g., performance withdrawal, social isolation) responses tend to reflect experiences of threat states (Howells, Sarkar, & Fletcher, 2017).

The synergistic links between psychological states and physiological processes captured in the BPM (Seery, 2011) underscores the importance of the biological experience of adversity. The BPM draws on the idea of energy mobilisation via the activation of the sympathetic-adrenomedullary (SAM) and pituitary-adrenocortical (HPA) axes during motivated performance situations (Dienstbier, 1989). In these circumstances, the SAM mobilises energy swiftly via the quick release and elimination of epinephrine and norepinephrine, whereas HPA axis activation occurs more gradually via the slow release and elimination of cortisol. Although the sudden onset of SAM activation has been outlined as an indicator of "toughened" individuals, the transient half-life within the body of only a few minutes limits its measurement potential (Dienstbier, 1989). Contrastingly, cortisol released via HPA activation has a half-life of over an hour making it amenable to measurement and therefore the preferred latent indicator of the stress response (Seery, 2011). The association between psychological stress and HPA axis activation has been especially prominent in environments with high ego involvement and low predictability and control (Kirschbaum & Hellhammer, 1994). The measurement of cortisol and representation of challenge or threat states has been approached using a range of physiological measures (e.g., urine, blood serum). Offering a real-time insight into the experiences of an individual, previous work has indexed challenge and threat states via four discrete cardiovascular measures (heart rate, ventricular activity, total peripheral resistance and cardiac output; Seery, 2011), whereas short-term (i.e., 24-hour period) accumulation of adversity has been commonly measured via saliva sampling (for a review, see Kirschbaum & Hellhammer, 1994). Hair sampling permits assessments of long-term of cortisol accumulation within the body, whereby 1cm of hair growth reflects approximately one month of cortisol secretion (Stalder & Kirschbaum, 2012). Despite the utility of such measures, a multi-modal approach that combines subjective (e.g., perceptions of stress intensity or appraisal) and

biological (e.g., hair cortisol) indices is the preferred approach to capturing stress states following adversity (Weckesser et al., 2019). This multi-model approach to stress measurement is evident in recent work in sport settings (e.g., cardiovascular indices; Moore et al., 2019).

How Do Teams Experience Adversity?

Teams represent two or more individuals working towards a shared objective. As teams encompass multiple individuals, it is common to assume a reductionist perspective in that the collective experience of adversity simply represents an aggregation of these individual experiences (Chapman et al., 2018). However, common within the group dynamics literature is the holistic Aristotelian view that the whole is greater than the sum of its parts (Kozlowski & Klein, 2000). Lower-level characteristics (e.g., individual) emerge temporally at higher-levels (e.g., team) via composition or compilation (Kozlowski & Klein, 2000). Composition describes an isomorphic form of emergence where the individual level attributes combine as a team-level characteristic that is similar in make up to its individual-level constituent elements in that is has a similar meaning across levels. Contrastingly, compilation describes a process of emergence whereby the higher-level property holds a functional resemblance to the lower level construct, yet is distinct in nature from the individual constituent elements. For example, consider the difference between the concepts of collective efficacy and team performance within sport. Collective efficacy reflects composition emergence because it captures the degree to which individual level perceptions of the team's capabilities converge as a collective construct. Contrastingly, team performance emerges via complementary patterns and configurations of diverse individual level components, whereby the unique contributions of individual members interact to produce some type of functioning that is qualitatively different yet meaningful for the collective (e.g., putting together pieces of a puzzle). Distinct differences may be present in the antecedents and mechanisms underpinning the emergence process (Kozlowski & Klein, 2000), so it is important to consider the adverse experience for individual members and the team as a collective, and the processes that underpin emergence within and across both levels.

