Curtin School of Allied Health

Optimising Elite Athlete Stress Regulation via Systematic Reflections of Stressor Events

Elizabeth M. Murdoch

0000-0003-2380-4784

This thesis is presented for the Degree of

Doctor of Philosophy

of

Curtin University

February 2024

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.

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 [name blinded] Human Research Ethics Committee (EC00262), approval numbers HRE2020-0715 and HRE2022-0575.

Acknowledgements

I am extremely grateful to have had the opportunity to complete this PhD and be embedded in a high-performance sporting institute. This industry-driven PhD has enabled me to develop my skills as a researcher and a practitioner, and I have many people to thank for that. Throughout this chapter of my life, I have had unwavering support from my family, friends, and colleagues, all of which has enabled me to persist in the face of challenges and make me the person I am today.

I would like to thank my supervisor, Professor Daniel Gucciardi, whose expertise and continual support has moulded my PhD into this final product. Throughout this process, he has always been there to provide me with feedback and support, and I am extremely grateful to have had a supervisor so involved in my research. To Jo and Pete at [name blinded], their knowledge and assistance with implementing my studies at [name blinded] and reaching out to athletes and coaches was invaluable. To Nikos, El, Monique, and Carly, thank you for your honest and detailed feedback throughout my PhD and for always being there for a friendly chat. All in all, my supervisory team has helped me develop my writing and presentation skills which has allowed me to advance as a researcher and professional.

To the people I have met along this journey – athletes, parents, sporting coaches, and other professionals who provided their feedback and shown interest. I am very appreciative of the time we spent together and am thankful that I could spend 'time on the ground' delivering my research which has had a real-life impact on others. Lastly, I am incredibly lucky to have so many genuine people in my life who have delivered continual support along my research journey. Especially my parents who always have my back, nudge me to deep dive into opportunities, and encourage me to make the most of it. While this chapter of my life has had its hurdles, I believe the uncomfortable experiences have developed my confidence and contributed towards my overall growth.

Dedication

My PhD is dedicated to my mother, Jules, who is my number one supporter in everything I do. From a young age, she has instilled in my siblings and I the importance of education, independence, and having a voice. Her hard-work, resilience, and thirst for knowledge inspires me in all that I do. I am forever grateful for her love, guidance, and support. I would not be where I am today without her.

Table of Contents

Abstract

High performance sport consists of stressor events which can cause disruption to an athletes' functioning and negatively influence performance and psychological well-being. To adjust to stressors encountered across competition, training, and personal events, it is pivotal athletes have the meta-cognitive skills that enable them to effectively self-regulate, and to help them overcome similar experiences in the future. Due to the important work sport psychologists do on equipping athletes with stress regulation techniques, there is a need to interrogate the literature and extend the conceptual knowledge that surrounds athlete stress regulation. The overarching purpose of this thesis was to advance conceptual and empirical knowledge of athlete resilience by exploring stressor reflections and the development of coping insights. I achieved this goal via two systematic reviews and meta-analyses of the literature as well as two qualitative investigations of stressor reflections in practice.

First, I conducted a meta-analysis reviewing the literature on stress regulation interventions with athletes to gain insight into current thinking regarding the types of interventions, their active ingredients, and their effectiveness on sporting performance, as well as psychological and physiological dimensions. We conducted a pre-registered systematic review of seven databases to identify randomised controlled trials to answer our questions. Our findings indicated a positive and significant moderate overall effect of stress regulation interventions on performance outcomes, and a significant large effect on physiological outcomes, yet the effect on psychological dimensions was statistically inconsequential. The strongest effects on performance were observed at follow-up when compared with post-test. Collectively, our findings offer a high-quality assessment on the effectiveness of stress regulation interventions for athlete performance and provide direction for future research in terms of conceptual (e.g., taxonomies of stress regulation techniques) and methodological (e.g., reporting transparency, statistical power) issues.

Second, I conducted a meta-analysis to critically evaluate the existing body of literature pertaining to various methodologies of self-reflection – a cognitive tool employed to perceive stress-inducing events as opportunities for personal learning and development. Specifically, our investigation sought to confirm the hypothesis that self-distanced reflective practices offer an advantage over a self-immersed style. This goal was accomplished through a pre-registered systematic review spanning seven electronic databases to identify experimental tests with adults aged 18-65 years where the focus of the reflection was a stressor or adverse event that participants had already experienced. We carried out a three-level, random effects meta-analysis of 25 experiments which revealed a small-to-moderate advantage of self-distanced reflections, most effective when they targeted a stressor experience that emphasised one's emotional state or lifetime. Nevertheless, our assessment of the overall quality of evidence including risk of bias suggested uncertainty regarding the benefit of this pragmatic self-regulatory approach.

Third, I conducted a qualitative study in which we explored coping insights among highly trained and national athletes who engaged in reflective exercises from either a self-distanced or self-immersed perspective over five weeks. Utilising a well-established framework for self-reflection and coping insights, we interpreted commonalities and distinctions in coping insights across both groups. Regardless of their reflective stance, athletes demonstrated promising signs of self-awareness, trigger identification, and re-appraisal. However, limited insight was observed in areas such as values consideration, evaluation, and future-focus. Stressors reported by athletes tended to be of mild magnitude or 'everyday' in their nature. The study underscores the importance of thorough examinations of the self-reflection approach to unlock higher-level insights that can enhance resilient capacities. A comprehensive understanding of the intricate interplay between stressor

exposure and athlete psychological well-being necessitates a meticulous exploration of the emotionality associated with each stressor event.

Fourth, I extended the nature of our analysis by completing a qualitative study which explored the coping insights among highly trained/national level swimmers in the lead up to major swimming competitions, who reflected on a stressor event from self-distanced or self-immersed perspectives over a 3-week period. Guided again by the framework of self-reflection and coping insight, our exploration yielded a diverse array of coping insights from participants in both categories. Notably, regardless of their assigned perspective, athletes exhibited positive inclinations towards reinterpreting their stressor experiences and embracing the challenges they faced. However, our findings revealed a noteworthy gap in the consideration of individual values and the adoption of a future-focus viewpoint. Within the written reflections, the emotionality described by athletes varied across both groups and influenced the development of coping insights. Our findings suggest there is need to interrogate the emotionality linked to unique stressor events and consider a blended approach for reflection strategies, alongside strengthening the operationalisations of conceptual models of stressor reflection protocols.

Taken together, this thesis critically assesses and consolidates the conceptual and empirical knowledge of athlete stress regulation techniques to provide a foundation for mixed-method studies targeting a unique self-reflection tool to enable adaption to stressor events. This thesis extends past work by applying the self-reflection and coping insight framework to an athlete population, to qualitatively explore the development of coping insights for resilient capacities from two distinct perspectives. A deeper understanding of the athlete processes during stressor events justifies further research on stressor reflection protocols. Overall, these findings provide important implications for theory development, and future empirical and practical approaches in sport psychology.

Chapter 1: General Introduction

This PhD opportunity came about when I was embedded in a high-performance sporting university, completing my Masters in Sport and Exercise Psychology, living in the UK. I was surrounded by so many potential athletes who were navigating a high-performance system and a full-time study load. Many were thriving in multiple areas, winning medals at Nationals or inter-university competitions (BUCS events). At the time I was also studying the topic of performance psychology under Professor David Fletcher, an expert in performance psychology and stress management in high performing teams. David's teachings included the idea that one could learn to use stressful sporting events to adapt and improve over time, rather than avoid difficult events and their uncomfortable nature. Why did I find this topic so interesting, in comparison to the 'classics' like goal setting or motivation theory? It boiled down to my personal experiences in sport as an adolescent. My commitment to rowing and swimming, both highly demanding sports, involved various stressors spanning across training, competition, and within the organisation or team culture. Pain and discomfort often occurred during training sessions and competition, but it was second nature to the athletes. How could one continue to expose themselves to such experiences, day in and day out? Curiosity led me to question the psychological processes involved in these stressor events and a desire to explore the responses and strategies that enable one to follow a pathway towards positive sporting performances. This inner drive led to me accept a PhD opportunity at [name blinded] to answer these questions.

Australia places a huge emphasis on its sports people. Athletes are glorified and their feats are celebrated within society. It is truly mesmerising when one can get up on the world stage and perform, when it matters at events like the Olympics or World Championships. We marvel at athletes' ability to react in the moment and adapt to stress and pressure – how do they do it? What's the magic formula? But we know, this storyline is not always the case.

Behind the highs, there are lows; times in which the incorrect move or shot is chosen, or moments where athlete emotions override and dictate performance. The phenomenon of psychological stress is characterised by a unique combination of novelty (e.g., new or different from past experiences), disruption (e.g., interrupts or disturbs normal homeostasis), and/or criticality (e.g., personally meaningful), which triggers an appraisal process regarding whether one needs to self-regulate and how they might do so (see also Luhmann et al., 2021). Athlete life encompasses stressors within training, competition, and organisational domains (Sarkar & Fletcher, 2014) alongside their personal life and may disperse or 'travel' from one domain to another (e.g., interpersonal events in training extend to communication errors in competition). Within the training context, stressors commonly encountered include communication issues with teammates and the coach/es, problems with team culture, or inability to make times and perform in rigorous training schedules (Arnold & Fletcher, 2012; Sarkar & Fletcher, 2014). Stressors commonly encountered within competition settings include pressure to execute a time or make a team, competitors, and risk of injury (Hanton et al., 2005; Kristiansen & Roberts, 2010). From an organisational standpoint, athletes might experience stressor events due to unavailability from their support networks (e.g., physiologist, dietitian), alongside issues with training or competition structure (Arnold & Fletcher, 2012). Athletes may also be concurrently experiencing stressors outside of their sporting environment including financial stress, mental health fluctuations, transitioning from the sport, family and/or relationship stress (Sarkar & Fletcher, 2014). For athletes, these stressors can occur within the context of unique developmental or career stages where they experience different needs or demands. Accordingly, it is vital that athletes have a toolbox of stress regulation techniques at their disposal, which are dynamic and personalised to the athlete and their context.

Psychological stress theories provide frameworks for understanding how individuals perceive and respond to stressors (see Harris, 2020, for an overview). The Transactional Model of Stress and Coping by Lazarus and Folkman (1984) emphasises the dynamic process of appraisal, where individuals assess the significance of a stressor and their personal resources to cope with it. The initial appraisal on the stress event is core to this process and dictates the nature of the stress process for an individual (Lazarus, 1999). Transdisciplinary perspectives also take the contextual, habitual, and temporal dimensions that arise from person-situation interactions into account (Epel et al., 2018). We also highlight the biopsychosocial model (Blascovich & Mendes, 2000) which emphasises the interplay between psychological processes and cardiovascular responses in terms of challenge and threat states. We highlight these key theories and models to portray the enormity of literature targeting psychological stress, which we consider and expand upon throughout the thesis. We cover an extended literature review in the meta-analyses completed in chapters two and three of this thesis, which encapsulates a targeted approach rather than a 'generic' investigation of the literature. We discuss our findings in relation to the key psychological stress theory and concepts.

The topic of individual stress regulation has gained significant traction across other contexts including the military (Crane et al., 2019), organisations/businesses (Ayala & Manzano, 2014), 'pop' psychology (Hart & Sasso, 2011), and university students (Crane, Kangas, Karin, et al., 2020). In the sporting context, When I began formulating the studies for my PhD, a large part of my reading was directed towards the Systematic Self Reflection (SSR) model (Crane et al., 2019), which has been heavily investigated as a self-reflection tool in an organisational context. Self-reflection is considered a meta-cognitive approach whereby individuals or groups evaluate self-regulatory processes from past experiences and align their processes with their own values and goals; through this process one learns how to manage

similar situations optimally in the future (Marshall, 2019). The SSR model paints similarities to sport psychology tools and post-competition reflection guides, whereby an athlete reflects upon what they did well, what they could improve upon, and how they could do it. We became eager to explore the SSR model further amongst the athlete population. Whilst it was tempting to 'jump the gun', we decided to step back and question first the current stress regulation interventions in the sport psychology space, alongside their effectiveness on sporting performance. Much of the sport psychology literature is based in controlled lab environments compared with real-life, high-pressured situations and as a practicing psychologist, I was curious to explore the barriers to delivering authentic, athlete-centred research.

Like any athlete, reflection of past performances and skills is crucial to developing optimal performance. Sport psychology literature highlights strategies including mindfulness (Bühlmayer et al., 2017), controlled breathing (Lehrer et al., 2020), distraction (Balk et al., 2013), and cognitive re-structuring (Larsson et al., 1988) techniques but these strategies all presume what works for one person, works for all. Oftentimes these strategies and skills targeted towards athletes lack individuality and remain the same across differing contexts. When we started to consider a self-reflection tool for athletes, we were conscious of the negative emotions one may be exposed to if they were reliving their stressor event firsthand. These questions led us to explore the different cognitive methods used when engaging in the self-reflection process, which eventually led to carrying out a meta-analysis. After delving into self-distanced and self-immersed literature by Kross and colleagues (for a review, see Kross & Ayduk, 2017), it became clear that there were two distinct meta-cognitive approaches that could be adopted when reflecting on stressor events. The self-immersed reflection style draws emphasis on the 'hot' features of the individual's stressor event by allowing them to re-live the experience first-hand. In contrast, self-distanced reflections allow

one to step back and gain perspective on the stressor event experienced, which prompts them to reflect on the broader chain of events using a third-person perspective (Kross et al., 2005; Kross & Ayduk, 2017). We were eager to test these two self-reflection vistas within an athlete population.

Challenges arose during my PhD, mainly due to athlete recruitment and their willingness to engage in a self-reflection intervention. My PhD funding was linked to [name blinded], meaning I was lucky enough to have direct access to high-level athletes. Although, asking athletes to participate in research on top of their demanding training and competition load can be tough, which meant we had to reposition our work from 'which reflection vista works best?' to 'what coping insights are developed via each reflection vantage point?'. Interest in coping insights began due to the extension of Crane's SSR model to the self-reflection and coping insight framework (Falon, Kangas, et al., 2021) during my PhD. The addition of coping insights, being new or refined awareness of one's thoughts, feelings, and behaviours within the context of situations or events that place meaningful demands on them (Falon, Karin, et al., 2021; Grant et al., 2002), is an important step in developing the appropriate coping strategies to bring about optimal outcomes. Rather than executing statistical analyses for my last two studies, we pivoted to a qualitative approach for the remaining two studies of my PhD. This refocus allowed for authenticity as athletes were able to deploy their own self-regulatory strategies, and in a methodological sense, enabled us to 'look under the hood' and interrogate the nature of reflections from self-distanced and self-immersed vistas from the standpoint of the coping insights generated or the increased awareness of one's coping from engaging in the reflection process.

This PhD thesis encompasses four papers that chronicle the exploration, development, implementation, and evaluation of a self-reflection intervention for highly trained/national athletes. I first present a meta-analysis of the literature on stress regulation techniques in a

sporting context, and their effectiveness on sporting performance, which concludes with addressing conceptual and methodological issues in future work. Second, I present another meta-analysis which delves into self-distanced and self-immersed reflection vistas and their effectiveness within adult populations, which forecasts the importance of emotional states for this self-regulatory tactic. Third, I carried out a qualitative study exploring the coping insights prevalent within athletes randomised to self-distanced and self-immersed reflections over a 5-week period, targeting psychological well-being and ill-being outcomes. Lastly, I completed another qualitative study with highly trained/national swimmers, investigating the development of coping insights over a 3-week period whereby athletes are randomised to self-distanced and self-immersed conditions. In sum, these papers supported the idea that both self-distanced and self-immersed reflection strategies are beneficial for athletes when facing stressor events and for the development of resilient capacities. The results provide us with a compass to act on for future research in sport psychology.

Table 1. Definitions table

Construct	**Definition**
Psychological stress	From a psychological standpoint, the transactional theory of stress and coping (Lazarus & Folkman, 1984) is one dominant model in which it is proposed that psychological stress occurs when people perceive the demands of their environment outweigh resources available to them to manage or alter the situational demands encountered (Lazarus et al., 1985).
Stressor	A situation or experience that an individual appraises as personally stressful to them.

Coping insight	Coping insights refer to individual's conscious awareness of their thoughts, feelings, and behaviours. These insights naturally develop when one is engaging in self-reflective processes and build as one understands the ways in which they coped with the stressor experience.
Self-reflection	A meta-cognitive approach whereby individuals or collectives evaluate self-regulatory processes enacted during real-world or simulated experiences for compatibility with their values and goals and learn how best to manage future similar situations (Marshall, 2019).

Overview of Chapter 2

The purpose of this chapter is to report our first manuscript in which we narratively and statistically analysed and synthesised the existing literature on stress regulation interventions in an athlete population. We target different types of interventions, their active ingredients, and their effectiveness on sporting performance. In doing so, we uncover limitations of past studies and consider future directions.

Note: This chapter has published in the International Review of Sport and Exercise Psychology.

Murdoch, E.M., Lines, R.L.J., Crane, M.F., Ntoumanis, N., Brade, C., Quested, E., Ayers, J., & Gucciardi, D.F. (in press). The effectiveness of stress regulation interventions with athletes: A systematic review and multilevel meta-analysis of randomised controlled trials. *International Review of Sport and Exercise Psychology*. https://doi.org/10.1080/1750984X.2021.1977974

Chapter 2: The Effectiveness of Stress Regulation Interventions with Athletes: A Systematic Review and Multilevel Meta-Analysis of Randomised Controlled Trials

2.1. Introduction

Athlete performance is complex as it depends on learning skills across multiple domains and executing them in training and high-stakes competition environments. Athletes encounter numerous and varied stressors in their sporting pursuits, which can be broadly classified in terms of training (e.g., teammates' behaviours and interactions, goals), competition (e.g., risk of injury, spectators), organisational (e.g., support staff, selection), or personal non-sporting factors (e.g., romantic or family relationships, finances; Arnold et al., 2013; Sarkar & Fletcher, 2014). The potentially stressful nature of sport necessitates the need for athletes to be capable of regulating their engagement with stressors optimally so they can deliver optimal performance. Acute stress, for example, can lead to maladaptive outcomes in terms of physical (e.g., negative effect on basketball free throw and tennis serves; Lautenbach et al., 2015; Mascret et al., 2016) and cognitive performance (e.g., increased reaction time; Paul et al., 2012). Meta-analytic data supportthe adaptive nature of psychological interventions for sport performance, the effects of which may endure one month after completion of training (Brown & Fletcher, 2017). Yet, our knowledge of the effectiveness of interventions designed specifically to help athletes regulate their engagement with stressors is limited to narrative reviews of the literature (Rumbold et al., 2012). Absent from the evidence base is an appreciation of the overall magnitude of their effectiveness, the types of interventions that are most effective, and the conditions for which and athletes for whom we might expect the strongest effects. We address these knowledge gaps in the current study.

2.2. Literature Review

Given the breadth and complexity of stress as a scientific concept, it is unsurprising that scholars have proposed numerous hypotheses and models to facilitate the study of stress and its effects on humans (see Harris, 2020, for an overview). Transdisciplinary perspectives provide a unified picture of stress as an emergent property that arises from person-situation interactions within the confines of contextual, habitual, historical, and temporal dimensions (Epel et al., 2018). Common among this unified perspective is the centrality of situational factors (e.g., frequency and intensity of stressors), cumulative stress exposure (e.g., history of major stressors or traumas), protective factors that potentially buffer the maladaptive effects of stress (e.g., malleable personal resources, social resources), and psychological (e.g., emotion regulation) and physiological (e.g., autonomic, neuroendocrine, and immune systems) responses. Numerous theories exist to explain these core elements of the stress experience. From a psychological standpoint, for example, the transactional theory of stress and coping (Lazarus & Folkman, 1984) is one dominant model in which it is proposed that psychological stress occurs when people perceive the demands of their environment outweigh resources available to them to manage or alter the situational demands encountered (Lazarus et al., 1985). Cognitive appraisals are core to this process because the initial evaluation of a stressor influences the nature of the stress process for individuals (Lazarus, 1999). The biopsychosocial model (Blascovich & Mendes, 2000) extends the transactional perspective of stress to consider the interplay between psychological processes and cardiovascular responses in terms of challenge and threat states. A *challenge* state is experienced when people appraise their personal resources as exceeding the demands associated with the stressor, whereas a *threat* state occurs when demands are perceived to outweigh personal resources (for reviews see Blascovich & Mendes, 2010; Hase, O'Brien, Moore, & Freeman, 2019). These two stress states have differential effects on physiological systems and, in turn, human function; a challenge state is characterised by increases in cardiac output, decreases in total peripheral

resistance, and rapid sympathetic nervous system activation (SNS), whereas a threat state is characterised by no or small increases in cardiac output, increases in total peripheral resistance, and a slow rise in SNS (Epel et al., 2018).

Scholars typically leverage key theoretical perspectives of psychological stress when designing stress regulation interventions with athletes. Broadly defined, coping represents self-regulatory mechanisms by which individuals manage internal or external demands appraised as stressful (Lazarus & Folkman, 1984). Interventions informed by the transactional theory of stress and coping (Lazarus & Folkman, 1984) might teach athletes coping strategies such as cognitive restructuring (e.g., Larsson et al., 1988) or emotion regulation (e.g., cognitive reappraisal, distraction; Balk et al., 2013) to enable them to appraise stressor experiences in adaptive ways. In contrast, interventions inspired by a biopsychosocial model might employ biofeedback (e.g., Kavussanu et al., 1998; Paul et al., 2012) or a combination of self-regulatory skills and enhanced biofeedback (e.g., Kachanathu et al., 2013) to help athletes address the interplay between psychological and physiological processes. Holistic approaches that originated from outside of the Western biopsychosocial medical approach, such as Acceptance and Commitment Therapy or Dialectical Behaviour Therapy (Follette & Hazlett-Stevens, 2016), may incorporate mindfulness strategies focused on breathing exercises and awareness of present thoughts and feelings (e.g., Glass et al., 2019; Siyaguna, 2019). At a broader level, multimodal interventions typically encompass multiple dimensions of the stress process including the interface between situational (e.g., coping strategies; Mesagno et al., 2008), psychological (e.g., attentional style, mental skills training; Larsson et al., 1988), and physiological dimensions (e.g., arousal, relaxation; Lautenbach et al., 2015). One such example of a multimodal intervention is stress inoculation training, which incorporates cognitive and behavioural methods to assist individuals in coping with stress. In such interventions, typically there is a primary emphasis on learning

coping skills (e.g., problem-solving skills), detecting negative self-talk, and re-directing energy to take constructive action and practicing these strategies during stressful situations (Meichenbaum & Novaco, 1985). Given the breadth and diversity of intervention options available, knowledge of which interventions are most effective and the conditions in which and people for whom they work best is required for optimising athletic performance.

In the latest integrative synthesis to date, Rumbold and colleagues (2012) evaluated stress regulation[1] interventions for athletes via a systematic review of the published literature up until 2010. They identified 64 studies in which scholars evaluated psychosocial interventions designed to help athletes regulate their interactions with stressors via experimental and non-experimental designs. Broadly, these interventions encompassed various cognitive strategies (e.g., self-talk, imagery), multi-modal packages (e.g., stress inoculation training), and alternative approaches (e.g., anger awareness, music interventions). Overall, their narrative synthesis of the literature generally supported the utility of these stress regulation interventions for reducing stressors, modifying cognitive appraisals, facilitating coping behaviours, and reducing negative affective states and increasing positive affective states. Regarding performance outcomes, findings supported the positive effects of cognitive (4 of 6), multimodal (23 of 30), and alternative (3 of 3) approaches for stress regulation interventions. The magnitude of effects for performance were weaker than those for psychosocial outcomes related to the stress process itself, thereby suggesting that changes in psychosocial factors (e.g., cognitive appraisals) may not necessarily translate into

[1] Technically, Rumbold and colleagues used the terminology "stress management". By definition, the term 'manage' implies that one has dealt with difficult circumstances successfully (https://dictionary.cambridge.org/dictionary/english/manage), whereas 'regulate' reflects doing something in a specific way irrespective of outcome (https://dictionary.cambridge.org/dictionary/english/regulate). We believe this distinction is important for two key reasons: (i) regulate conveys both reactive and proactive approaches to engaging with internal or external stimuli, which is most reflective of the ideal approach to engaging with stressors in one's life; and (ii) regulate does not conflate the concept with its outcome, which is important because one might regulate their efforts in/effectively depending on context. The term regulate is also preferred in other areas of psychological science, such as emotion regulation and self-regulation, where there exists large bodies of conceptual and empirical work.

performance benefits. Athletes' competitive level, age, and the temporal frame of the intervention were identified as potentially meaningful moderators of intervention effectiveness, with the strongest effects observed with athletes competing at college level or aged 12-21 years, and when interventions allowed for greater delivery time (2-month period). Collectively, therefore, these findings supported the effectiveness of stress regulation interventions with athletes.

There are several justifications for an update of Rumbold and colleagues' (2012) synthesis. First, the reliance on statistical significance, rather than the magnitude of effect and its precision for making inferences regarding intervention effectiveness, is suboptimal for informing theory and practice (e.g., false positives; Greenland et al., 2016). Second, the inclusion of non-experimental designs (e.g., non-random assignment) in their narrative synthesis makes it impossible to infer causal effects with certainty because one cannot discount alternative explanations for associations among determinants and outcomes. Third, the reliance on published research raises concerns regarding potential publication bias in that studies which produce statistically significant findings are more likely to be published and therefore skew the findings and their interpretations in ways that are favourable. Publication bias is a long-standing issue for the psychological sciences (Rosenthal, 1979), including the sub-field of sport and exercise psychology (Spence & Blanchard, 2001). Fourth, the evidence summarised reflected work completed up until 2010; thus, there is a need for an updated search to capture the past decade of research in this space. Accordingly, we address these considerations in the current study via a systematic review and meta-analysis of stress regulation interventions for athletes tested via randomised field or laboratory-based experiments.

The overarching goal of our work was to synthesise causal evidence on stress regulation interventions with athletes in a way that provides insight into the magnitude of the

effectiveness and extent to which such findings generalise across contexts. In so doing, we offer several important contributions to theory and practice on stress, athlete performance, and their interaction. Our first contribution is the assessment of the overall effectiveness of stress regulation interventions in optimising athlete performance. There exists meta-analytic evidence on the effectiveness of individual categories of stress regulation interventions such as mindfulness (Bühlmayer et al., 2017), self-talk (Hatzigeorgiadis et al., 2011), slow-paced breathing realized with heart rate variability biofeedback (Lehrer et al., 2020), and relaxation (Pelka et al., 2016). However, absent from the literature is a comprehensive statistical interrogation of stress regulation interventions, which can provide insight to the relative effectiveness of such approaches. Second, we test several moderators or boundary conditions of the effectiveness of stress regulation interventions with athletes that provide new knowledge for theory development, refinement, and elaboration (e.g., differential effectiveness of theory-informed versus theory-absent interventions), as well as practice (e.g., features of intervention programs including content, duration, and mode). As a complement to these statistical interrogations of the evidence, we narratively examine interventions tested in the literature to characterise the nature of stress regulation programs with regard to their design (e.g., materials, program deliverer, temporal elements) and active ingredients (i.e., behaviour change techniques). Finally, we conduct a comprehensive assessment of meta-bias to assess the extent to which elements of the scientific process (e.g., risk of bias, publication bias) contribute to over- or under-estimated statistical summaries of a body of work (Johnson & Hennessy, 2019; Mathur & VanderWeele, 2020). This contribution is important for making well-informed inferences regarding the quality of evidence and guiding future research in ways that alleviate methodological concerns present in existing research.

2.3. Methods

We registered the protocol for this systematic review on the Open Science Framework on April 15th 2020 using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses-Protocol template (PRISMA-P; Shamseer et al., 2015). Pre-registration of systematic review and meta-analysis protocols is considered best practice (Moher et al., 2015; Nosek et al., 2018) because it minimises bias (Kvarven et al., 2020; Quintana, 2015). The protocol registration, data files, and analytical scripts and outputs are located on the OSF project page (http://bit.ly/2Mvskg1). We report the results of this work in accordance with the PRISMA 2020 guidelines (Page et al., 2021).

2.3.1. Literature Search

We first conducted a search of the following electronic databases on April 29th 2020 to maximise reach (e.g., PsycInfo captures un/published literature) yet minimise redundancy (e.g., Falagas et al., 2008): Web of Science (core collection), Scopus, Embase, Medline, PsycInfo, CINHAL Plus, and ProQuest Dissertations and Theses Global. We also updated the search on July 7th 2021 as part of the peer-review process. The search strategy for each database included a combination of terms for the participant group (athlete* OR sport), target concept (stress* OR coping), and study design (intervention OR experiment* OR train* OR trial OR program* OR inoculation). We subsequently executed backward (i.e., reference lists of eligible studies) and forward searches (i.e., articles that cited the eligible studies using Google Scholar) for completeness.

2.3.2. Eligibility Criteria

We considered primary studies for inclusion if they: (i) tested the effectiveness of an intervention or training program of stress regulation with athletes; (ii) randomised participants to experimental conditions; and (iii) provided sufficient information in the published paper to compute an effect size for performance (i.e., the primary outcome) or this information was available by contacting the authors directly. We excluded studies when: (i)

they utilised non-experimental designs (e.g., cross-sectional, longitudinal, quasi-experimental such as non-random assignment); (ii) the article was written in any language other than English; (iii) the full-text was unavailable via our university library subscriptions or directly from the corresponding author (i.e., 2 email requests/reminders, separated by 2 weeks); (iv) information required to compute an effect size was unavailable in the document and via direct requests from the corresponding author (i.e., 2 email requests/reminders, separated by 2 weeks); and (v) the results were published as a conference abstract rather than a full-text report (e.g., dissertation, pre-print) because they are often poorly reported (e.g., Hopewell & Clarke, 2005).

Population. Athletes were the focus of this systematic review and meta-analysis. For the purpose of this study, an athlete is defined as an individual who is behaviourally engaged in sport, which is defined as 'involving physical exertion and skill as the primary focus of the activity, with elements of competition where rules and patterns of behaviour governing the activity exist formally through organisations and is generally recognised as a sport' (Australian Government, 2011, p. 7). When relevant information (e.g., the type of sport played) was unavailable in primary reports, we relied on authors' descriptions of their participants (e.g., if described as an athlete or sport performer we considered the study eligible for inclusion). There were no restrictions on type of sport or athlete demographics (e.g., competition level, age).

Intervention. We focused on interventions that targeted the regulation of athletes' experiences with stressors. It was expected that interventions would be characterised in ways that align with the definition of psychological stress, that being, a 'process that involves individuals transacting with their environments, making appraisals of the situations they find themselves in, and endeavouring to cope with any issues that may arise' (Fletcher et al., 2006, p. 329; adapted from Lazarus, 1999). We considered interventions that targeted one

intervention component in isolation (e.g., self-talk) or combined two or more components (e.g., stress inoculation training).

Comparators. We included all types of comparators, including waitlist controls, no contact controls, and active controls. We considered the nature of control groups when interpreting findings (see Freedland et al., 2019; Gold et al., 2017).

Outcomes. As athletes engage in sport primarily to achieve valued performance outcomes, we focused on performance as the primary outcome for this systematic review and meta-analysis. Within sporting contexts, performance represents the enactment of behavioural or cognitive tasks that characterise assessments of success in one's sporting domain. We considered indices of performance across technical, tactical, or physical domains (Janelle & Hillman, 2003). We expected individual performance to be assessed via objective (e.g., competition statistics), informant-reported (e.g., coach assessed), and/or subjective (i.e., self-reported) measures. Given the centrality of athlete appraisals within the stress regulation process (e.g., Hobfoll, 1989; Lazanis, 1999), we examined athletes' stress perceptions as a secondary outcome. The transactional stress process consists of a wide variety of components including stressors, appraisals, emotions, and coping; it is the balance of, and interrelation among, these components that has the potential to affect athletes' perceptions of stress (Lazarus & Folkman, 1984). We also examined physiological markers of the stress process (e.g., heart rate variability, salivary cortisol, respiration rate) as a secondary outcome at the request of reviewers. Nevertheless, we present the findings of these secondary outcomes only rather than discuss their implications because we prioritised identifying literature that included performance as an outcome, so we cannot be certain that we've sourced the full spectrum of work that has examined the effects of stress regulation interventions on psychological or physiological outcomes.

2.3.3. Article Screening

Two independent reviewers [EM and RL] executed the screening process independently using a web application – Research Screener (https://researchscreener.com) – allowing assessors to screen titles and abstracts from databases using machine learning. Research Screener ranks the abstracts in order of significance from existing articles known to the team as relevant for inclusion based on the screening criteria, and continuously updates the learning algorithm every 50 abstracts screened based on what is deemed as in/eligible by the reviewer. Preliminary evidence supports the utility of Research Screener for semi-automating the screening process (Chai et al., 2021). Briefly, across nine systematic reviews and two scoping reviews, Research Screener delivered a 60-90% workload saving, and estimated a conservative threshold of the need to screen no more than 50% of articles to assure that 100% of eligible articles are identified. EM and RL discussed uncertainty regarding the screening decision for 16 papers with DG, who made the executive decision regarding their suitability for inclusion in the meta-analysis. Reasons for study exclusion were summarised as part of the search and included in the data extraction flow diagram (see Figure 1).

2.3.4. Data Extraction

EM extracted all data items from primary studies using a pre-determined form or requested information from the corresponding author of eligible studies when the data were unavailable in the full text. We extracted data on the nature of the publication, participants characteristics, key details of the intervention as per the template for intervention description and replication (TIDieR) guidelines (Hoffmann et al., 2014), type of outcome, type of comparator, descriptive statistics of key study variables, theoretical framework employed to guide the intervention (if any), source of ratings for moderator and outcome variables, and the statistical technique for the primary analysis. The data extraction form is available on the

OSF project page. A second member of the research team [DG] assessed a random sample of 50% of data extraction forms to check accuracy and consistency; DG noted minor errors (e.g., coding of intervention characteristics according to TIDieR) that were subsequently rectified by EM in the remaining 50% of articles.

2.3.5. Statistical and Narrative Analyses

Coding of studies. Key information from studies, interventions, samples, and outcome variables were coded using a detailed template. We coded performance as either physical or cognitive in nature, whereas psychological outcomes were coded as cognitive, emotional/affective (e.g., stress perception), or motivational/self-efficacy/perceived control. We coded interventions among eligible studies into one of five categories according to the overarching content of the program: biofeedback (use of an external device to provide information about one's physiological state), cognitive elements (mental strategies designed to regulate stressor interpretations, e.g., reappraisal), mindfulness/meditation (breathing exercises and awareness of present thoughts and feelings or mind-body exercises designed to develop a sense of calmness and balance; see van Agteren et al., 2021), relaxation (psychomotor techniques which target the central nervous system and a reduction in sympathetic activation), and multimodal components (incorporation of stress regulation categories over an intervention period). We also coded for participant exposure to low stress (e.g., training, execution of skills in no timeframe) and/or high stress environments (e.g., competition, videotaping performance), and method of assessment for the outcome variable (objective, subjective, informant assessed). Regarding study characteristics, we coded for publication type (peer reviewed paper or dissertation), comparator type (no treatment, waitlist, regular practice, contact control), and the inclusion of a follow-up measurement (an assessment period which occurs after the intervention to examine the degree to which effects

are lasting) in the study. We coded for sample characteristics by gathering the percentage of female participants and mean age.

Calculation of effect sizes. To quantify the effect of the intervention against the comparator group, we calculated the standardised mean difference, allowing for synthesis of the same outcome variable across studies when measured using different tools. When studies included primary outcome variables measured at multiple time points post intervention, we computed effects independently for first post-intervention or second post-intervention. Effect sizes were calculated from means, standard deviations, and sample sizes of experimental groups using established formulas for pre-post (Morris, 2008) and post-only (Borenstein et al., 2009) designs. When these statistics were missing or unavailable from authors, we used *F* statistics, *t* scores, and *p* values to calculate effect sizes (Lakens, 2013). We used an excel file to facilitate the calculation of the effect sizes, which is available on OSF project page. A positive effect size represented the beneficial effects of stress-regulation interventions; in cases where a higher score was indicative of a worse performance (e.g., time taken to run a race), we transformed the effect size direction so that a positive effect size represented better performance for stress regulation conditions.

Statistical synthesis of effect sizes. The majority of included studies ($k = 17$) consisted of two or more effect sizes and/or compared multiple treatments against the same comparator group (i.e., multiple treatment studies; Gleser & Olkin, 2009). To account for such dependencies among effect sizes from the same study, we utilised a three-level meta-analytic model to account for sampling variance of individual effects (level 1), and variance of effects within (level 2) and between (level 3) studies (Cheung, 2014; 2019). Readers are referred elsewhere for a tutorial on three-level meta-analysis (Gucciardi et al., 2021). We first estimated an overall effect of stress regulation interventions on performance, psychological, and physiological outcomes separately using an intercept only random-effects model with

restricted maximum-likelihood estimation. One-tailed likelihood ratio tests were subsequently applied to test the statistical meaningfulness of the variance distributed within (level 2) and between (level 3) studies; statistically significant ($p < .05$) variance at either level implies that effect sizes are heterogeneous and, therefore, moderator analyses are justified. In such cases, we extended the intercept-only model with the moderator variables noted below using an adjustment to the standard errors to minimise the likelihood of unjustified significant results (Knapp & Hartung, 2003). We conducted all statistical analyses using the package *metafor* (Viechtbauer, 2010) in the R statistical platform (R Development Core Team, 2019). The full analytical script is available on the OSF project page.

Moderator and sensitivity analyses. We examined elements of the study sample (age and percentage of female participants), intervention type (biofeedback, mindfulness/meditation, relaxation, cognitive, and multimodal), assessment time point (first post-intervention and second post-intervention), theory-informed intervention (yes/no), comparison group (contact control, no treatment, regular practice, waitlist), outcome assessment method (informant, objective, subjective), testing session (low or high stress), intervention materials (hardcopy, diary, technology-enhanced, none), intervention provider (healthcare professional, researcher, none mentioned), delivery mode (face-to-face or self-directed/face-to-face in group, face-to-face for individuals, self-directed), temporal frame of the intervention (1 session, 1-2 weeks, 4-8 weeks, 10-12 weeks), intervention delivery duration (continuous), and intervention time (continuous) as moderators of the overall pooled effect. Continuous variables were mean centred prior to moderation analyses. Sensitivity analyses were performed to examine the presence and influence of outlier cases and influential studies on the overall pooled effect.