When it comes to understanding the experiences of adversity within teams, it is important to clarify what we mean by the concept of 'shared'. Shared adversities have been described as a unique event in which the same features or circumstances are experienced directly by all group members (Windschitl, Kruger, & Simms, 2003). Examples of this conceptualisation of shared adversity include sport teams who experience extreme environmental conditions (e.g., heat), relegation to a lower competition level, or loss within the final of a major competition. Common to each of these examples is the simultaneous experience of the same type of adversity across all individuals of the team. An alternative conceptualisation of adversity experiences within groups is one where the event is experienced directly by one or more members and indirectly by others (also see Chapter 4 on vicarious experiences of growth). This type of collective adversity experience is important because indirect or vicarious experience of adversity (e.g., witnessing a teammate being physically harmed) can affect people's experiences of stress. Previous work has demonstrated this effect via enhanced levels of cortisol secretion in the observer (Engert, Plessow, Miller, Kirschbaum, & Singer, 2014). Examples of this conceptualisation of adversity for sporting

teams include the loss of a team member due to major injury (e.g., anterior cruciate ligament), witnessing a team member experiencing verbal abuse/racism from supporters, and the awareness of team member losing a close family member. Consideration of these two broad types of experiences of adversity among teams is important because they may affect collective functioning in different ways and ultimately the degree to which functioning may change because of that shared experience. Owing to the limited research in this area, we consider these two types of adversity experiences collectively in this chapter unless otherwise noted.

The cognitive underpinnings of shared adversity. Cognition, which has been defined as the "mechanisms by which animals acquire, process, store and act on information from the environment" (Shettleworth, 2010, p. 4), represents an appropriate starting point for considering the nature of shared adversity experiences for teams and how they may affect collective functioning and growth. Conceptual work on shared cognition has evolved from a sole emphasis upon shared knowledge structures across individuals towards an interactive model of shared cognition that resides in the observable activities or processes between team members (Cooke, 2015). These dynamic team-level activities or processes are grounded in the context in which teams perform and play out over time. Rather than denying the existence of previously dominant static models, this interactionist approach acknowledges the existence of shared mental models, yet underscores the importance of observing the interactions between team members as markers of team cognitive processing (McNeese, Cooke, Fedele, & Gray, 2015).

Knowledge components reflect an important start point for teams when confronted with adversity (Cooke, 2015). For example, organised knowledge structures encompassing representations of both task and team related factors that are shared between team members facilitate team coordination (Cannon-Bowers, Salas, & Converse, 1993). Shared mental models, which reflect overlapping maps of the environment between team members, enhance team effectiveness via a highly shared and accurate understanding of task constraints, and the future needs and actions of other team members (Mohammed, Hamilton, Sánchez-Manzanares, & Rico, 2017). The question of interest here is the degree to which team members are on the same page. More immediate in nature, situational awareness is reflective of an individual's knowledge of their direct environment, which includes (a) perceptions of task-relevant environmental cues, (b) comprehension of the information that is collected from that environment, and (c) projection of how such environmental information may vary in the future (Endsley, 1995). Conceptualised at the team level to be a shared interpretation of the immediate context, team situational awareness is deemed important for performance in complex and dynamic environments because members know what is going on around them (Mohammed et al., 2017). These knowledge components of a team's shared cognitive experience represent important avenues in which to explore the effect of adverse experiences upon future team functioning.

Interactions among team members are critical for team effectiveness (Cooke, 2015). For example, there may be instances where certain teams with limited shared knowledge (i.e., newly formed teams) perform effectively. The ability to compensate for this limited shared knowledge may be explained by the presence of effective process components. Team

coordination, which represents decision-making and behavior regulation with respect to the group and task context (Steiner, Seiler, & Cooke, 2017), is built largely around the communicative ability of a team (Cooke, 2015). Notably, the effective transference of adaptive information across team members at the right time is crucial to the development of new knowledge, where integration of new ideas is a marker of cognitive processing at the team level. Knowledge processes (e.g., communication, coordination) within the context of adversity therefore may supplement the exploration of knowledge components and demonstrate observable proxies from which to gain insight into the cognitive aspects of shared experiences.