Statistical heterogeneity. We calculated the I^2 statistic to quantify the proportion of variability in effects that cannot be attributed to sampling variance (Higgins & Thompson,

2002; Huedo-Medina et al., 2006). An intuitive way to appreciate the I^2 statistic is as an indication of 'the amount of non-overlap among confidence intervals' (Borenstein et al., 2017, pp. 7). In three-level meta-analysis, total heterogeneity (I^2 statistic) is decomposed across levels, such that there exists within-study heterogeneity (I_2^2) and between-study heterogeneity(I_3^2). To estimate the absolute amount of variability among effects, we computed the prediction interval to make inferences regarding the 95% likelihood that an effect in future similar studies will fall between an estimated range (Borenstein et al., 2017; IntHout et al., 2016).

Meta-bias. As a first look at publication bias, we quantified the magnitude and meaningfulness of effect size differences via meta-regressions in which the overall effect is regressed on sample size, publication type (peer-reviewed versus unpublished), and study quality (i.e., risk of bias – see below). We assessed publication bias using the multilevel extension of Egger's regression test (Egger et al., 1997), where the overall pooled effect from the three-level model is regressed on some function of the standard error of effect sizes (Fernández-Castilla et al., 2021) and contour-enhanced funnel plots including regions for statistical significance at $p < .05$ and $p < .01$ levels (Peters et al., 2008), where asymmetry in the plot is interpreted as evidence of publication bias (Lau et al., 2006). We also utilised the R package *metaviz* (Kossmeier et al., 2019) to produce 'sunset' funnel plots from the meta-analytic data that incorporate information on statistical power of each individual study included in the synthesis (Kossmeier et al., 2020). Finally, we conducted a *p*-curve analysis to assess the evidential value via a distribution of statistically significant findings only; a left-skewed curve indicates possible bias and a right-skewed supports evidential value (Simonsohn et al., 2014).

Confidence in cumulative evidence. The quality of evidence and strength of recommendations was assessed using the GRADE approach across the domains of risk of

bias, consistency, directness, precision, and publication bias (Guyatt et al., 2008). The Cochrane revised risk of bias tool (RoB 2; Sterne et al., 2019) was used to extract relevant information; the results of this assessment are located on the OSF project page.

Narrative analysis of intervention content. In addition to a statistical synthesis, we narratively synthesised the findings of eligible studies to summarise and explain the characteristics and findings of stress regulation interventions, according to TIDieR guidelines (e.g., content, mode of delivery; Hoffmann et al., 2014). Specifically, we captured the nature of interventions (e.g., duration, mode) where stress regulation training was found to be effective. Additionally, we identified the active ingredients present in stress regulation interventions using the behaviour change technique taxonomy (Michie et al., 2013).

2.3.6. Deviations from Pre-Registered Protocol

We deviated from the pre-registered protocol in the following ways. First, in cases where a study had more than one comparator group (e.g., placebo group), we decided to analyse the groups separately rather than to merge the comparator groups because three-level meta-analysis can handle dependency among effects. Second, we did not compute sensitivity analyses for athlete competition level (e.g., elite or non-elite) because in most cases non-elite athletes participated in the included studies and there was insufficient detail by which to categorise samples using recommended guidelines (see Swann et al., 2015). Third, the degree of participant attrition was excluded from analyses due to insufficient reporting of this methodological feature within the eligible studies. Fourth, there was substantial variation in the types of scales utilised and concepts assessed for stress perceptions and psychological outcomes; accordingly, we decided to integrate these assessments in broad categories (e.g., cognitive, emotion/affect) because it was a secondary focus of the meta-analysis. Fifth, we planned to synthesise intervention content using the compendium of self-enactable techniques (Knittle et al., 2020), yet were unable to do so because the majority of interventions were

delivered by a third person/party and often there was insufficient detail regarding intervention content. Sixth, we utilised sunset (power-enhanced) funnel plots to visualise and assess the evidential value of the studies included in this meta-analysis (Kossmeier et al., 2020). Seventh, we decided to explore the presence and influence of outliers because they can alter the confidence in one's interpretation of the robustness of the overall pooled effect (Viechtbauer & Cheung, 2010). Eighth, we incorporated a *p*-curve analysis as part of our multicomponent investigation of meta-bias. Ninth, we decided against conducting a trim and fill analysis as part of the multicomponent publication bias tests because simulations show that it works best with large numbers of effects and sample sizes (Fernández-Castilla et al., 2021), something which was uncharacteristic of our dataset, and has limited power to detect selection bias (Rodgers & Pustejovsky, 2020). Finally, we included physiological markers of the stress process as a secondary outcome at the request of reviewers.

2.4. Results

2.4.1. Literature Search Overview

An overview of the search and study selection process is presented in Figure 1. In total, we identified 21 eligible studies from the electronic database search, and an additional 6 eligible studies via forward and backward scans; three papers reported results from the same sample so we coded them as coming from the same Level 3 study (John et al., 2010, 2011; Kachanathu et al., 2013). Of these 27 studies, the information required to compute effect sizes was unavailable in four cases (Christie et al., 2020; Marshall, 2002; McCormick, 2016; Thompson et al., 2020), which resulted in a final sample of 23 studies included in the meta-analysis. The 23 studies were published between 1983 and 2019, and yielded 115 effect sizes (ES) of which 93 were deemed relevant for inclusion. The total sample included 899

participants who, on average, were 26.50 years of age and 42% female participants (see Table 1 for a detailed overview of included studies).

2.4.2. Overall Effect of Stress Regulation Interventions

Performance. The overall effect of stress regulation interventions (65 effect sizes, k = 21, N = 2022) on performance was moderate in magnitude (g = 0.52, se = 0.16, 95% CI = 0.19, 0.84; see Figure 2). The 95% prediction interval revealed a 95% chance that the effect of a new study will lie between -1.00 and 2.03 (Hedges' g). The likelihood ratio tests revealed significant variance in effects within studies (level 2; LRT = 14.93, p < .001) and between studies (level 3; LRT = 37.93, p < .001), which explained 22.19% and 57.16% of the variance, respectively. As there was substantial heterogeneity among effect sizes (I^2 = 79.35%; Higgins et al., 2003), we carried out moderator analyses to examine factors that may explain the variance between studies.

Psychological dimensions. The overall effect of stress regulation interventions (28 effect sizes, k = 10, N = 787) on psychological outcomes was small in magnitude and statistically inconsequential (g = 0.35, se = 0.23, 95% CI = -0.12, 0.81; see Supplementary Figure 1). The 95% prediction interval revealed a 95% chance that the effect of a new study will lie between -1.10 and 1.80 (Hedges' g). The likelihood ratio tests revealed significant variance in effects between studies (level 3; LRT = 16.98, p <.001) but not within studies (level 2; LRT = .03, p = .86), which explained 73.64% and 1.30% of the variance, respectively. As there was substantial heterogeneity among effect sizes (I^2 = 74.94%; Higgins et al., 2003), we carried out moderator analyses to examine factors that may explain the variance between studies.

Physiological dimensions. The overall effect of stress regulation interventions (28 effect sizes, k = 10, N = 368) on physiological outcomes was large in magnitude and statistically meaningful (g = 2.13, se = 0.81, 95% CI = 0.47, 3.79; see Supplementary Figure

2). The 95% prediction interval revealed a 95% chance that the effect of a new study will lie between -4.07 and 8.32 (Hedges' *g*). The likelihood ratio tests revealed significant variance in effects within studies (level 2; LRT = 138.86, $p < .001$) and between studies (level 3; LRT = 9.75, $p = .002$), which explained 59.72% and 38.47% of the variance, respectively. As there was substantial heterogeneity among effect sizes ($I^2 = 98.19\%$; Higgins et al., 2003), we carried out moderator analyses to examine factors that may explain the variance between studies.

Sensitivity tests. We conducted a series of sensitivity tests to examine the influence of outliers and influential studies on the overall pooled effects. In terms of performance outcomes, one study reported one effect whose residual exceeded three standard deviations (Paul & Garg, 2012). The overall effect of stress regulation interventions on performance reduced by 0.02 with the removal of this one outlier ($g = 0.50$, se = 0.16, 95% CI = 0.19, 0.82). There were four effects with a Cook's distance more than three times the mean (De Witt, 1980; Hall & Erffmeyer, 1983; John et al., 2011; Lautenbach et al., 2015); the exclusion of these outliers reduced the overall effect of stress regulation interventions on performance by 0.09 ($g = 0.43$, se = .15, 95% CI = .13, .73). None of the effects for psychological outcomes had residuals that were more than three standard deviations from the mean. Two effects had a Cook's distance more than three times the mean (Larsson et al., 1988; Solberg et al., 1996); the exclusion of these outliers reduced the overall effect of stress regulation interventions on psychological outcomes by 0.02 ($g = 0.33$, se = 0.26, 95% CI = -0.19, 0.86). Regarding physiological outcomes, one study reported one effect whose residual exceeded three standard deviations (John et al., 2010). The overall effect of stress regulation interventions on physiological outcomes reduced by 0.22 with the removal of this one outlier ($g = 1.91$, se = 0.65, 95% CI = 0.57, 3.24). There were five effects with a Cook's distance more than three times the mean (Choudhary et al., 2016; John et al., 2010, 2011; Kachanathu

et al., 2013); the exclusion of these outliers reduced the overall effect of stress regulation interventions on performance by 1.01 (g = 1.12, se = .47, 95% CI = 0.21, 2.02).

2.4.3. Moderator Effects

Results of the moderator analyses for performance and psychological outcomes are provided in Table 2. Statistical power for meta-analytic models involving three or more levels is typically optimised because it maximises the available information (López-López et al., 2017), yet it is also important to acknowledge that our moderator tests here are potentially underpowered when levels of the moderator are characterised by one or two studies or effects.

Performance. Of 11 candidates, only one variable moderated the overall effect of stress regulation interventions on performance, namely assessment time point, $F(2, 63) = 12.62$, $p < .001$, such that intervention effects were strongest at second post-intervention (g = 1.32, 95% CI = 0.78, 1.86) when compared with first post-intervention (g = 0.44, 95% CI = 0.15, 0.74). The inclusion of this moderator to the overall model, Cochran's $Q(64) = 322.01$, $p < .001$, significantly reduced heterogeneity, yet the residual heterogeneity remained statistically meaningful, $QE(63) = 247.68$, $p < .001$. Model comparisons indicated that the best model in terms of parsimony and fit was the one that included assessment time point as a moderator of the pooled effect (AICc = 153.21, BIC = 161.24), relative to the overall model excluding all moderators (AICc = 163.11, BIC = 169.24). Collectively, these findings supported the meaningfulness of assessment time point as a moderator. All other moderators were statistically inconsequential.

Psychological dimensions. Of 11 candidates, two variables moderated the overall effect of stress regulation interventions on psychological outcomes, namely (i) intervention type, $F(3, 24) = 4.47$, $p = .012$, such that intervention effects were strongest and meaningfully different from zero for biofeedback only (g = 1.80, 95% CI = 0.79, 2.81); and (ii) temporal

frame, $F(3, 25) = 5.43$, $p = .005$, such that intervention effects were strongest and meaningfully different from zero when the intervention lasted between 1-2 weeks ($g = 1.80$, 95% CI = 0.78, 2.82). The inclusion of these two moderators to the overall model, Cochran's $Q(27) = 92.47$, $p < .001$, significantly reduced heterogeneity, yet the residual heterogeneity remained statistically meaningful, $QE(22) = 39.89$, $p = .01$. Model comparisons indicated that the best model in terms of parsimony and fit was the one that excluded intervention type and temporal frame as moderators (AICc = 57.45, BIC = 60.45), relative to the model that included them as moderators (AICc = 60.02, BIC = 63.10). All other moderators were incompatible with a meaningful effect.

Physiological outcomes. Of 10 candidates, two variables moderated the overall effect of stress regulation interventions on psychological outcomes, namely (i) intervention type, $F(4, 24) = 11.40$, $p < .001$, such that intervention effects were strongest and meaningfully different from zero for biofeedback ($g = 2.82$, 95% CI = 1.70, 3.94) and mindfulness/meditation ($g = 8.08$, 95% CI = 5.82, 10.34); and (ii) theory-informed interventions, $F(1, 26) = 5.43$, $p = .003$, such that intervention effects were strongest and meaningfully different from zero when the intervention was developed with no specific mention of theory as a guide ($g = 3.95$, 95% CI = 2.32, 5.57) compared with theory-informed interventions ($g = 0.28$, 95% CI = -1.36, 1.93). The inclusion of these two moderators to the overall model, Cochran's $Q(27) = 92.47$, $p < .001$, significantly reduced heterogeneity, yet the residual heterogeneity remained statistically meaningful, $QE(22) = 223.04$, $p < .001$. Model comparisons indicated that the best model in terms of parsimony and fit was the one that included intervention type and theory-informed intervention as moderators (AICc = 128.24, BIC = 131.32), relative to the model that excluded them as moderators (AICc = 138.15, BIC = 141.15). All other moderators were incompatible with a meaningful effect.

2.4.4. Assessment of Meta-Bias

Performance. The multilevel extension of Egger's test, F (1,63) = 20.07, $p < .001$, suggested asymmetry in the funnel plot; visual inspection indicates that effects are roughly distributed unevenly on either side of the mean effect, with smaller studies favouring stronger positive effects of stress regulation interventions on performance (see Figure 3). The sunset enhanced funnel plot depicted in Figure 3 indicated that the median power of all studies is 22.4%, assuming an effect of g = 0.50, and low probability of replication (R-index = 0%). Sample size, $F(1, 63) = 0.18$, $p = .67$, publication status, $F(1, 63) = .91$, $p = .34$, and study quality, $F(1, 63) = 0.002$, $p = .96$, did not alter the strength of effect of stress regulation interventions on performance. The *p*-curve analysis supported evidential value in the summarised literature, with fewer large ($p > .04$) than small ($p \leq .01$) p values, with a high power of tests included in the p-curve (97%, 90% CI = 92%, 99%). The visual depiction of the *p*-curve analysis is available on the OSF project page.

Psychological dimensions. The multilevel extension of Egger's test, F (1,26) = 3.10, $p = .09$, suggested symmetry in the funnel plot, which was supported by a visual inspection of the funnel plot (see Supplementary Figure 3). The sunset enhanced funnel plot depicted in Supplementary Figure 3 indicated that the median power of studies is 24.4 %, assuming a true effect of 0.50 ($p = .05$), and these studies have a low probability of replicating (R-index =16.7%). Sample size, $F(1, 26) = 1.48$, $p = .24$, publication status, $F(1, 26) = .51$, $p = .48$, and study quality, $F(1, 26) = 0.18$, $p = .68$, did not alter the strength of effect of stress regulation interventions on psychological outcomes. The *p*-curve analysis supported evidential value in the summarised literature, with fewer large ($p > .04$) than small ($p \leq .01$) p values, with a reasonable degree of power of tests included in the p-curve (78%, 90% CI = 44%, 94%). The visual depiction of the *p*-curve analysis is available on the OSF project page.

Physiological dimensions. The multilevel extension of Egger's test, F (1,26) = 27.43, p <.001, suggested asymmetry in the funnel plot, which was supported by a visual inspection of the funnel plot (see Supplementary Figure 3). The sunset enhanced funnel plot depicted in Supplementary Figure 3 indicated that the median power of studies is 17.6 %, assuming a true effect of .50 (p = .05), and these studies have a zero probability of replicating (R-index =0%). Sample size, F(1, 26) = 2.15, p = .15, publication status, F(1, 26) = 1.68, p = .21, and study quality, F(1, 26) = .15, p = .70, did not alter the strength of effect of stress regulation interventions on physiological outcomes. The p-curve analysis supported evidential value in the summarised literature, with fewer large (p > .04) than small ($p \leq .01$) p values, with a high power of tests included in the p-curve (99%, 90% CI = 99%, 99%). The visual depiction of the p-curve analysis is available on the OSF project page.

2.4.5. Risk of Bias

We assessed risk of bias on the primary outcome of performance (k = 23) using the RoB2 framework and guidelines (Sterne et al., 2019). A summary of all primary studies is depicted in Table 3, whereas individual assessments of each primary study are provided on the OSF project page. Overall bias decisions revealed that 21 outcomes were rated as having some concerns, primarily due to none of these studies being pre-registered. In terms of high risk of bias, two outcomes received the highest risk rating (Choudhary et al., 2016; Greenspan, 1991). The main sources of bias identified for these two studies were: (1) not pre-registering the protocol, (2) concerns regarding the measurement of performance, and (3) deviations from the intended intervention. For the 21 outcomes assessed as having some concerns, the main sources of bias related to the randomisation process (15 out of 21) and selection of the reported results (21 out of 21). The major reasons outcomes received this rating were due to (1) limited details presented on the randomisation of participants to experimental groups and (2) not preregistering the protocol.

2.4.6. GRADE Assessment

An overview of our assessment of quality of evidence contributing to the analyses of the effects of stress regulation interventions using the GRADE system is presented in Table 4. We assessed the overall level of certainty of evidence that stress regulations positively affect performance and psychological outcomes as low. This assessment was due to serious concerns regarding risk of bias outlined above, inconsistency in point estimates of effects and non-overlap in several confidence intervals, large degree of between-study heterogeneity, and a small risk of reporting bias because we were unable to access data for four studies.

2.4.7. Narrative Synthesis of Stress Regulation Interventions

All details of the data extracted from each study, according to the 12 TIDieR dimensions (Hoffmann et al., 2014) is provided on the OSF project page. We summarise the findings of this review below, with a specific focus on dimensions that characterise the nature of stress regulation interventions within all 23 eligible papers. This narrative synthesis focuses on the core methodological items in the TIDieR checklist, namely items 3-9 (Dirven et al., 2020).

Materials used to deliver stress regulation interventions. The majority of studies utilised materials to administer interventions (k = 22). In 14 studies, the materials utilised technology (e.g., a cassette, computer, audio recording) to assist with the delivery of stress regulation interventions. Music was delivered via a CD in three studies as a relaxation / mindfulness device, whereas four studies used biofeedback devices to capture physiological data to assist with the delivery of the intervention. There were eight studies that used workbooks or handouts (k = 5) or diaries (k = 3) as part of the intervention delivery to guide and inform participants about the stress regulation process. The remaining study did not utilise intervention materials (Pelka et al., 2017).

Stress regulation intervention providers. The majority of eligible studies (*k* = 16) reported details on who delivered the intervention, yet the information provided was often vague and limited in detail. The primary reason for this interpretation is that limited information was provided on these individuals with regard to their suitability to deliver a stress regulation intervention (e.g., expertise, training); for example, authors often described intervention providers as the experimenter(s) and/or researcher(s) (*k* = 11). There were seven studies where there was no mention of the intervention provider (e.g., Choudhary et al., 2016; Hall & Erffmeyer, 1983). There were only five studies identified where adequate and detailed information on the providers of the intervention was reported, such as the delivery of the intervention by a licensed/registered psychologist, the psychologist's experience working with athletes, and their involvement throughout the intervention process (e.g., Glass et al., 2019; Greenspan, 1991).

Mode of delivery. Most studies provided interventions via face-to-face delivery (*k* = 19); seven of these studies were delivered individually and 12 studies were delivered in a group setting. The remaining four studies consisted of interventions that were completed individually in the participants' own time (e.g., listened to a relaxation cassette or completed a Stress Inoculation Manual). In one study, the self-talk manual was emailed to participants for self-completion (McCormick et al., 2018).

Dosage of stress regulation interventions. Most studies (*k* = 21) delivered the intervention across multiple sessions or time points; the remaining two studies delivered a booklet/manual to participants in one session (McCormick et al., 2018; Serrano, 1993). We assessed three criteria to characterise the dosage of interventions, namely time spent in the stress regulation intervention, total study duration, and the number of sessions/temporal frame over which the intervention occurred. All studies reported information for at least one for these areas, with 21 (91%) reporting sufficient detail for all dimensions, and the

remaining two studies reporting one out of three criteria (Balk et al., 2013; Serrano, 1993). In terms of the temporal frame over which stress regulation interventions occurred, the majority of sessions took place for six weeks (k = 5) or for one session (k = 5). The remaining studies (k = 13) varied in their temporal frame from two sessions (Whitmarsh, 1992) to 12 weeks (LaGrange & Ortiz, 2006). Information on the total study duration was reported in the majority of eligible studies (k = 22), with time ranging from less than one hour to 720 minutes. The actual time spent taking part in the stress regulation intervention was reported by the majority of eligible studies (k = 21), where total time ranged between 20 minutes to 75 minutes (M_{mins} = 37, SD = 18.06).

Active ingredients of stress regulation interventions. We used the Behaviour Change Technique (BCT) Taxonomy (Michie et al., 2013) to examine the active ingredients implemented in the stress regulation interventions of the eligible papers (see Table 5). The most commonly reported behaviour change techniques reported were: (i) behavioural practice/rehearsal (n = 13); (ii) self-belief, including mental rehearsal of successful performance, focus on past performance, and/or self-talk (n = 11); (iii) regulation, including techniques that target reduced negative emotions (n = 8); and (iv) shaping knowledge, which consists of instructions on how to perform the behaviour and/or information about antecedents (n = 8). There were seven studies which targeted self-monitoring of behaviour or biofeedback as a mechanism for behaviour change (e.g., Choudhary et al., 2016; McCormick et al., 2018). Overall, our analysis revealed a wide range of active ingredients present in stress regulation interventions with athletes.

2.5. Discussion

Stressors are prevalent within sport settings (Arnold et al., 2013; Sarkar & Fletcher, 2014), hence interventions are essential to enable athletes to regulate their engagement with

such experiences optimally (Brown & Fletcher, 2017). Valuable evidence acquired via a narrative synthesis of the literature up to 2010 revealed support for the positive effects of cognitive, multimodal, and alternative approaches for stress regulation interventions on performance outcomes for athletes (Rumbold et al., 2012). Nevertheless, this summation of the literature is limited by the reliance on statistical significance for interpretations regarding the value of such work, mixing of non-experimental with experimental evidence, and inclusion of published work only. We addressed these limitations in the current study via a systematic review of the literature on stress regulation interventions and meta-analysis of randomised controlled experiments to estimate the magnitude of their effectiveness, the types of interventions that are most effective, and the conditions in which and athletes for whom we might expect the strongest effects. In so doing, we present the first statistical summary of the effectiveness of stress regulation interventions for optimising athlete performance.

2.5.1. Are Stress Regulation Interventions Effective for Optimising Athlete Performance?

Across 21 randomised experiments, we found a significant moderate overall effect of stress regulation interventions on performance outcomes (g = .52). This estimate is comparable with the summary effect reported in a previous meta-analysis of psychological, social, and psychosocial interventions with sport performers (g = .57; Brown & Fletcher, 2017). Sensitivity and meta-bias analyses generally supported the robustness of the pooled effect of stress regulation interventions on athlete performance. Considered in combination with existing narrative evidence (Rumbold et al., 2012), this pooled effect offers an optimistic view regarding the effectiveness of stress regulation interventions for athlete performance. Nevertheless, caution is urged when making inferences regarding the extent to which this summary effect generalises to future studies of a similar nature to those encompassed by our statistical synthesis because the prediction intervals suggested some interventions may be

inefficacious or detrimental for athlete performance. In other words, the summary effect reported here may represent an overestimation and, therefore, a true null effect of stress regulation interventions on athlete performance in future experimental trials cannot be discounted.

Our assessments of heterogeneity, meta-bias and risk of bias, methodological quality, and the overall quality of the evidence point towards several possibilities why there may be substantial noise and imprecision in the overall pooled estimate of the effect of stress regulation interventions on athlete performance. Prediction intervals may incorporate heterogeneity in the effect sizes and the quality of studies synthesised (Riley et al., 2011). Any biases in primary studies (e.g., poor statistical power) are, therefore, included in the calculation of the prediction interval (Higgins & Green, 2011). Substantively, we synthesised a diverse range of stress regulation interventions so there likely is some degree of heterogeneity in the primary effects because of this diversity in the nature of stress regulation interventions. Examples of this variability in the magnitude of effects of specific psychological interventions can be found in terms of mindfulness (SMD = 1.35; Bühlmayer et al., 2017), self-talk (d = .48; Hatzigeorgiadis et al., 2011), biofeedback (g = .90; Lehrer et al., 2020), or multimodel programs (g = .57; Brown & Fletcher, 2017). Variability in elements of the primary studies synthesised in our statistical model as moderators have also likely contributed to the heterogeneity in effect sizes, including sample characteristics (i.e., age, gender), comparator groups (e.g., active control, waitlist), and intervention characteristics (e.g., active ingredients). We also cannot rule out the possible influence of contextual factors of primary studies that we were unable to extract from the information reported in the manuscript (e.g., degree of participants' engagement with the intervention).

Study quality is another important consideration for interpretations of pooled meta-analytic estimates. Our risk of bias assessment indicated all included studies had 'some

concerns' or 'high risk'. The main areas of concern related to the randomisation process (e.g., limited details presented on the randomisation of participants to control or experimental groups) and selection of the reported results (e.g., little or no information on the data analyses executed). Randomisation, for example, is the hallmark of high-quality experimental trials, because it reduces selection bias when the allocation sequence is unpredictable and unknown to investigators who enrol participants into a trial (Schulz et al., 2010). It is important for scholars to provide such detail on intervention procedures in future research so that findings are transparent, replicable, and enhance understanding in the field. Perhaps most pivotal, our sunset funnel plots indicated that the available evidence in primary studies identified via our systematic search is insufficiently powered to detect meaningful effects if they exist, and that the pooled effect might be considered a false positive. This finding is consistent with previous snapshots of the sport and exercise psychological literature in which it was revealed that statistical power in this field is often insufficient to detect effects of a magnitude considered typical for psychological research (Schweizer & Furley, 2016). Our findings reinforce the importance of justifications for sample sizes in future research so that readers can evaluate the degree to which a study finding is informative (Lakens, 2021).

2.5.2. Which Type of Stress Regulation Interventions are Most Effective?

We examined a broad array of substantive and methodological moderators of the effectiveness of stress regulation interventions as a means by which to shed light on boundary conditions. A key consideration in this regard is the substantive focus and content of the stress regulation intervention itself, because this information can offer insights into which ingredients or package of ingredients are most effective for optimising athlete performance. Visual inspection of the individual effect sizes for each intervention suggested that some approaches were more effective than others (see Table 2), yet moderator analyses indicated that the inclusion of intervention type as a predictor of the overall pooled effect was

statistically inconsequential and therefore inconclusive. The most likely explanation here is that we were underpowered to detect a meaningful moderator effect, with some intervention categories encompassed by one or two studies or effects. Low statistical power for detecting moderator effects in meta-analyses is common within the psychological sciences (Cafri et al., 2010).

Harnessing theories of human behaviour optimises intervention development because they help clarify the complexities of behaviour change (e.g., causal determinants, mechanisms of action; Bohlen et al., 2020). Theory also provides expectations regarding core concepts and their integration within a nomological network including core determinants, mechanisms, and boundary conditions that ultimately optimises cumulative science and effective practice (Muthukrishna & Henrich, 2019). Our narrative synthesis of stress regulation interventions identified limited coherence in or absence of theoretical approaches driving behaviour change techniques utilised within existing stress regulation interventions. In only 9 of 23 cases, the study authors reported the use of psychological theory to guide their intervention approach, which included theories or conceptual models of mental practice (Sackett, 1934), person-situation interactions (Smith & Rohsenow, 1987), and stress and coping (Lazarus & Folkman, 1984). Nevertheless, the translation of guiding theory into intervention design was reported sufficiently in only two of these nine papers (Greenspan, 1991; Larsson et al., 1988). Larsson and colleagues (1988), for example, leveraged Lazarus and Folkman's theory of stress and coping as a means by which to apply stress inoculation training via elements of problem identification, psychoeducation, and skills training (e.g., cognitive restructuring, relaxation) and their application and refinement in simulated competitive performances. Equally, there were instances of misalignment between an overarching theoretical framework and the BCTs employed in the intervention. As an illustrative example, Whitmarsh (1992) referred to neurobiological theories of pain but

implemented a Stress Inoculation Training intervention which targeted a reduction in negative emotions, behavioural practice/rehearsal, and mental rehearsal. The plethora of competing alternative (yet oftentimes complementary) theoretical perspectives in the behavioural sciences, particularly within the domain of stress (Harris, 2020), represents a salient challenge for scholars interested in developing theory-informed interventions (Hastings et al., 2020). Integrative work is underway that leverages ontological modelling systems to unify knowledge of entities (e.g., concepts, objects, events) across disciplines (West et al., 2019). One consideration for future work is the need to develop a taxonomy of key concepts in theories of stress, mechanisms of action, and potential intervention targets.

2.5.3. What are the Conditions in Which and for Whom are Stress Regulation Interventions Most Effective?

Our statistical and narrative analyses provided new knowledge on substantive and methodological boundary conditions of the effectiveness of stress regulation interventions for athlete performance. We extracted information on and statistically tested features of the testing context (i.e., low versus high stress, assessment time point, outcome assessment method, comparator group), sample characteristics (i.e., age, gender), and intervention features (i.e., materials, provider, delivery mode, temporal frame, delivery duration, intervention time). Of these factors, only assessment time point was a salient moderator of the overall pooled effect of stress regulation interventions on athlete performance, such that effects were strongest at second post-intervention (g = 1.32, 15 effects) when compared to first post-intervention (g = .44, 78 effects). This finding is comparable with a previous meta-analysis of psychological, social, and psychosocial interventions with sport performers, where it was found the effect on performance was strongest at second post-intervention (g = 1.16), when compared with first post-intervention (g = .57; Brown & Fletcher, 2017). The assessment of the primary outcome at first post-intervention was measured firstly after the

intervention occurred (k = 15), one-week after the intervention occurred (k = 2), or throughout the intervention over a 3-month period (k = 2). The assessment of the primary outcome at follow-up was measured one month after the completion of the experiment (Paul & Garg, 2012; Paul et al., 2012) or post-season (Larsson et al., 1988). This finding makes intuitive sense as stress regulation techniques likely take time for athletes to apply and learn in the 'real world' where stressors are prevalent in their training and competition schedules. The majority of interventions captured in our statistical synthesis aimed to teach athletes self-regulatory skills in dealing with stressors (e.g., Glass et al., 2019; Larsson et al., 1988) which, like any skill, take time to practice and learn (Côté et al., 2012). Thus, providing athletes with opportunities to apply in an iterative fashion strategies to optimise their engagement with stressors learned during the intervention phase is likely to augment maintenance effects.

2.5.4. Strengths, Limitations, and Future Research

Key strengths of this systematic review and meta-analysis of stress regulation interventions are the prioritisation of randomised controlled trials as the evidence source, statistical and narrative synthesis of intervention effectiveness, pre-registration of our protocol using PRISMA-P (Shamseer et al., 2015), accommodation of dependence among effect sizes within a three-level meta-analytic framework, tests of several moderators or boundary conditions of the effectiveness of stress regulation interventions, and examination of the active ingredients of each intervention. Nevertheless, there are several limitations of the primary studies synthesised here and methodological approach that need to be considered when interpreting the findings and assessing the contribution to theory and practice. First, our evaluations of study quality indicated that, overall, the strength of evidence is poor and therefore interpretations of the pooled effect summarised require caution. We identified several weaknesses of the methodological features of primary studies that can inform future research on stress regulation interventions with athletes (e.g., randomisation process,

statistical power). Second, methodological reporting was often inadequate thereby limiting our ability to test potentially interesting moderators of the effectiveness of stress regulation interventions on athlete performance that may have meaningfully accounted for unexplained heterogeneity. For example, the absence of an overarching theoretical framework in most studies meant it was impossible to test the differential effectiveness of specific types of stress theory (e.g., biopsychosocial versus psychological). The need and guidelines for high-quality reporting of methodological procedures has improved considerably over the past decade, with checklists available for the reporting of trials (CONSORT; Schulz et al., 2010) and intervention components (e.g., TIDieR; Hoffmann et al., 2014). We encourage scholars in the field of sport and performance psychology to engage proactively with such guidelines and checklists to optimise the conception and reporting of high-quality randomised controlled trials (Moher et al., 2001; Turner et al., 2012). Third, roughly half of the eligible studies (k = 10) tested the effectiveness of the target interventions on athlete performance in high stress scenarios; it is essential that stress regulation interventions are evaluated in future research in settings where the acquired knowledge and skills are required most to maximise the congruency between concept and method. In other words, we require fewer experimental scenarios and greater real-life scenarios. Fourth, there also is a need to broaden the substantive focus of interventions and conceptual work on stress regulations for athlete performance to encompass organisational stressors, with this element of the occupational context representing an ever prominent consideration for the modern athlete (Arnold et al., 2013; 2017) yet absent from the primary research identified via our systematic review. Finally, our search protocol focused on stressor experiences broadly rather than specific situations or events (e.g., pressure, injury), so our findings reflect knowledge of holistic interventions rather than interventions tailored to specific situations (e.g., pressure training; Low et al., 2020).

2.6. Conclusion

Stress regulation is pivotal to optimising athletic performance. The findings of this systematic review and meta-analysis offer an optimistic outlook on the effectiveness of stress regulation interventions for athlete performance, yet they underscore several key areas for strengthening in future research. These considerations cover conceptual (e.g., taxonomies of stress regulation techniques) and methodological (e.g., reporting transparency, statistical power) issues. Addressing these considerations in future work will enhance the evidence-based upon which practitioners can develop stress regulation interventions that are most effective for performance in ways that tailored to context and person.

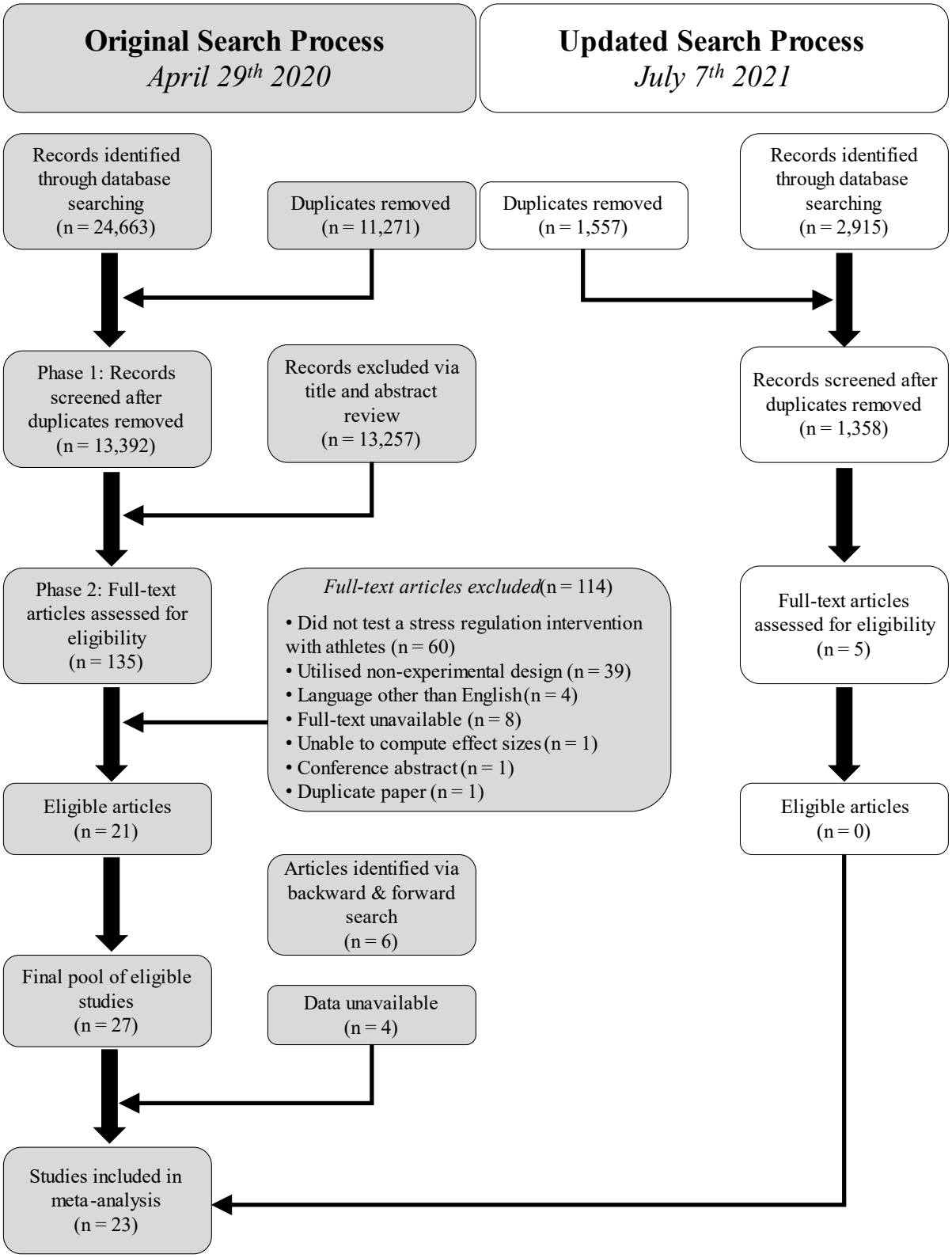


Figure 1. PRISMA flow diagram.