The emotional underpinnings of shared adversity. Emotions are neurophysiological states characterised by dimensions of valence (i.e., negative or positive) and intensity (i.e., the strength of the emotional experience) (Barrett, 2006). For teams, the linkage and transmission of emotional experiences from one person to another/others (i.e., emotional contagion; Hatfield, Cacioppo, & Rapson, 1994) plays a pertinent role in future behavior (Barsade, 2002). Affective Process Theory (Elfenbein, 2014) provides a conceptual backdrop for understanding emotional connection via three broad mechanisms. Aligned with the direct experience of adversity, the *shared stimulus* mechanism reflects situations where team members are exposed to the same environmental stimulus and members' interpretations tend to converge over time via interactions and leadership influence despite likely in their individual experience. Mechanisms indicative of indirect experiences of adversity can occur in two ways: (a) *imitated stimulus*, where one or more individuals encounter a stimulus and then imitate their experiences in ways that resonate sequentially across other team members' (e.g., observing the reaction of a teammate to a severe injury), and (b) *empathetic-through-stimulus*, where an individual becomes aware of an event through interaction with a team member (e.g., discussion with coach about an injury to teammate). The emergence of affective convergence via these three mechanisms, and the valence of such states has been shown to influence team behaviors (e.g., communication, group conflict, cooperation) and performance outcomes (e.g., task performance, self-related group performance, service quality appraisals) among various types of teams both inside and outside of sport (e.g., Barsade, 2002; Barsade, Coutifaris, & Pillemer, 2018; Totterdell, 2000). In essence, the dynamic nature of the affective state of a team in response to adversity holds influence upon important group processes and outcomes, and as such represents an important mediator of team functioning within such contexts. Understanding the conscious and subconscious mechanisms linking group emotions and the moderators of this dynamic state (e.g., leadership chacteristics, Johnson, 2008) represents important considerations for understanding team functioning following adversity.

What Might Changes in Functioning Look Like for Teams?

Team functioning might be affected negatively, positively or both across differing facets of team functioning following adversity exposure. In terms of deleterious effects, teams have been shown to lose an awareness of team perspective (Driskell, Salas, & Johnston, 1999) or to make poorer decisions under heightened levels of stress (Cannon-Bowers & Salas, 2001). The concept of growth is one area where teams might experience positive changes from adversity exposure. At intrapersonal and interpersonal levels, growth has been defined as "positive psychological changes experienced as a result of

the struggle with traumatic or highly challenging life circumstances" (Tedeschi, Shakespeare-Finch, Taku, & Calhoun, 2018, p. 3). Fundamental to this definition is the nature of change as opposed to enhancement of attributes. This attribute of growth reflects the functional-descriptive model of change in which individuals' fundamental assumptions regarding the world are challenged and constrained to change by adverse events over time, with internal (e.g., emotional distress, core beliefs) and external factors (e.g., social support, proximal and distal social-cultural dimensions) determining subsequent growth (Tedeschi et al., 2018). Importantly, it is inappropriate to infer collective growth from individual member growth because the whole is deemed greater than the sum of parts (Tedeschi et al., 2018). For example, individual member enhancements in motivation or coping strategies may affect collective behavior negatively because it disrupts synchronicity between members. This disparity demonstrates the need to observe changes in functioning at the team level (e.g., relationships between members) and the potential for individual level growth to foster or undermine team growth.

Joseph and Linley's (2005) Organismic Valuing Theory of Growth (OVT) mirrors several of these characteristics (see Chapter 2 for a detailed conceptual exposition), and has been the modal theoretical model used within studies of growth in competitive sport (Howells et al., 2017). Within the context of OVT, individuals' predisposition towards growth occurs via the changing of belief systems one holds for the world that occur following adversity (Joseph & Linley, 2005). This definition also reflects the common conceptualisation of growth as a process of change characterised via indicators of intrapersonal (e.g., self-efficacy), interpersonal (e.g., development of relationships), and physical (e.g., enhanced performance) functioning (Howells et al., 2017). When considering growth within teams, it seems pertinent to consider necessary characteristics of growth as an emergent state or outcome characterised by (a) positive change at the team level in the quality or value of a team properties (e.g., shared belief systems, relationships, mental models, team philosophy) or activities (e.g., cooperation, coordination); (b) prolonged or robust change over a period of time following adversity and relative to the quality or value prior, and (c) change relative to the quality or value prior to the onset of adversity. Interested readers are referred elsewhere for a discussion of similar themes in relation to the multilevel nature of team resilience (Gucciardi et al., 2018).

The input, mediator, output, input (IMOI) model of team effectiveness (Ilgen, Hollenbeck, Johnson, & Jundt, 2005) offers a structured yet flexible template of what collective functioning might look like for team following adversity. Inputs represent those conditions that exist prior to team performance, which can encompass individual (e.g., personality), team (e.g., composition), or context (e.g., organisational constraints) factors. Mediators include the ways by which inputs are engaged, integrated, and translated into valued outcomes via dynamic interactions among team members (e.g., communication). Outputs refer to the task and non-task consequences of the dynamic interactions among team members (e.g., learning, performance effectiveness). Finally, Ilgen et al. (2005) described the feedback-loop nature of team development and indicated the need to consider outputs as future inputs when assessing team-related constructs. This aspect may be important when assessing collective functioning following adversity to allow for an understanding of how over time outcomes lead in

to future inputs and mediators to contribute to future outcomes (e.g., prolonged growth). Linking this framework to future explorations of team functioning within a sporting context requires an understanding of the key inputs, mediators, and outcomes underpinning this construct and their interaction.