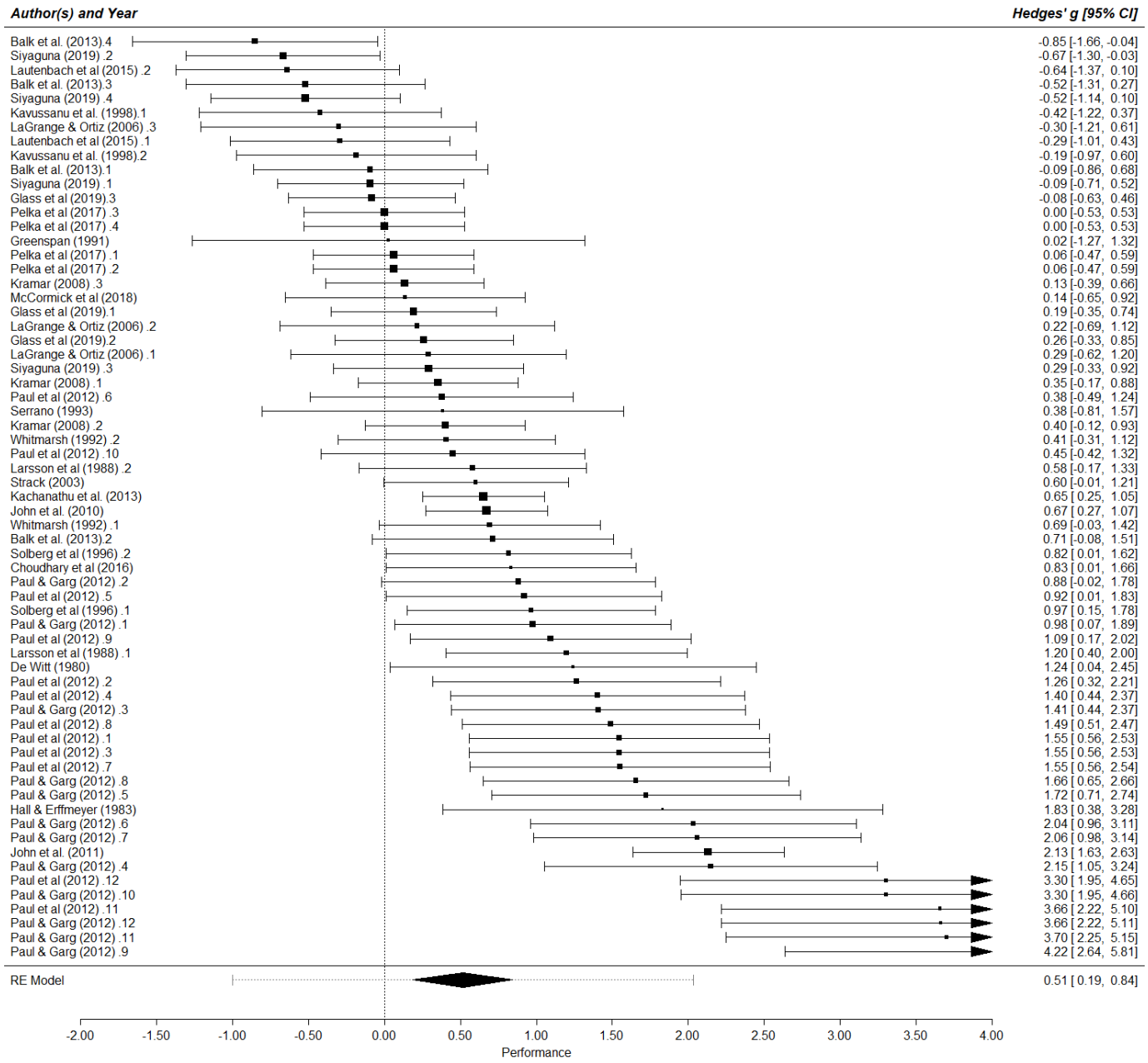


Figure 2. Forest Plot of Effect Sizes for Performance Outcomes.

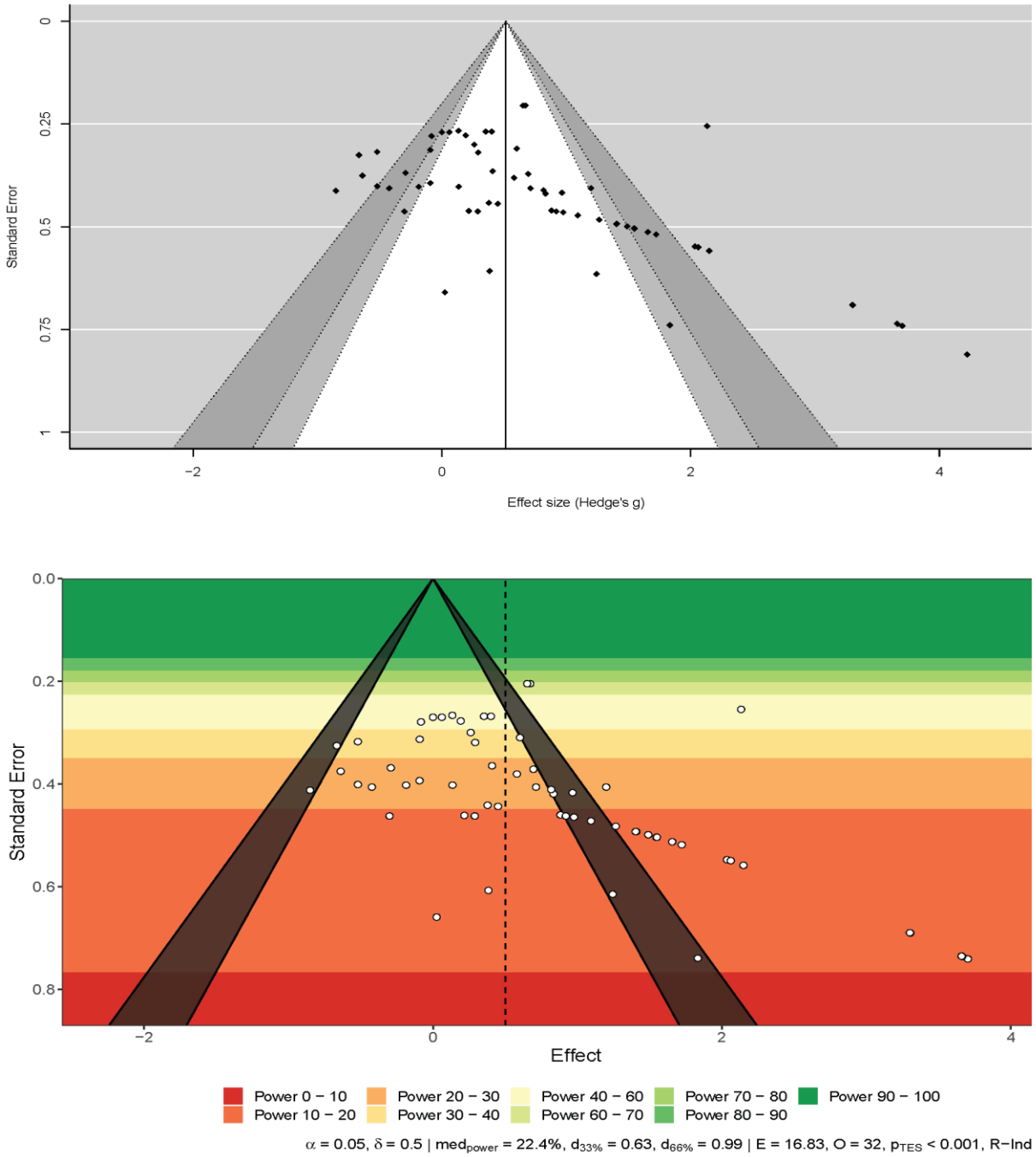


Figure 3. Contour-Enhanced and Sunset Plots for Performance Outcomes. Note: Each dot represents an individual effect size and is plotted as a function of standard error. The vertical line in the contour-enhanced plot represents the random-effects-model estimate (g = 0.52). Top panel: light and dark grey triangles denote 95% and 99% confidence intervals, respectively, for the effect sizes, given the absence of publication (or small-study) bias. Bottom panel: significance contours at .05 and .01 levels are noted by dark shaded areas, with discrete colour-coded power regions computed via a two-tailed test with significance at .05.

Table 1. Characteristics of Studies Included in the Meta-Analysis and Narrative Review.

Study	Intervention Type	N	Age	Females (%)	Country	Sport	Outcomes	Type of Measurement	Experimental Group	Effect Size (Hedges' *g*)
Balk et al. (2013)	Cognitive	38	59.6	32	Netherlands	Golf	Performance (physical)	Objective	Reappraisal Distraction	-0.09*, -0.52 0.71*, -0.85
							Psychological (emotion / affect)	Subjective	Reappraisal Distraction	0.18*, -0.13 -0.16* , 0.37
Choudhary et al. (2016)	Biofeedback	24	22.54	50	India	Athletics	Performance (physical)	Informant-reported	Biofeedback	0.83*
De Witt (1980)	Multimodal	12	-	0	USA	Basketball	Performance (physical)	Informant-reported	Cognitive-enhanced biofeedback	1.24
Glass et al. (2019)	Mindfulness	52	19.32	85	USA	NCAA Division 3 athletes	Performance (physical) Performance (physical)	Subjective Informant-reported	Mindful Sport Performance Enhancement	0.19 , 0.26 , -0.08
							Psychological (emotion / affect)	Subjective		0.43
Greenspan (1991)	Multimodal	8	17	-	USA	Archery	Performance (physical)	Informant-reported	Stress management training	0.03*
							Psychological (emotion / affect)			-0.14*, 0.31*
							Psychological (motivation / self-efficacy / perceived control)			1.15*, 1.80*
Hall & Erffmeyer (1983)	Multimodal	10	-	100	USA	Basketball	Performance (physical)	Objective	Videotaped modelling	1.83
John et al. (2010)	Mindfulness	100	29.5	0	India	Shooting	Performance (physical)	Objective	Music therapy	0.67*

John et al. (2011)	Mindfulness	96	29.5	0	India	Shooting	Performance (physical)	Objective	Mindfulness meditation therapy	2.13*
Kachanathu et al. (2013)	Mindfulness	99	29.5	0	India	Shooting	Performance (physical)	Objective	Music therapy	0.65*
Kavussanu et al. (1998)	Biofeedback	36	-	33	USA	Basketball	Performance (physical)	Objective	Single biofeedback	-0.19
									Multimodal biofeedback	-0.42
Kramar (2008)	Multimodal	56	20	55	USA	Soccer	Performance (physical)	Objective	Mental training	0.35, 0.40, 0.13
							Psychological (cognitive)	Subjective		0.09, -0.39
Larsson et al. (1988)	Multimodal	28	16.5	0	Sweden	Golf	Performance (physical)	Objective	Stress inoculation	1.20*, 0.58*
							Psychological (cognitive)	Subjective		0.08*, 1.15*
							Psychological (motivation/self-efficacy/perceived control)	Subjective		1.33*, 1.28*
Lautenbach et al. (2015)	Cognitive	29	24	48	Germany	Tennis	Performance (physical)	Objective	Non-automated pre-performance routine	-0.64*, -0.29
							Psychological (cognitive)	Subjective		-0.52, -0.398*
McCormick et al. (2018)	Cognitive	24	39.3	14	United Kingdom	Ultramarathon	Performance (physical)	Objective	Self-talk	0.14*
							Psychological (motivation/self-efficacy/perceived control)	Subjective		-0.14*, -0.63*

Grange & Ortiz (2006)	Relaxation	18	33	100	USA	Golf	Performance (physical)	Subjective	Progressive relaxation	0.29, 0.22, -0.30
Paul & Garg (2012)	Biofeedback	30	21.13	44	India	Basketball	Performance (physical)	Objective	HRV biofeedback	0.98, 0.88, 1.41, 2.15, 1.72, 2.04, 2.06[1], 1.66[1], 4.22[1], 3.30[1], 3.70[1], 3.66[1]
							Psychological (motivation/self-efficacy/perceived control)	Subjective		1.81, 1.73, 1.88[1], 1.78[1]
Paul et al. (2012)	Biofeedback	30	21.7	46	India	Basketball	Performance (physical)	Objective	HRV biofeedback	0.92, 0.38, 1.55, 1.49, 1.09[1], 0.45[1], 3.66[1], 3.30[1],
							Performance (cognitive)	Objective		1.55, 1.27, 1.55[1],1.40[1]
Pelka et al. (2017)	Relaxation	27	25.22	29.6	Finland / Germany	Competitive background in sport	Performance (physical)	Objective	Breathing	0.06
									Power nap	0.06
									Progressive Muscle relaxation	0.00
									Yoga	0.00
Serrano (1993)	Multimodal	10	19.6	100	USA	Volleyball	Performance (physical)	Informant-reported	Stress inoculation	0.38
Siyaguna (2019)	Mindfulness	59	19.12	45.7	USA	Varsity/club sports	Performance (physical)	Objective	Brief mindfulness	-0.09*, -0.66, 0.29*, -0.52
							Psychological (cognitive)	Subjective		.29, -0.06*, -0.36*, -0.43

Solberg et al. (1996)	Meditation	25	25	16	Norway	Shooting	Performance (physical)	Objective	Meditation	0.97, 0.82*
							Psychological (cognitive)	Subjective		0.90
Strack (2003)	Biofeedback	43	16.8	-	USA	Baseball	Performance (physical)	Objective	Mindfulness	0.60
Whitmarsh (1992)	Multimodal	45	31.6	43	USA	Rowing, cycling, triathlon	Performance (physical)	Objective	Stress inoculation	0.70
									Skill acquisition	0.41

Note: *High stress condition; [1]Follow-up

Table 2. Moderator Analyses of the Effect of Stress Regulation Interventions on Performance, Psychological, and Physiological Outcomes.

	Performance		Psychological Outcomes		Physiological Outcomes	
Moderator	*k*	*g* (95% CI)	*k*	*g* (95% CI)	*k*	*g* (95% CI)
Intervention type	21		10		10	
Biofeedback		1.05 (0.46, 1.63)***		1.78 (0.79, 2.81)***		2.82 (1.70, 3.94)***
Cognitive		-0.20 (-0.98, 0.57)		-0.24 (-0.82, 0.33)		0.23 (-2.40, 2.87)
Mindfulness/meditation		0.45 (-.017, 1.06)		0.30 (-0.30, 0.90)		8.08 (5.82, 10.34)***
Multimodal		0.67 (0.08, 1.25)*		0.45 (-0.12, 1.03)		0.65 (-0.78, 2.07)
Relaxation		0.05 (-0.82, 0.92)		-		-0.29 (-2.14, 1.55)
Assessment time-point	21		10		10	
First post-intervention		0.44 (0.15, 0.74)**		0.32 (-0.12, 0.76)		1.85 (-0.09, 3.79)
Second post-intervention		1.32 (0.784, 1.86)***		0.78 (-0.30, 1.86)		3.16 (-0.56, 6.88)
Theory-informed	21	0.225 (-0.37, 0.82)	10	.20 (-0.51, 0.92)	10	0.32 (-2.79, 3.43)
Comparison group	21		10		10	
Contact control		0.52 (0.074, 0.97)*		0.58 (-0.11, 1.28)		1.33 (-0.73, 3.40)
No treatment		0.59 (0.11, 1.08)*		0.21 (-0.46, 0.88)		1.70 (-0.95, 4.35)
Regular practice		0.50 (-0.21, 1.22)		0.23 (-0.96, 1.42)		3.77 (0.81, 6.72)*
Waitlist		0.12 (-1.34, 1.58)		0.43 (-1.25, 2.11)		-
Outcome assessment method	21		10		-	
Informant		0.29 (-0.37, 0.94)		0.66 (-0.95, 2.27)		-
Objective		0.62 (0.22, 1.01)**				-
Subjective		0.23 (-0.72, 1.19)		0.32 (-0.19, 0.83)		-
Low/high stress testing session	21		10		10	
Low stress		0.42 (0.05, 0.80)*		0.41 (-0.10, 0.91)		1.54 (-0.32, 3.40)
High Stress		0.68 (0.22, 1.14)**		0.28 (-0.25, 0.80)		3.32 (0.79, 5.85)*
TIDieR materials	21		10		10	

Hardcopy		0.42 (-0.41, 1.26)		0.80 (-0.19, 1.79)		0.35 (-4.41, 5.12)
Diary		-0.05 (-1.01, 0.90)		-0.30 (-1.26, 0.67)		0.13 (-3.10, 3.35)
No materials		0.11 (-.54, 0.77)		0.23 (-0.74, 1.21)		-0.29 (-4.58, 4.00)
Technology-enhanced		0.83 (0.40, 1.26)***		0.82 (.001, 1.63)*		3.53 (1.67, 5.39)***
TIDieR intervention provider	21		10		10	
Healthcare provider		0.13 (-0.52, 0.79)		0.39 (-0.32, 1.10)		0.23 (-5.48, 5.95)
Not mentioned		0.89 (0.35, 1.43)**		0.82 (-0.01, 1.64)		3.16 (-0.03, 6.35)
Researcher / experimenter		0.42 (-0.07, 0.91)		-0.15 (-0.95, 0.65)		1.90 (0.38, 4.19)
TIDieR delivery mode 1	21		10		10	
Face-to-face		0.54 (0.18, 0.91)**		0.38 (-0.16, 0.92)		2.31 (0.52, .4.11)*
Self-directed		0.38 (-0.44, 1.19)		0.20 (-0.93, 1.34)		0.36 (-5.23, 5.93)
TIDieR delivery mode 2	21		10		10	
Face-to-face, group		0.49 (-0.01, 0.99)*		0.33 (-0.40, 1.06)		2.40 (-0.46, .5.26)
Face-to-face, individual		0.61 (0.05, 1.18)*		0.46 (-0.48, 1.41)		2.24 (-0.35, 4.83)
Self-directed		0.38 (-0.45, 1.20)		0.21 (-1.00, 1.42)		0.35 (-5.60, 6.30)
TIDieR temporal frame categories	21		10		10	
1 session		-0.04 (-0.62, 0.54)		-0.14 (-0.70, 0.42)		0.01 (-3.99, 4.01)
1-2 weeks		1.12 (0.55, 1.69)***		1.80 (.78, 2.82)**		3.16 (-0.74, 7.06)
4-8 weeks		0.51 (0.06, 0.96)*		0.35 (-0.08, 0.77)		2.36 (-.21, 4.92)
10-12 weeks		0.37 (-0.61, 1.35)				.3.17 (-2.71, 9.04)
Proportion of females	19		9		9	
Intercept		0.52 (0.17, 0.88)**		0.33 (-0.22, 0.88)		2.27 (0.59, 3.94)*
Slope		-0.35 (-1.55, 0.86)		-0.43 (-2.70, 1.84)		-4.77 (-10.81, 1.27)
Average age of sample	18		10		9	
Intercept		0.51 (0.17, 0.86)**		0.34 (-0.13, 0.81)		2.25 (0.60, 3.90)**
Slope		-0.02 (-0.05, 0.01)		-0.02 (-0.05, 0.02)		0.42 (-0.06, 0.90)
TIDieR delivery duration	19		9		9	

Intercept		0.55 (0.19, 0.91)**		0.38 (-0.15, 0.92)		2.24 (0.42, 4.06)*
Slope		0.00 (-0.001, 0.002)		.001 (-.002, .004)		0.005 (-0.005, 0.015)
TIDieR intervention time	19		9		9	
Intercept		0.63 (0.27, 0.99)***		0.39 (-0.16, 0.94)		2.44 (0.68, 4.21)**
Slope		-0.01 (-0.03, 0.01)		-0.01 (-0.04, 0.02)		-0.07 (-0.18, 0.05)

Table 3. Risk of Bias Summary Table for Performance Outcomes.