How Might Adversity Promote Growth in Sport?

Benefits of shared experiences of adversity. Shared experiences of adversity may hold important functional bearing on the development of team affect and cognitive inputs to functioning. Notably, shared adversities enhance the effective teamwork capability of groups without intervention (Paton, & Stephens, 1996; Turner, Hogg, Turner, & Smith, 1984), with experiences of adversity proposed to stimulate processes of growth (Tamminen, Holt, & Neely, 2013). Benefit finding among teams fosters relationships with others (Garrison & Sasser, 2009), matching the common identification of enhanced group cohesion following shared adverse experiences (Turner, Hogg, Turner, & Smith, 1984). As examples, shared experiences of pain in groups within laboratory settings enhances trusting interpersonal relationships between members (Bastian, Jetten, & Ferris, 2014), whereas in sport an injury to a star player may bring teammates closer together (Bloom, Stevens, & Wickwire, 2003).

Underpinned by Social Identity Theory (Tajfel & Turner, 1979), shared adversity experiences are likely to facilitate team cohesion through enhanced perceptions of positive distinctiveness following events and through perceptions of a shared fate, meaning, and affective reactions that are ascribed to the event (Pollock, Paton, Smith, & Violanti, 2003). This internalisation of social identity within teams promotes interpretations of such experiences as ‘our’ problem instead of ‘my’ or ‘your’ problem. Internalising meaning via social identities fosters communal coping strategies that promote adaptive team functioning over deleterious processes (Leprince, D'Arripe-Longueville, & Doron, 2018). Defined as “the cooperative problem-solving process salient in coping with both individual and collective stressors involving [sic] the appraisal of a stressor as our issue and cooperative action to address it” (Lyons, Mickelson, Sullivan, & Coyne, 1998, p. 579), communal coping strategies may reflect important transitionary processes for future functioning or an outcome of growth in itself following the immediate experience of adversity should pre adversity coping strategies be enhanced in some way (Howells et al., 2017). Communal coping strategies in sport include problem-focused communal efforts (e.g., information sharing, refocusing, back to basics), relationship-focussed coping (e.g., motivational support, social bonding), communal management of emotions (e.g., interpersonal emotional regulation, reassurance), and communal goal withdrawal (e.g., task disengagement, venting emotions) (Leprince et al., 2018). An integral communal coping strategy triggered by adversity is systematic reflection upon experiences. For individuals, stressor reflection enhances awareness of current capacities and limitations (Crane, Searle, Kangas, & Nwiran, 2019). At the team level, reflections may clarify the capacities and limitations of the collective unit, and enhance awareness of the strengths and weaknesses of team members. Thus, purposeful reflections of shared experiences of adversity may promote the salience of the social identity within teams, enhance the cohesiveness of a

group, and maximise the likelihood of effective strategies being adopted following such experiences to promote team functioning.

Training and shared adversity experiences. Team development interventions foster team competencies, processes, leadership and interactions that are critical to collective effectiveness (Lacerenza, Marlow, Tannenbaum, & Salas, 2018). Of these approaches, team competencies or teamwork expertise are key inputs to established teams that may benefit from training within the context of adversity (see Chapter 19 for detailed information). Team training has been defined as "a formalised, structured learning experience with preset objectives and curriculum that target specific team competencies" (Lacerenza et al., 2018, p. 519), with previous work showing the advantageous nature of training prior to stressful experiences (Driskell et al., 1999). Several specific team training strategies have been outlined including coordination training, cross training, and stress exposure training (Burke, Salas, Wilson-Donnelly, & Priest, 2004), with training within the context of adversity holding three overarching benefits (Driskell, Salas, Johnston, & Wollert, 2008). Firstly, training within the context of shared adversity has been proposed to enhance a team's familiarity with the performance environment. Developing a shared understanding of effects of adversity upon environmental and task constraints, teammates' behaviors under such circumstances (i.e., shared mental model), and the affective state of the team, with training in the context of adversity has been shown to generalise to novel, unexperienced adversities experienced by teams (Driskell, Johnston, & Salas, 2001). Secondly, adversity may foster the development of coordinative team performance strategies and skills to meet the demands of this context. For example, teams may adjust their playing strategy following the loss of a star performer to injury. Shared adversity experiences may also enhance creativity among team members; thus, applying training techniques within the context of adversity may facilitate novel solutions to problems (Bastian, Jetten, Thai, & Steffens, 2018). Finally, grounding training in adversity may enhance the collective efficacy of a group when they encounter similar experiences in the future and the collective efficacy of the group more generally (Friedland & Keinan, 1982). For example, teams who experienced and successfully overcame the adversity of an unexpected managerial change may propel their confidence to a higher level when it comes to overcoming similar hurdles and subsequent adversities in future. In sum, experiences of adversity may add significant value to training programs where performance is incumbent (e.g., elite stage) through the development of core knowledge, skills, and affective processes and may be a prerequisite to desirable functioning following these experiences. However, it is important to adopt caution and awareness of the moral implications of such training. The relaying and sharing of previous adverse experiences has the potential to result in re-traumatisation, whereas sudden experiences of high severity adversity may also result in undesirable outcomes. Drawing a line in the sand ultimately requires a delicate balance of care, control, and progression (e.g., athlete driven).

Conclusion

There is intuitive and practical appeal to the idea that adversity experiences can promote collective functioning and growth among sporting teams. However, little systematic empirical or theoretical work has addressed this proposition directly.

In this chapter, we reviewed research and theory from related fields with the view to shed light on several key questions that might provide a platform from which to consider the nature of this proposition and guide future work. It is essential that future work clarify the multilevel, temporally dynamic nature of adversity experiences for collective functioning.

References

Andras, P., Lazarus, J., & Roberts, G. (2007). Environmental adversity and uncertainty favour cooperation. *BMC Evolutionary Biology, 7*, 240-248. doi:10.1186/1471-2148-7-240

Barrett, L. F. (2006). Are emotions natural kinds? *Perspectives on Psychological Science, 1*, 28-58. doi:10.1111/j.1745-6916.2006.00003.x

Barsade, S. G. (2002). The ripple effect: Emotional contagion and its influence on group behavior. *Administrative Science Quarterly, 47*, 644-675. doi:10.2307/3094912

Barsade, S. G., Coutifaris, C. G. V., & Pillemer, J. (2018). Emotional contagion in organizational life. *Research in Organizational Behavior, 38*, 137-151. doi:10.1016/j.riob.2018.11.005

Bastian, B., Jetten, J., & Ferris, L. J. (2014). Pain as social glue: Shared pain increases cooperation. *Psychological Science, 25*, 2079-2085. doi:10.1177/0956797614545886

Bastian, B., Jetten, J., Thai, H. A., & Steffens, N. K. (2018). Shared adversity increases team creativity through fostering supportive interaction. *Frontiers in Psychology, 9*(2309), 1-10. doi:10.3389/fpsyg.2018.02309

Blascovich, J. (2013). Challenge and threat. In A. J. Elliot (Ed.), *Handbook of approach and avoidance motivation* (pp. 431-445). New York: Psychology Press.

Bloom, G. A., Stevens, D. E., & Wickwire, T. L. (2003). Expert coaches' perceptions of team building. *Journal of Applied Sport Psychology, 15*, 129-143. doi:10.1080/10413200390213830

Burke, C. S., Salas, E., Wilson-Donnelly, K., & Priest, H. (2004). How to turn a team of experts into an expert medical team: guidance from the aviation and military communities. *Quality and Safety in Health Care, 13*, 96-104. doi:10.1136/qshc.2004.009829

Cannon-Bowers, J. A., & Salas, E. (2001). Reflections on shared cognition. *Journal of Organizational Behavior, 22*, 195-202. doi:10.1002/job.82

Cannon-Bowers, J. A., Salas, E., & Converse, S. (1993). Shared mental models in expert team decision-making. In N. J. Castellan (Ed.), *Individual and group decision making* (pp. 221-246). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Chapman, M. T., Lines, R. L., Crane, M., Ducker, K. J., Ntoumanis, N., Peeling, P., ... & Gucciardi, D. F. (2018). Team resilience: A scoping review of conceptual and empirical work. *Work & Stress*, 1-25. doi:10.1080/02678373.2018.1529064