Study	Outcome	Randomization process	Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported result	Overall Bias
Balk et al. (2013)	Performance	?	+	+	+	?	?
Choudhary et al (2016)	Performance	?	–	+	+	?	–
De Witt (1980)	Performance	?	?	+	+	?	?
Glass et al. (2019)	Performance	?	+	+	?	?	?
Greenspan (1991)	Performance	?	–	+	–	–	–
Hall and Erffmeyer (1983)	Performance	?	+	+	?	?	?
John et al. (2010)	Performance	+	+	+	+	?	?
John et al. (2011)	Performance	+	+	+	+	?	?
Kachanathu et al. (2013)	Performance	+	+	+	+	?	?
Kavussanu et al. (1998)	Performance	?	+	+	+	?	?
Kramar (2008)	Performance	?	+	+	+	?	?
Larsson et al. (1988)	Performance	+	+	+	+	?	?
Lautenbach et al. (2015)	Performance	?	+	+	+	?	?
McCormick et al. (2018)	Performance	?	+	+	+	?	?
Grange and Ortiz (2006)	Performance	?	+	+	+	?	?
Paul and Garg (2012)	Performance	?	+	+	+	?	?
Paul et al. (2012)	Performance	?	+	+	+	?	?

Pelka et al. (2017)	Performance	+	+	+	+	?	?
Serrano (1993)	Performance	?	+	+	+	?	?
Siyaguna (2019)	Performance	?	+	+	+	?	?
Solberg et al. (1996)	Performance	?	+	+	+	?	?
Strack (2003)	Performance	?	+	+	+	?	?
Whitmarsh (1992)	Performance	+	+	+	+	?	?

Table 4. GRADE Summary of Findings.

	Certainty Assessment						Summary of Findings			
Outcome	Number of studies (#ES)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Other Considerations	Stress Regulation	Comparator Condition	Effect (95% CI)	Certainty
Performance	23 (65)	Serious[a]	Serious[b]	Not serious	Not serious	Very strong association[c]	1009/2022 (49.9%)	1013/2022 (50.1%)	0.52 (0.19 to 0.84)	Low

Note: #ES = Number of Effect Sizes; CI = Confidence Interval.

[a] Most of the eligible studies had a risk of bias rating of some concerns (see Table 3).

[b] Substantial heterogeneity among effect sizes ($I^2 = 78.42\%$)

[c] Very large effect sizes observed (see Figure 2 and 3).

Table 5. Behaviour Change Techniques (BCT) Coded Within Eligible Studies

Group	BCT identified	Balk et al. (2013)	Choudhary et al. (2016)	De Witt (1980)	Glass et al. (2019)	Greenspan (1991)	Hall and Erffmeyer (1983)	John et al. (2010)	John et al. (2011)	Kachanathu et al. (2013)	Kavussanu et al. (1998)	Kramar (2008)	Larsson et al. (1988)	Lautenbach et al. (2015)	McCormick et al. (2018)	Grange and Ortiz (2006)	Paul and Garg (2012)	Paul et al. (2012)	Pelka et al. (2017)	Serrano (1993)	Siyaguna (2019)	Solberg et al. (1996)	Strack (2003)	Whitmarsh (1992)
Group 2: Feedback and Monitoring	2.3. Self-monitoring of behaviour																							
	2.6. Biofeedback																							
Group 4: Shaping knowledge	4.1. Instruction on how to perform the behaviour																							
	4.2. Information about antecedents																							
Group 5: Natural consequences	5.3. Information about environmental and social consequences																							
Group 6: Comparison of behaviour	6.1. Demonstration of the behaviour																							
Group 7: Associations	7.1. Prompts/cues																							

Group 8: Repetition and substitution	8.1. Behavioural practice/rehearsal																							
Group 11: Regulation	11.2. Reduce negative emotions																							
Group 12: Antecedents	12.4. Distraction																							
Group 13: Identity	13.2. Framing/reframing																							
Group 15: Self-belief	15.2. Mental rehearsal of successful performance																							
	15.3. Focus on past success																							
	15.4. Self-talk																							

Overview of Chapter 3

This chapter discusses our second manuscript in which we targeted the existing literature on self-reflection and its effectiveness across various outcomes. We decided to focus on self-reflection as a stress management strategy primarily due to its effectiveness across other contexts (e.g., military, university). We centred our focus on the vantage point one uses when engaging in self-reflection due to its potential to be replicable as an intervention in the sporting environment. Specifically, our investigation compared two styles of self-reflection, self-distanced and self-immersed, and its effectiveness across an adult population. We discuss outcomes targets, limitations of past research, and consider important elements for future research.

Note: This chapter has been published in Stress and Health.

Murdoch, E. M., Chapman, M. T., Crane, M., & Gucciardi, D. F. (2023). The effectiveness of self-distanced versus self-immersed reflections among adults: Systematic review and meta-analysis of experimental studies. *Stress and Health*, *39*(2), 255–271. https://doi.org/10.1002/smi.3199

Chapter 3: The effectiveness of self-distanced versus self-immersed reflections among adults: Systematic review and meta-analysis of experimental studies

3.1. Introduction

Stressor events are typically viewed as being negative in nature, yet in some instances can provide opportunities for self-insight and personal growth. Stressor events are characterised by high levels of novelty, disruption, and/or criticality (Morgeson et al., 2015). Depending on their intensity and frequency as well as emotional significance, stressor events typically pose heightened vulnerability to maladaptive outcomes and therefore demand the deployment of resources to minimise or mitigate their effects on one's functioning (Luhmann et al., 2021). Viewed from a transactional (Lazarus & Folkman, 1984; Obbarius et al., 2021) person-situation interactionist perspective (Lazarus, 2006), stressor events contain situational cues that individuals cognitively process in relation to salient personal factors (e.g., traits, resources, goals). In this regard, cognitive appraisals are at the core of this process because the initial evaluation of a stressor event influences the stress process one then undergoes (Lazarus, 1999). As such, meta-cognitive strategies are of importance in order to interrogate the stress process and promote stress regulation. Self-reflection acts as meta-cognitive strategy to allow one to analyse their initial interpretations of their stressor event. Introspection and reflection are among the primary means by which people interrogate or psychologically filter autobiographical lived experiences of stressors (Teasdale et al., 2002). The way individuals engage with introspection and reflection can be adaptive (e.g., decreased negative affect, reduced levels of stress; Glass et al., 2019; Soliday et al., 2004) or maladaptive (e.g., increase rumination, increase levels of aggression) for human functioning. Understanding strategies that prompt adaptive forms of self-reflection remains an important avenue for future research.

3.2. Literature review

One important consideration for self-reflection is the vantage point from which individuals frame their (re)appraisal of autobiographical stressor experiences. From an emotion regulation standpoint, reinterpretation and distancing are the two main reappraisal tactics (Ayduk & Kross, 2010; Kross & Ayduk, 2011). Distancing occurs when individuals reason about target events in ways that maximise their removal of the current self from the experiential reality. Doing so allows for reinterpretation (or reconstrual) to occur whereby individuals generate new or alternative meaning from the event. Meta-analytic data supportthe superiority of distancing as an emotion regulation strategy (Webb et al., 2012). Individuals can utilise any combination of four distancing methods, namely by taking a perspective (i) that is more *spatially* distant from the stimulus; (ii) in which the stimulus is *temporally* distant from their current self; (iii) in which the stimulus represents a *hypothetical* scenario; and (iv) that is *objective* in nature akin to an imagined observer, neutral party, or contextually salient professional (Powers & LaBar, 2019). Irrespective of the dimension applied, increasing distance of the current self from the target event prompts more abstract interpretations or cognitive processing (Trope & Liberman, 2010). In so doing, distanced appraisals of target events engage processes of affective self-reflection and cognitive control that help shape new affective responses that are neutral or adaptive in nature (Powers & LaBar, 2019). Meta-analytic data supports psychological distancing as an effective, versatile tactic that can be used by individuals when engaging with reflection of stressor events (Moran & Eyal, 2022).

If self-distancing is an effective, versatile tactic for analysing target events or experiences, particularly those negative in valence, doing so should be superior to the natural opposite in which one adopts an immersed vantage point. Self-immersed reflections occur when individuals visualise target events via a first-person experience, as if they were reliving

the event through their own eyes; thus, there is an absence of psychological distancing from the event (Dorfman et al., 2021). For example, individuals may reflect as if they were retelling the event to a news reporter. Self-immersed memories are emotion-laden because individuals relive the experience and the activation of emotional states directly (Mcisaac & Eich, 2002; Williams & Moulds, 2007). Comparatively, reflecting from a distanced perspective with an objective focus prompts the individual to consider target events from a third person perspective, encouraging them to 'step back' psychologically from the experience (Grossmann et al., 2021; Kross et al., 2005). For example, they may adopt the perspective of their sport coach on the sidelines, watching themselves engaging in the experience. Narrative reviews on the literature (Kross & Ayduk, 2017) and meta-analytic data (Moran & Eyal, 2022) support the adaptive nature of self-distanced reflections relative to self-immersed perspectives. Self-distanced reflections optimise emotional (e.g., reduced negative emotions and momentary distress; Kross & Ayduk, 2008, 2017; Penner et al., 2016) and cognitive (e.g., increased reconstrual and decreased recounting of the stressor event; Kross & Ayduk, 2008) states in the short- and long-term. Self-immersed reflections, in contrast, typically produce negative emotional (e.g., increased emotional activation; Ayduk & Kross, 2010; Kross & Ayduk, 2008) and cognitive (e.g., depressive rumination; Ayduk & Kross, 2010; Kross & Ayduk, 2008) outcomes. Collectively, therefore, the available evidence suggests that a self-distanced vantage point is superior to a self-immersed vista.

Despite the apparent effectiveness of self-distanced reflections relative to self-immersed reflections, several unanswered questions remain regarding the nature of their effectiveness. First, what is the magnitude of the differential effectiveness between self-distanced and self-immersed reflections on human functioning beyond that of emotional states (Moran & Eyal, 2022)[1]? Knowledge of the magnitude of an effect via a point estimate and/or a range of plausible values is essential for generating high-quality theoretical

summaries and avoids the imprecision and potential falsification that directional hypotheses convey (Edwards & Christian, 2014). Second, what is the nature of self-distanced reflections that offer the greatest adaptiveness for important outcomes? The content and structure of effective reflections is limited to broad descriptions of the nature of the perspective adopted (e.g., a third-person perspective, reliving the experience; Kross & Ayduk, 2008), making it challenging to ascertain how best to execute a psychologically distanced perspective. Accordingly, there is a need to interrogate the descriptions of reflection interventions in ways that clarify the active ingredients and mechanisms by which these different strategies are delivered to inform guidelines for best practice. Third, what other features of people and contexts in which they are examined alter the magnitude of differential effectiveness between self-distanced and self-immersed reflections? Evidence regarding the effectiveness of reflection interventions is somewhat contradictory, with some findings supportive of the adaptive (e.g., Grossman et al., 2021) or maladaptive (e.g., Giovanetti et al. 2019) nature of self-distanced reflections, as well as mixed effects (e.g., Fuentes et al., 2021). Thus, there is a need to examine these differential effects according to key features of the target populations, interventions, and contexts. Meta-analytic investigations are well positioned to alleviate the impracticalities inherent with individual studies that make it challenging to test multiple considerations robustly (e.g., statistical power). Doing so has important implications for theory (e.g., boundary conditions) and practice (e.g., tailor instructional sets to different audiences).

We seek to generate evidence on these unanswered questions regarding the effectiveness of self-distanced reflections via a systematic review and meta-analysis of experimental comparisons of these two vantage points. We expected self-distanced reflections to be superior to self-immersed reflections across all outcome categories (e.g., cognitive, affective), with magnitude of this difference likely small-to-moderate in nature ($g < .40$;

Moran & Eyal, 2022). Regarding the nature of self-distanced reflections and the people and contexts that may augment the differential effectiveness of these two vantage points, we approached this task in an exploratory manner in the absence of robust evidence to generate hypotheses with confidence. Meta-analyses are advantageous in this regard because they permit tests of substantive and methodological factors that are often challenging to implement within individual studies (e.g., resources).

3.3. Methods

The protocol for this systematic review and meta-analysis was registered on 2nd August 2021 via the Open Science Framework (OSF; https://bit.ly/self-immersed-meta-registration), using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis-Protocol template (PRISMA-P; Shamseer et al., 2015). This document is reported in accordance with the PRISMA 2020 guidelines (Page et al., 2021). Broadly, our methodological and analytical decisions were informed by best practice guidelines for meta-analysis; interested readers are referred to these guidelines for detailed information on specific elements of our methods (e.g., Moreau & Gamble, 2022; Steel, Beugelsdijk, & Aguinis, 2021).

3.3.1. Literature Search

EM conducted the systematic search from inception until 3rd August 2021 via the following databases to capture relevant studies: Scopus, Medline, Web of Science (core collection), PsycInfo, CINAHL Plus, Embase, and ProQuest Dissertations and Theses Global. The search strategy adopted for each database consisted of the following combination of search terms: (adult*) AND (“self distanc*” OR “perspective taking” OR “psychological distance” OR “distanced analysis” OR “self perspective” OR “third person”) AND (intervention OR experiment* OR train* OR trial OR program* OR random*). Full details of

the search protocol are provided in our registered PRISMA-P document. We also manually completed a forward and backward search of eligible studies on 15th November 2021.

3.3.2. Eligibility Criteria

We considered studies for inclusion if they (i) experimentally tested the effectiveness of self-distanced reflections against self-immersed reflections to maximise knowledge on causal effects (Imai et al., 2013); (ii) sampled adults aged 18-65 years; and (iii) the focus of the reflection was a stressor or adverse event that participants had already experienced. We excluded papers when (i) they utilised non-experimental designs (e.g., longitudinal, quasi-experimental); (ii) participants completed two or more forms of reflections sequentially (e.g., within-subjects design); (iii) assessed 'spontaneous' rather than experimentally manipulated forms of reflection; (iv) sampled participants with a known medical or health condition; (v) the article was written in any language other than English; (vi) the full-text was unavailable via our university library subscriptions, digital repositories (e.g., ResearchGate) or directly from the corresponding author (i.e., 2 email requests/reminders, separated by 2 weeks); and (vii) the results were published as a conference abstract rather than a full-text (e.g., dissertation, pre-print) because they are often poorly reported (e.g., Hopewell & Clarke, 2005).

Population

Apparently healthy adults were the focus of this systematic review, that is, individuals (i) aged 18-65 years with (ii) who have no existing health or medical conditions. We decided to exclude samples with a known medical or health condition, particularly individuals with a diagnosed mental illness, because they likely had been exposed to distancing in some shape or form within their therapeutic work (e.g., Acceptance and Commitment Therapy; Zettle & Hayes, 1987). Additionally, our confidence in the quality of evidence and strength of recommendations within the eligible body of work would be diminished when there are

substantial differences in the population, intervention, or outcome, particularly "whether biological or social factors are sufficiently different that one might expect substantial differences in the magnitude of effect" (Guyatt et al., 2011, p. 1303).

Intervention

We focused on self-distanced reflection interventions where researchers experimentally manipulated individual reflections on a past stressor or adverse experience from a third person perspective; we made no restrictions on the characteristics of stressor or adverse events, such as the temporal focus (e.g., daily or lifetime) or type of event (e.g., everyday stressor or traumatic event). For the purposes of this review, we expected that interventions would be characterised in ways that align with the definition of self-distancing, namely a "process in which a narrow egocentric focus on the experience in the here and now is diminished and, instead, a focus on the bigger picture is promoted" (Kross & Ayduk, 2017; Orvell et al., 2019).

Comparison

We consider comparators only when they required participants to execute a self-immersed reflection, whereby self-relevant events and emotions are experienced in the first person (Nigro & Neisser, 1983) as if they were reliving the experience firsthand.

Outcomes

Guided by a narrative review of the literature on self-distanced reflections (Kross & Ayduk, 2017), we focused broadly on adults' cognitions (e.g., recounting versus reconstruals, cognitive control), affective states (e.g., positive or negative affect), physiological states (e.g., indices of stress), and behaviour (e.g., risk-taking) as primary outcomes.

3.3.3. Article Screening

References identified via the electronic database were imported into a citation management program (Endnote) and subsequently exported into Research Screener

(https://researchscreener.com), a web application that allows titles and abstracts from papers that have been extracted from databases to be screened using machine learning. Evidence supports the utility of Research Screener for semi-automating the screening process (Chai et al., 2021). The machine learning algorithm initially ranks the included abstracts from papers in order of significance based on seed articles supplied by the user. We utilised six seed articles for the purposes of this review (Dorfman et al., 2021; Furman et al., 2020; Giovanetti et al., 2019; Grossmann et al., 2021; Kross et al., 2005; Kross & Ayduk, 2008) because they targeted our key areas of interest and captured the breadth of research we wished to examine. The machine learning algorithm is updated every 50 abstracts screened based on what is deemed as in/eligible by the reviewer. EM screened 50% of the total abstracts (n = 5075); EM flagged no articles for full text review in the final 26 rounds of 50 articles (n = 1300). A second reviewer [MC] used Research Screener to screen 20% of the total sample (n = 2030); EM and MC discussed discrepancies and when a decision was unable to be made based upon the title and abstract the paper was retained for full text review. Two reviewers [EM and MC] conducted the full text review stage separately, with a separate member of the research team [DG] judging the eligibility of studies when there was a disagreement. A visual depiction of the article screening and selection process is presented in Figure 1.

3.3.4. Data Extraction

EM extracted the relevant data from the included studies using a pre-determined form or requested information from the corresponding author of eligible studies when data were unavailable in the full text, with up to 2 reminder emails each 7 days apart. DG assessed 50% of data extraction forms to ensure the data was entered correctly and consistently. We extracted data to calculate the relevant effect size and characterise the sample (age, gender), study location, outcome type (cognitive, affective, physiological, behavioural, social), outcome method (subjective, informant-reported, objective), target event for reflection

(generic stress or adversity, emotional stress or adversity, discrimination), temporality of the target event (daily, recent, lifetime), magnitude of the target event (low-to-moderate, high), intervention provider (experimenter, not reported), manner by which participants completed the reflection (written down versus cognitively processed only), mode of delivery (face-to-face, self-directed), time spent reflecting (min), temporal frame of the entire intervention, delivery duration (min), publication type (peer-reviewed manuscript versus dissertation), outcome assessment point (post-intervention or follow-up), and risk of bias (see below). The complete data extraction sheet is located on the OSF project page (https://bit.ly/self-immersed-meta-project).

3.3.5. Statistical Analyses

Calculation of Effect Sizes

We statistically synthesised the eligible studies by calculating the standardised mean difference corrected for relative sample size (Hedge's *g*), which allowed for each outcome variable to be compared across studies. To calculate the estimate of effectiveness between self-distanced and self-referenced reflections, we extracted means, standard deviations, and sample sizes of groups using established formulas for pre-post (Morris, 2008) and post-only (Borenstein et al., 2009) designs. We coded effects so that positively signed effects represented the superiority of the self-distanced reflection group, relative to the nature of the specific outcome of interest, such that we reversed coded effects for outcome variables where lower scores reflect a more positive or adaptive state (e.g., depressive symptoms). In cases where means and standard deviations were unavailable within the paper or via data requests from the authors, we used *F* statistics or *t* scores to calculate the effect size if available (Borenstein et al., 2009). The final dataset is available on the OSF project page.