Cooke, N. J. (2015). Team cognition as interaction. *Current Directions in Psychological Science, 24*, 415-419. doi:10.1177/0963721415602474

Crane, M. F., Searle, B. J., Kangas, M., & Nwiran, Y. (2019). How resilience is strengthened by exposure to stressors: the systematic self-reflection model of resilience strengthening. *Anxiety Stress & Coping, 32*, 1-17. doi:10.1080/10615806.2018.1506640

Dienstbier, R. A. (1989). Arousal and physiological toughness - implications for mental and physical health. *Psychological Review, 96*, 84-100. doi:10.1037//0033-295x.96.1.84

Driskell, J., Johnston, J., & Salas, E. (2001). Does stress training generalize to novel settings? *Human Factors, 43*, 99-110. doi:10.1518/001872001775992471

Driskell, J., Salas, E., Johnston, J. H., & Wollert, T. N. (2008). Stress exposure training: An event-based approach. In P. A. Hancock & J. L. Szalma (Eds.), *Performance under stress* (pp. 271–286). London, England: Ashgate Publishing.

Driskell, J. E., Salas, E., & Johnston, J. (1999). Does stress lead to a loss of team perspective? *Group Dynamics: Theory, Research, and Practice*, *3*, 291-302. doi:10.1037/1089-2699.3.4.291

Elfenbein, H. A. (2014). The many faces of emotional contagion: An affective process theory of affective linkage. *Organizational Psychology Review, 4*, 326-362. doi:10.1177/2041386614542889

Endsley, M. R. (1995). Toward a theory of situation awareness in dynamic systems. *Human Factors: The Journal of Human Factors and Ergonomics Society, 37*, 32-64. doi:10.1518/001872095779049543

Engert, V., Plessow, F., Miller, R., Kirschbaum, C., & Singer, T. (2014). Cortisol increase in empathic stress is modulated by emotional closeness and observation modality. *Psychoneuroendocrinology, 45*, 192-201. doi:10.1016/j.psyneuen.2014.04.005

Fletcher, D. (2018). Psychological resilience and adversarial growth in sport and performance. *Oxford Research Encyclopedia of Psychology*, 1-38. doi:10.1093/acrefore/9780190236557.013.158

Friedland, N., & Keinan, G. (1982). Patterns of fidelity between training and criterion situations as determinants of performance in stressful situations. *Journal of Human Stress, 8*, 41-46. doi:10.1080/0097840X.1982.9936118

Garrison, M. E. B., & Sasser, D. D. (2009). Families and disasters: Making meaning out of adversity. In K. E. Cherry (Ed.), *Lifespan perspectives on natural disasters: Coping with Katrina, Rita, and other storms* (pp. 113-130). New York, NY: Springer Publishing.

Gucciardi, D. F., Crane, M., Ntoumanis, N., Parker, S. K., Thogersen-Ntoumani, C., Ducker, K. J., . . . Temby, P. (2018). The emergence of team resilience: A multilevel conceptual model of facilitating factors. *Journal of Occupational and Organizational Psychology, 91*, 729-768. doi:10.1111/joop.12237

Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1994). *Emotional contagion*. Cambridge: England: Cambridge University Press.

Howells, K., Sarkar, M., & Fletcher, D. (2017). Can athletes benefit from difficulty? A systematic review of growth following adversity in competitive sport. *Sport and the Brain: The Science of Preparing, Enduring and Winning, Pt B, 234*, 117-159. doi:10.1016/bs.pbr.2017.06.002

Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Teams in organizations: From input-process-output models to IMOI models. *Annual Review of Psychology, 56*, 517-543. doi:10.1146/annurev.psych.56.091103.070250

Jackson, D., Firtko, A., & Edenborough, M. (2007). Personal resilience as a strategy for surviving and thriving in the face of workplace adversity: a literature review. *Journal of Advanced Nursing, 60*, 1-9. doi:10.1111/j.1365-2648.2007.04412.x

Johnson, S. K. (2008). I second that emotion: Effects of emotional contagion and affect at work on leader and follower outcomes. *The Leadership Quarterly, 19*, 1-19. doi:10.1016/j.leaqua.2007.12.001

Joseph, S., & Linley, P. A. (2005). Positive adjustment to threatening events: An organismic valuing theory of growth through adversity. *Review of General Psychology, 9*, 262-280. doi:Doi 10.1037/1089-2680.9.3.262

Kirschbaum, C., & Hellhammer, D. H. (1994). Salivary cortisol in psychoneuroendocrine research - recent developments and applications. *Psychoneuroendocrinology, 19*, 313-333. doi:10.1016/0306-4530(94)90013-2

Kozlowski, S. W. J., & Klein, K. J. (2000). A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: foundations, extensions, and new directions* (pp. 3-90). San Francisco, CA: Jossey-Bass.

Lacerenza, C. N., Marlow, S. L., Tannenbaum, S. I., & Salas, E. (2018). Team development interventions: Evidence-based approaches for improving teamwork. *American Psychologist, 73*, 517-531. doi:10.1037/amp0000295

Leprince, C., D'Arripe-Longueville, F., & Doron, J. (2018). Coping in teams: Exploring athletes' communal coping strategies to deal with shared stressors. *Frontiers in Psychology*, *9*(1908), 1-11. doi:10.3389/fpsyg.2018.01908

Linley, P. A., & Joseph, S. (2004). Positive change following trauma and adversity: A review. *Journal of Traumatic Stress, 17*(1), 11-21. doi: 10.1023/B:JOTS.0000014671.27856.7e

Luthar, S. S., & Cicchetti, D. (2000). The construct of resilience: Implications for interventions and social policies. *Development and Psychopathology, 12*, 857-885. doi:10.1017/S0954579400004156

Lyons, R. F., Mickelson, K. D., Sullivan, M. J. L., & Coyne, J. C. (1998). Coping as a communal process. *Journal of Social and Personal Relationships, 15*, 579-605. doi:10.1177/0265407598155001

McNeese, N. J., Cooke, N. J., Fedele, M. A., & Gray, R. (2015). Theoretical and methodical approaches to studying team cognition in sports. *International Conference on Applied Human Factors and Ergonomics and the Affiliated Conferences, Las Vegas, Nevada, 3*, 1211-1218. doi:10.1016/j.promfg.2015.07.201

Mohammed, S., Hamilton, K., Sánchez-Manzanares, M., & Rico, R. (2017). Team Cognition: Team Mental Models and Situation Awareness. In E. Salas, R. Rico, & J. Passmore (Eds.), *The Wiley-*

Blackwell handbook of the psychology of team working and collaborative processes (pp. 369-392). Sussex, UK: Hoboken Wiley-Blackwell.

Moore, L. J., Young, T., Freeman, P., & Sarkar, M. (2018). Adverse life events, cardiovascular responses, and sports performance under pressure. *Scandinavian Journal of Medicine & Science in Sports, 28,* 340-347. doi:10.1111/sms.12928

Pollock, C., Paton, D., Smith, D., & Violanti, J. (2003). Team resilience. In D. Paton., J. Violanti., & L. Smith. (Eds.), *Promoting capabilities to manage posttraumatic stress: perspectives on resilience.* (pp. 74-88). Springfield, Ill: Charles C. Thomas.

Seery, M. D. (2011). Challenge or threat? Cardiovascular indexes of resilience and vulnerability to potential stress in humans. *Neuroscience and Biobehavioral Reviews, 35,* 1603-1610. doi:10.1016/j.neubiorev.2011.03.003

Shettleworth, S. J. (2010). *Cognition, Evolution, Behavior*. Oxford: England: Oxford University Press.

Stalder, T., & Kirschbaum, C. (2012). Analysis of cortisol in hair - State of the art and future directions. *Brain Behavior and Immunity, 26,* 1019-1029. doi:10.1016/j.bbi.2012.02.002

Steiner, S., Seiler, R., & Cooke, N. J. (2017). Understanding the successful coordination of team behavior. *Frontiers in Psychology, 8*(1869), 1-2. doi:10.3389/fpsyg.2017.01869

Tajfel, H., & Turner, J. C. (1979). An integrative theory of intergroup conflict In M. J. Hatch. & M. Schultz. (Eds.), *Organizational identity: A reader* (pp. 56-65). New York, USA: Oxford University Press.