Statistical Synthesis of Effect Sizes

We utilised a three-level, random effects meta-analysis model with restricted maximum likelihood estimation to test the overall pooled effect and the differential effectiveness of self-referenced reflections via meta-regression. Three level models enable analysts to accommodate non-independence among effects (e.g., multiple indicators of cognitive outcomes within the same study) by decomposing the total random variance into sampling variance (Level 1), and heterogeneity of effects within studies (Level 2) and between studies (Level 3) (Cheung, 2014). Our overarching analytical approach is informed by guidelines for conducting three-level meta-analysis (Gucciardi et al., 2021). We utilised the *metafor* (Viechtbauer, 2010)*, metaviz* (Kossmeier et al., 2020), *dplyr* (Wickham et al., 2021), *cowplot* (Wilke, 2020), and *ggplot2* (Wickham, 2016) packages in the R statistical platform (R Development Core Team, 2019) to analyse and visualise the data. The full analytical script is available on the OSF project page.

Moderator, Sensitivity, and Meta-Bias Analyses

Utilising a meta-regression approach that was informed by guidelines for reporting interventions (Hoffman et al., 2014), we examined 12 moderators of the effect of self-reflection interventions on the primary outcomes including outcome type, outcome method, target event for reflection, temporality of the target event, magnitude of the target event, intervention provider, manner by which participants completed the reflection, mode of delivery, time spent reflecting, temporal frame of the entire intervention, delivery duration, and outcome assessment point. Our moderator analyses are best considered exploratory rather than confirmatory in nature as we excluded a priori predictions in our pre-registered protocol; nevertheless, we use an adjusted alpha ($p <. 01$) to control for Type I error rates because we assessed 12 different moderators (Borenstein et al., 2009). As assessments of the sensitivity of the overall pooled effect to outliers, we considered effects with large residuals (three standard deviations greater than the mean) or Cook's distance (three times the mean;

Viechtbauer et al., 2010). For meta-bias, we examined the moderating effect of publication type, risk of bias, and the multilevel extension of Egger's test (Fernández-Castilla et al., 2021). As an alternative estimation of publication bias, we utilised power-enhanced (sunset) forest plots via the *metaviz* package (Kossmeier et al., 2020) to visualise effect sizes against their standard errors (Kossmeier et al., 2020).

Statistical Heterogeneity

We estimated statistical heterogeneity using I^2 (proportion of total variance in effect estimates that is due to heterogeneity rather than sampling error; Higgins et al., 2003) and its multilevel extension, namely $I^2_{(2)}$(estimate of heterogeneity effects within samples; a value of zero is indicative of no heterogeneity) and $I^2_{(3)}$(estimate of heterogeneity effects between samples; a value of zero is indicative of no heterogeneity). Consistent with recommendations (IntHout et al., 2016), we calculated a complementary assessment of between-study heterogeneity using 95% prediction intervals to compute the range in which the effect of estimates of future studies will lie.

Confidence in Cumulative Evidence

EM and DG assessed the quality of evidence and strength of recommendations within the eligible body of work using the GRADE approach across the domains of consistency in the magnitude of effect (e.g., visual and statistical inspection of heterogeneity in point estimates and confidence intervals); directness of the intervention to target populations and outcomes most important to those populations; precision in the 95% confidence interval for decision-making purposes (e.g., application differences between the lower and upper bounds of the interval); publication bias (e.g., sample sizes, proportion of positive versus negative results); and risk of bias (Guyatt et al., 2008). Our risk of bias assessment was informed by Cochrane's guidelines for randomised trials (RoB2; Sterne et al., 2019), which focus on randomisation process, deviations from intended interventions, missing outcome data,

measurement of the outcomes, and selection of the reported results. Assessments are made to categorise eligible papers as low, medium ("some concerns"), or high risk of bias. The RoB2 tool is an effective framework for measuring overall bias of experimental designs (Minozzi et al., 2020). We utilised the *robvis* Shiny app (McGuinness & Higgins, 2021) to create the summary visualisation of our risk of bias assessment.

3.3.6. Deviations from Pre-Registered Protocol

We deviated from the pre-registered protocol in one way. Originally, we identified six articles to utilise as seeds to initiate the algorithm in Research Screener, but ended up using only five seed articles for the formal screening process. We erroneously retained one study (Furman et al., 2020) in the pre-registered protocol, which should have been removed from the protocol registration because the experimental manipulation altered the self-talk that participants utilised to reflect on a food decision task rather than target a stressor event.

3.4. Results

3.4.1. Literature Search Overview

An overview of the search and selection process is depicted in Figure 1. We identified 17 eligible papers with 25 independent experiments and 68 relevant effects that fulfilled the eligibility criteria. This body of work covered approximately two decades of research (1993-2021) and studied 2,397 participants (M_{age} = 22.02, percentage of females = 63.30%). Full details of these studies are provided in Table 1.

3.4.2. Effectiveness of Self-Distanced Reflections

The overall pooled effect (68 effects, k = 25) indicated that self-distanced reflections fostered more adaptive outcomes than self-immersed reflections (g = .19, SE = .07, 95% CI [.05, .33]; see Figure 2). Heterogeneity was substantial (I^2 = 65.59%), which a log-likelihood

ratio test (LRT) confirmed is due solely to between-study (I^2 = 65.59%; level 3; LRT = 14.54, p < .001) rather within-study (I^2 = 0%; level 2; LRT = 0, p =1) variation in effects. The 95% prediction intervals suggests that for a new study there is a 95% chance that the effect will be between -0.42 and 0.80 (Hedges' g).

Sensitivity Tests

None of the effects had residuals that exceeded three standard deviations from the mean. Six effects across five experiments had a Cook's distance that exceeded three times the mean (Giovanetti et al., 2019 [experiments 1 and 2]; Levy, 2016; Valenti et al., 2011) [experiments 1 and 3]). The exclusion of these six effects increased the magnitude of the overall pooled effect by .10 (g = .29, SE = .06, 95% CI [.18, .40]) suggesting some sensitivity in the meta-analytic estimate to influential effects.

Moderator Effects

Results of the meta-regression analyses are provided in Table 2. Only one of the 13 moderators was a statistically meaningful predictors of the overall pooled effect, namely the target event for reflection, F (3, 64) = 4.63, p = .005; the temporal focus of the target event, F (2, 65) = 3.72, p = .03, and the intervention provider, F (2, 65) = 4.77, p = .012, were also potentially interesting moderators at the widely adopted alpha level of .05 (see Figure 3). Self-distanced reflections were most effective when they targeted a stressor experience that emphasised one's emotional state or the emotional significance of the event (g = .44, 95% CI = .27, .62).

Meta-Bias Assessment

Visual inspection of the funnel plot including Egger's linear regression test of within-study effects only suggests symmetry in the distribution of effects relative to their standard error, with a roughly equal number of effects on either side of the overall pooled effect (see Figure 4). The multilevel extension of Egger's test, F (1, 66) = 0.22, p = .64, supported an

interpretation of symmetry in the funnel plot. Power-enhanced (sunset) funnel plots indicated that roughly half of eligible studies were sufficiently powered (>80%) to detect large effects (g = .80), yet all were insufficient powered to detect moderate (g = .50) or small (g = .20) effects (see Figure 5). Publication status (p = .54), risk of bias (p = .96), and sample size (p = .70) were statistically inconsequential predictors of the overall pooled effect.

3.4.3. Quality of Eligible Studies and Overall Body of Evidence

Risk of Bias

We assessed risk of bias on the cognitive, affective, physiological, and behavioural outcomes of the included studies (n = 25) using the RoB2 framework and guidelines (Sterne et al., 2019). A summary of all eligible studies is depicted in Table 3. Overall, our bias ratings summarised 11 experiments as 'some concerns' and 14 experiments as 'high concerns', primarily due to considerations within the deviations from the intended intervention category. The primary and most critical consideration for this assessment related to the degree to which authors checked the validity of their experimental manipulation of the two types of reflections. Authors reported manipulation checks or activities that could be used to infer the quality of their experimental manipulation or intervention in 14 of the 25 experiments. Among the 19 experiments that required participants to write down their self-reflections, authors checked the quality of the manipulation in 11 (~58%) of their protocols, including participants' self-reporting their adherence to the instructions (n = 3), checks on the proportion of first and/or third person pronouns according to their experimental assignment (n = 7), and direct removal of participants who did not follow the experimental instructions for pronoun use (n = 1). With the exception of one study (Gu & Tse, 2006), authors rarely excluded participants who deviated from their intended experimental manipulation or assessed the sensitivity of their findings by comparing a per-protocol and intention-to-treat analysis (Heritier et al., 2003; Sainani, 2010).

GRADE Assessment

An overview of our assessment of the overall quality of evidence contributing to the analyses of the effects of self-distanced versus self-immersed reflections is presented in Table 4. We assessed the overall level of certainty of evidence regarding the differential effectiveness of self-distanced versus self-immersed reflections on autobiographical stressor experiences among apparently healthy adults across cognitive, affective, physiological, social, and behavioural outcomes to a low extent. This decision is underpinned primarily due to some concerns regarding risk of bias (as noted above), inconsistency, and indirectness. Regarding inconsistency, large heterogeneity (I^2 = 65.59%), variable point estimates that reflect negative and positive effects (ranging from -.83 to 1.04), and moderate degrees of overlapping confidence intervals (see Figure 2) all contributed to the downgraded assessment. We downgraded indirectness because of the dominance of undergraduate student samples (24 of 25 experiments), differences in the intended intervention and what the participants utilised in several experiments (e.g., individuals assigned to self-distanced reflections referred to themselves in the first person on occasion), and the reliance on affective (62%) or cognitive (29%) outcomes to assess the differential effectiveness of self-distanced versus self-immersed reflections.

3.5. Discussion

Via a systematic review of approximately 10,000 articles and statistical synthesis of 25 experiments and 68 effects, we found that self-distanced reflections offer a small-to-moderate advantage over self-immersed reflections (Funder & Ozer, 2019). Moderation analyses indicated that the target event for reflection, temporal focus of the target event, and the intervention provider meaningfully augmented the overall effectiveness of self-distanced

reflections. Sensitivity and meta-bias analyses alongside assessments of methodological quality indicated some uncertainty in the evidence base.

Taken together with meta-analytic estimates of psychological distancing strategies (Moran & Eyal, 2022; Soderberg et al., 2015) our findings suggest that self-distancing resembles an adaptive form of reflecting on autobiographical stressor experiences, relative to self-immersed reflections. Importantly, our meta-analytic estimate extends existing summaries to encompass cognitive, behavioural, social, and physiological outcomes alongside emotional factors as well as published and unpublished evidence thereby offering a holistic assessment of the evidence base. Despite our intentions to broaden the scope of view, we found that most available experiments comparing self-distanced and self-immersed reflections prioritised affective outcomes (56%) as the primary focus for assessments of effectiveness, followed by cognitive outcomes (33%). The magnitude of effect for cognitive outcomes (e.g., intrusive thoughts, thought content, reasoning) was roughly equivalent to affective outcomes, yet there was greater imprecision in this estimate. This finding makes intuitive sense because stressor experiences narrow one's cognitive focus (Garland et al., 2010) and trigger ruminative thoughts that disrupt adaptive self-regulatory processes (Crane et al., 2019). Unfortunately, due to the absence of available data for the other outcome categories (i.e., behaviour, psychophysiology), we are unable to make any sound conclusions regarding the robustness of the effectiveness of self-distanced reflections across outcome categories. Theoretically, our findings lend support to the central premise of construal level theory (Trope & Liberman, 2010) that ego-decentred vistas enable individuals to focus and extract knowledge on salient features of autobiographical experiences rather than the emotionally charged elements, thereby fostering adaptive reasonings for future functioning. The low cost and ease with which self-distancing can be applied to make sense of autobiographical experiences represents a potentially 'scalable' amendment to existing

psychological approaches that rely on introspection or self-reflections. In so doing, self-distanced reflections might permit individuals to transcend and connect 'lessons learned' across diverse stressor experiences for optimising human health, well-being, and functioning (e.g., Crane et al., 2020; Kalisch et al., 2019).

Despite the encouraging findings regarding the overall pooled effect, meta-regression analyses indicated that interpretations regarding the relative effectiveness of self-distanced reflections and therefore their application in research and practice require consideration of the target event for reflection. Given the centrality of the emotional intensity of one's reaction when reflecting on autobiographical experiences as a core mechanism of psychological distancing (Trope & Liberman, 2011), it's unsurprising that roughly one-third of experiments (n = 9 or 36%, 31 effects) required participants to reflect on autobiographical experiences that emphasised emotional states explicitly (e.g., overwhelming feelings of sadness, anger) and that self-distanced reflections evidenced their strongest effects for emotionally salient events. This finding has important conceptual and practical implications within the context of autobiographical events. The emotional salience of events makes such experiences potentially disruptive to healthy functioning, personally significant, and memorable to people (Luhmann et al., 2021), and represent the most stable elements of people's perceptions of such autobiographical experiences over time (Haehner et al., 2021). Conceptually, this finding supports a core theoretical proposition of psychological distancing, that is, distanced appraisals of target events engage processes of effective self-reflection and cognitive control that help shape new affective responses that are adaptive in nature (Powers & LaBar, 2019). Self-immersed reflections draw people towards the "hot" features of their stressor event resulting in recollections of the experience that are high in physiological and subjective emotional reactivity (Mcisaac & Eich, 2002; Williams & Moulds, 2007) and which evoke rumination (Ayduk & Kross, 2010; Lyubomirsky & Nolen-Hoeksema, 1995), thereby

deterring adaptive cognitive and emotional processing of the event. In contrast, self-distanced reflections allow individuals to interrupt cycles of rumination by stepping back from the event and taking a broader outlook on the chain of events, thereby promoting alterations to the meaning of the autobiographical experience in ways that minimise emotional reactivity (Kross et al., 2005; Kross & Ayduk, 2017). Thus, proactively applied self-distanced reflections might provide a necessary strategy by which to augment small changes in self-regulation that occur organically from autobiographical stressor experiences high in emotional salience.

Our findings also suggest caution is required regarding the optimism of the adaptiveness of self-distanced reflections relative to self-immersed vistas and the evidence base on which they are founded. First, the prediction interval indicated that future tests of the effectiveness of self-distanced relative to self-immersed reflections on autobiographical stressor events among apparently healthy adults could differ substantially from the point estimate reported here, including null or small-to-moderate negative effects. Second, power-enhanced (sunset) funnel plots visualised concerns regarding the credibility of individual effects of the pooled estimate, with all 25 experiments underpowered to detect small (g = .20) or moderate (g = .50) or effects. Third, the overall quality of evidence synthesised is low, with downgrades due primarily to inconsistency (e.g., large heterogeneity, influential experiments), indirectness (e.g., manipulation checks of experimental instructions), and risk of bias (e.g., underpowered). Taken together with recent re-analyses of the evidential base of construal level theory broadly (Maier et al., 2022), these statistical and methodological considerations potentially render our pooled estimate inconclusive until future high-powered, high-quality experiments are executed.

Key strengths of this systematic review and meta-analysis include a pre-registered protocol and transparency regarding deviations from those plans; prioritisation of

experiments to maximise insights into causal evidence; capture of un/published literature as well as a broad range of indicators of human functioning assessed via self-reports, informants, or objective methods; multicomponent assessment of risk of bias and overall quality of evidence; and statistical interrogation of intervention characteristics that might augment the differential effectiveness of self-distanced reflections. Nevertheless, we encourage readers to interpret our findings relative to the limitations of our work and the existing literature. First, we limited our meta-analytic focus on apparently healthy adults aged 18-65 years who utilised self-distanced or self-immersed reflections on lived experiences. Second, we made subjective decisions regarding the categorisation of moderator variables that others might reconstrue differently. Relatedly, we examined several substantively interesting elements of experimental manipulations or interventions for self-distanced reflections, yet remain cognisant that several of these tests are likely underpowered, primarily due to imbalance in data between levels of the moderator (e.g., outcome method, temporal frame). Third, most effects synthesised here targeted affective (62%) or cognitive outcomes (29%); thus, there remains a need to ascertain if the small advantages of self-distanced reflections translate into important behaviour (e.g., health-related).

3.6. Conclusion

We revealed a small-to-moderate advantage of self-distanced relative to self-immersed reflections on autobiographical experiences among apparently healthy adults. Although small effects in the psychological sciences are to be expected and often considered more 'believable' than large ones (Funder & Ozer, 2019), our assessment of the overall quality of evidence suggested uncertainty regarding the benefit of this pragmatic self-regulatory tactic. There remains an urgent need for high-powered, high-quality experiments on self-distanced

reflections to reconcile some the methodological and substantive considerations identified via our review.

Footnote

[1] We provide a detailed overview of the distinctions and therefore extensions of our work beyond the meta-analysis published by Moral and Eyal (2022) in supplementary material located on our OSF project page (https://bit.ly/self-immersed-meta-project).

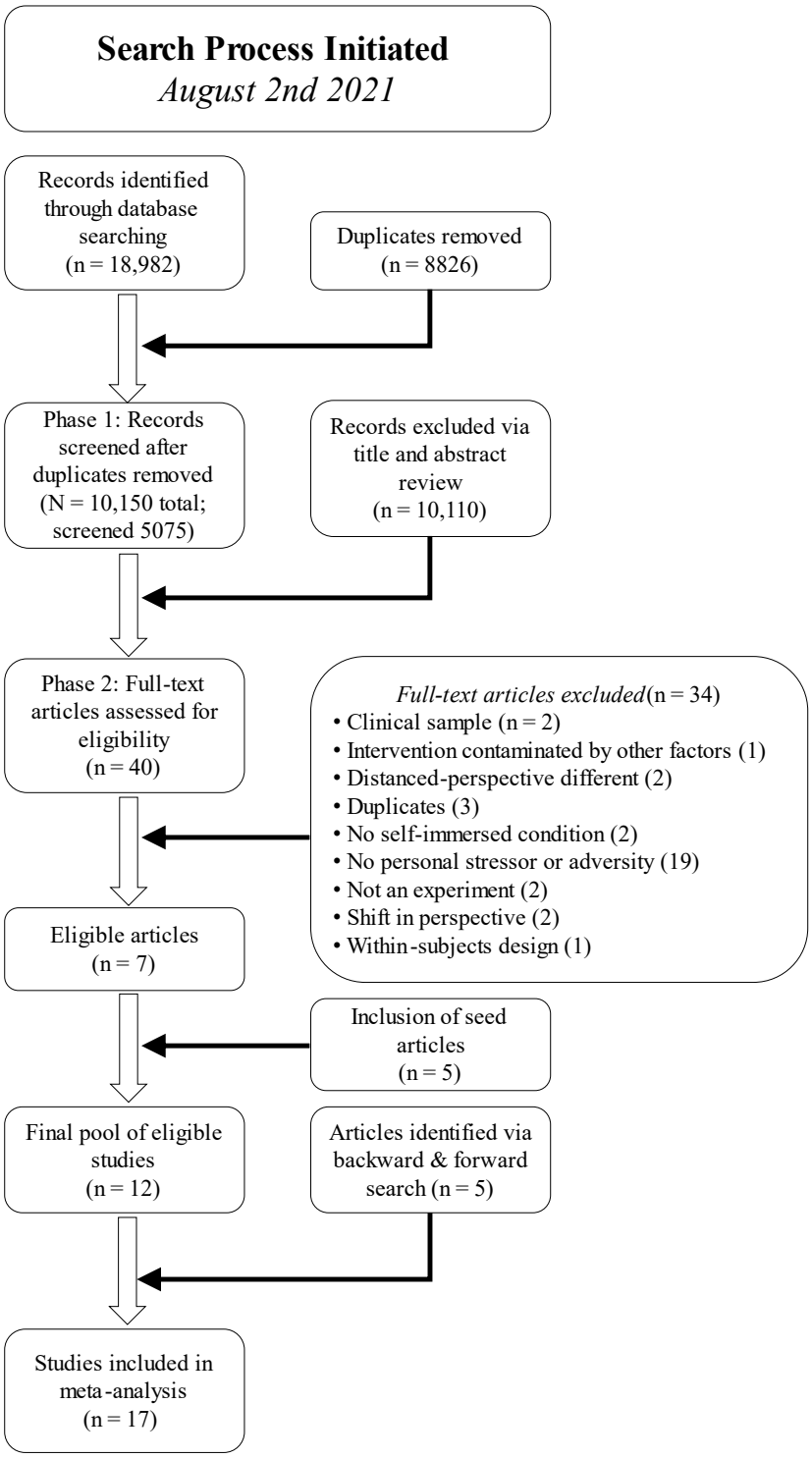


Figure 1. PRISMA flow diagram.