Tamminen, K. A., Holt, N. L., & Neely, K. C. (2013). Exploring adversity and the potential for growth among elite female athletes. *Psychology of Sport and Exercise, 14,* 28-36. doi:10.1016/j.psychsport.2012.07.002

Tedeschi, R. G., Shakespeare-Finch, J., Taku, K., & Calhoun, L. G. (2018). *Posttraumatic growth: Theory, research, and applications*. New York, NY: Routledge.

Totterdell, P. (2000). Catching moods and hitting runs: Mood linkage and subjective performance in professional sport teams. *Journal of Applied Psychology, 85,* 848-859. doi:10.1037/0021-9010.85.6.848

Turner, J. C., Hogg, M. A., Turner, P. J., & Smith, P. M. (1984). Failure and defeat as determinants of group cohesiveness. *British Journal of Social Psychology, 23*, 97-111. doi:10.1111/j.2044-8309.1984.tb00619.x

Weckesser, L. J., Dietz, F., Schmidt, K., Grass, J., Kirschbaum, C., & Miller, R. (2019). The psychometric properties and temporal dynamics of subjective stress, retrospectively assessed by different informants and questionnaires, and hair cortisol concentrations. *Scientific Reports, 9*(1098), 1-12. doi:10.1038/s41598-018-37526-2

Windschitl, P. D., Kruger, J., & Simms, E. (2003). The influence of egocentrism and focalism on people's optimism in competitions: When what affects us equally affects me more. *Journal of Personality and Social Psychology, 85*, 389-408. doi:10.1037/0022-3514.85.3.389

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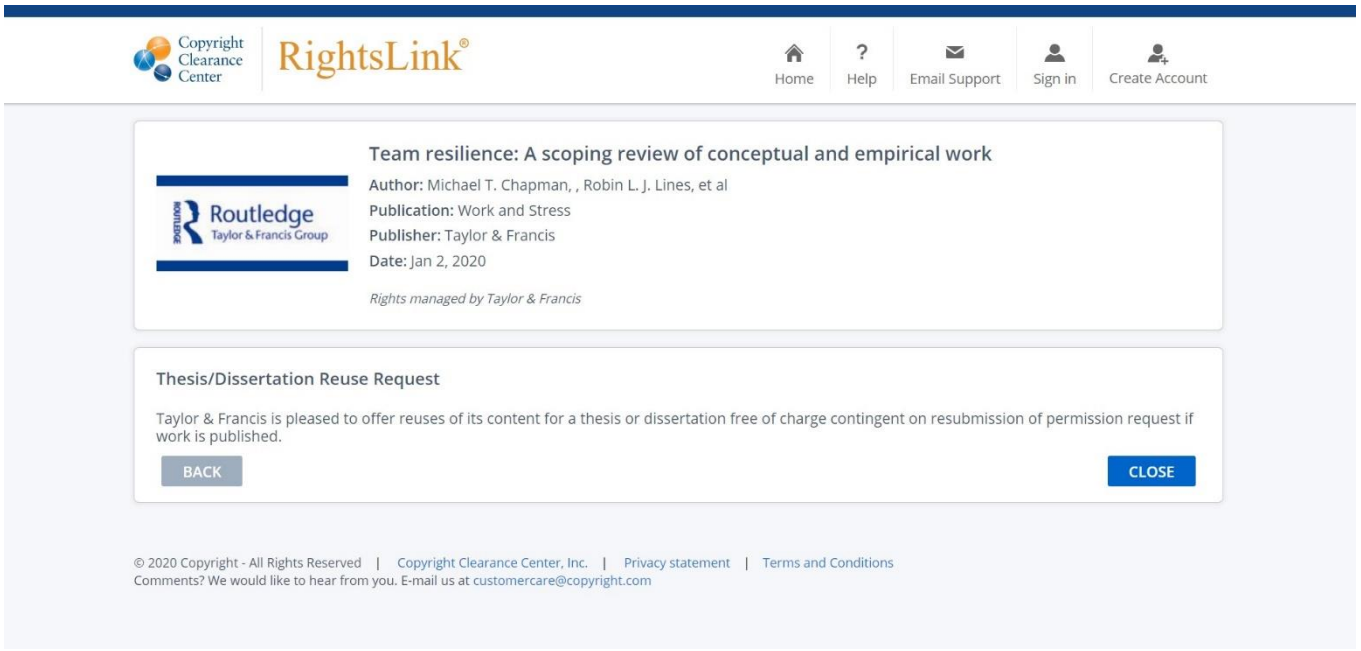

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