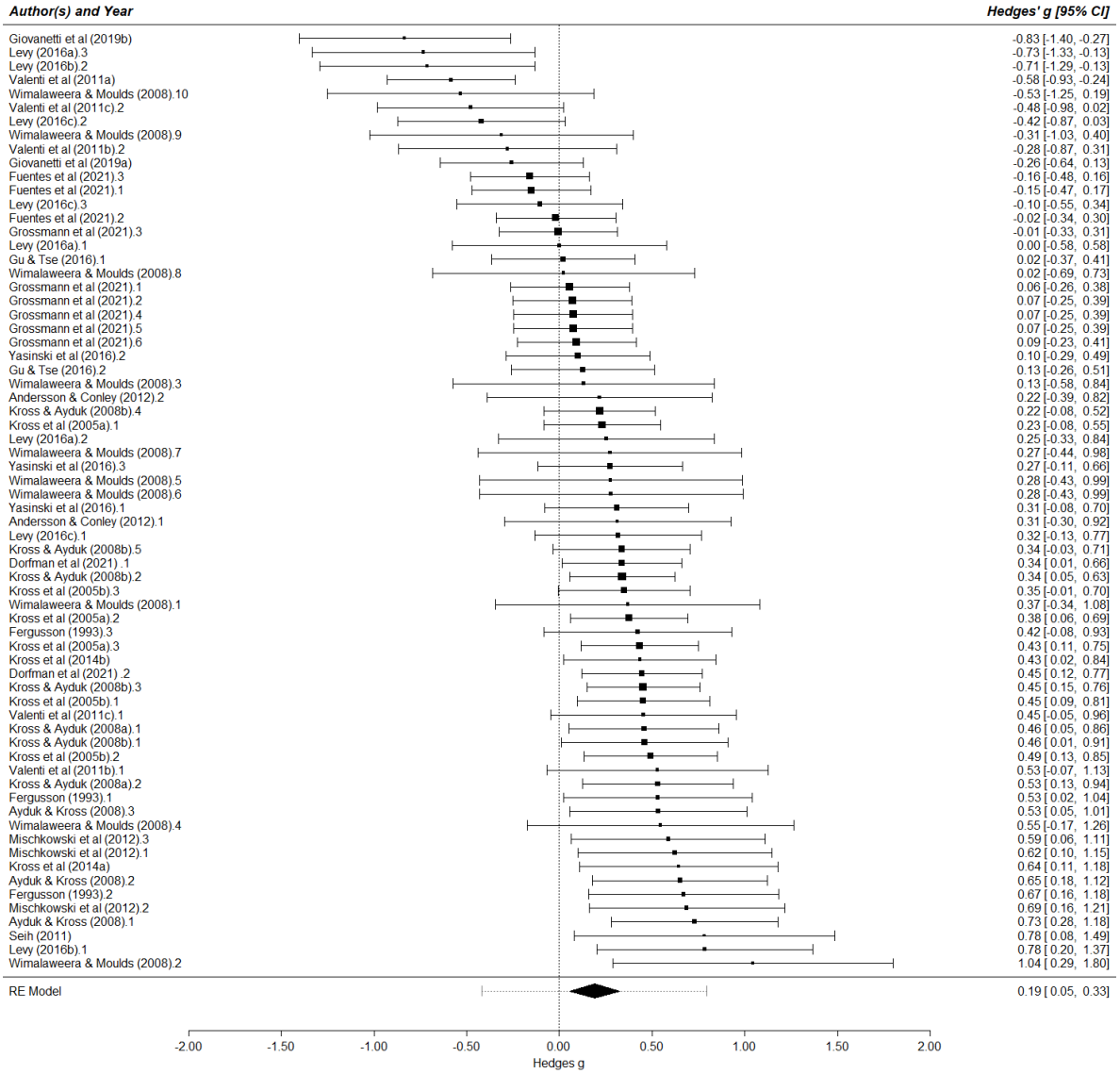


Figure 2. Forest plot of the overall pooled difference between self-distanced and self-referenced reflections (see the OSF project page for a version in which effect sizes are grouped by study to visualise the low within-study variance in effects; https://bit.ly/self-immersed-meta-project).

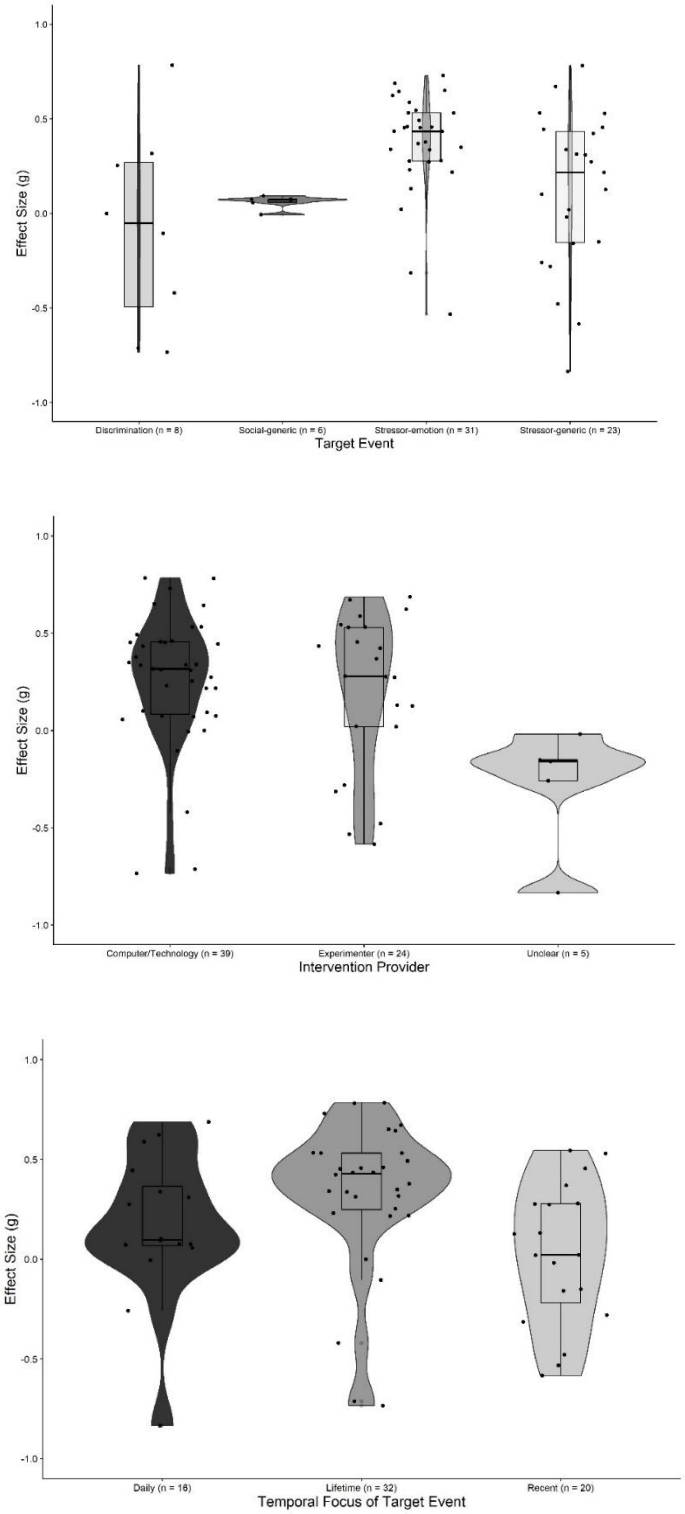


Figure 3. Visual depiction of the statistically significant moderators of the overall pooled effect statistically significant at p <.01 (target event) and p <.05 (intervention provider and temporal focus of target event).

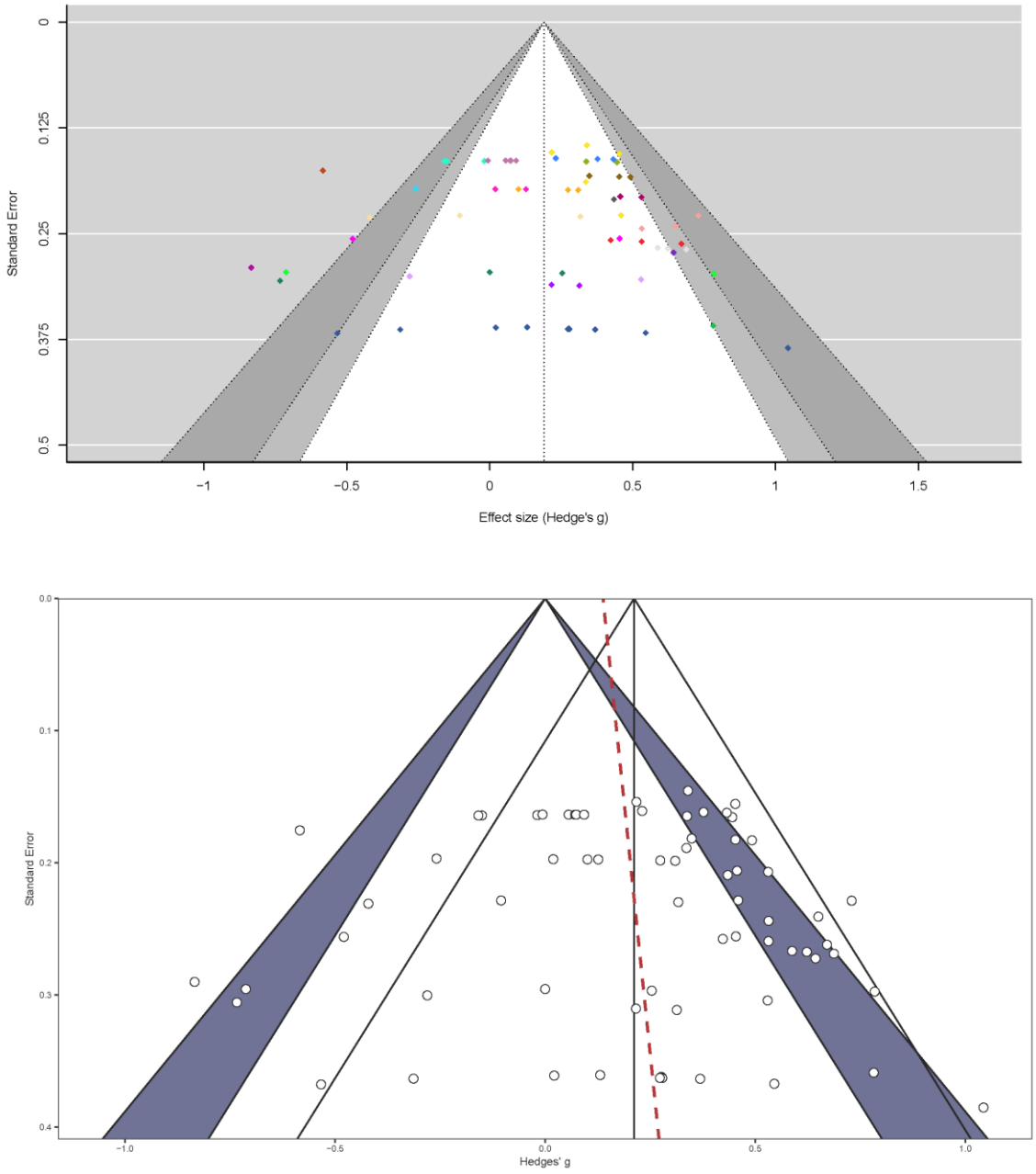


Figure 4. Contour-enhanced funnel plot (top) including Egger's linear regression test (bottom) for the overall pooled difference between self-distanced and self-referenced reflections (Note: different colours as used to visualise effects from within the same study; triangle with white background colour indicates $p > .05$, triangle with light grey background colour indicates $p < .05$, triangle with dark grey background colour indicates $p < .01$, and grey section outside of the triangle indicates $p < .001$).

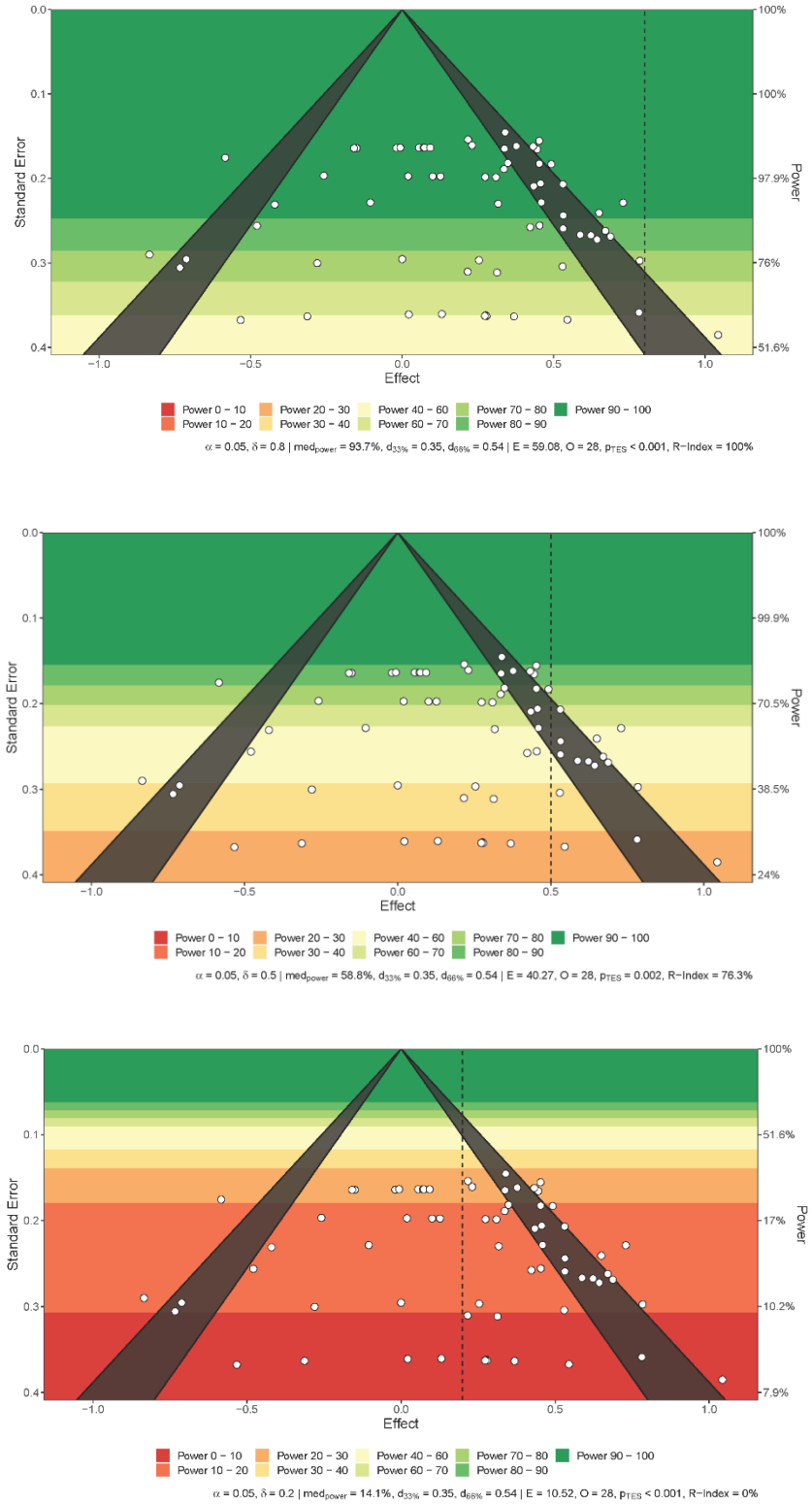


Figure 5. Sunset (power-enhanced) funnel plots for the overall pooled difference between self-distanced and self-referenced reflections

Table 1. Characteristics of Studies Included in the Meta-Analysis and Narrative Review.

Study	N	Age	Females (%)	Outcomes	Type of Measurement	Effect Size (Hedges' *g*)
Andersson & Conley (2012)	41	20.5	73	Cognitive Behaviour	Subjective Subjective	0.22[1] 0.31[1]
Ayduk & Kross (2008)	81	20.71	54	Affect Physiological	Subjective Objective	0.73 0.65, 0.53
Dorfman et al. (2021)	130	22.38	78	Affect	Subjective	0.34, 0.45
Fergusson (1993)	61	-	69	Affect Social	Subjective Subjective	0.53[1], 0.67 0.42[1]
Fuentes et al. (2021)	148	19.75	78	Affect	Subjective	-0.15, -0.02, -0.16
Giovanetti et al. (2019)	104 (s1); 51 (s2)	18.91	80	Affect	Subjective	-0.26, -0.83
Grossmann et al. (2021)	149	22.28 (s1); 35.04 (s2)	77 (s1); 45 (s2)	Cognitive	Subjective	0.06, 0.07, -0.01, 0.07, 0.07, 0.09

Gu & Tse (2016)	102	19.84	54	Affect	Subjective	0.02, 0.13
Kross & Ayduk (2008)	96 (s1); 78 (s2); 191 (s2); 96 (s2); 113 (s2)	23.88 (s1); 21.90 (s2)	53 (s1); 61 (s2)	Affect Cognitive	Informant-assessed Informant-assessed	0.46[1], 0.46, 0.34 0.53, 0.45, 0.22, 0.34[1]
Kross et al. (2005)	155 (s1): 123 (s2)	21.48 (s1); 21.60 (s2)	55 (s1); 53 (s2)	Affect Cognitive	Subjective Informant-assessed	0.45, 0.23, 0.38, 0.43 0.49, 0.35, 0.64, 0.43
Kross et al. (2014)	56 (s1a); 93 (s1b)	18.95 (s1); 32.23 (s2)	67 (s1); 54 (s2)	Cognitive	Subjective	0.64, 0.43
Levy (2016)	45 (s1); 48 (s2); 77 (s3)	-	-	Affect Behaviour Cognitive	Subjective Objective Objective	0, 0.25, 0.32, -0.42 0.78 -0.73, -0.71, -0.10
Mischkowski et al. (2012)	58	21.5 (s1); 21.0 (s2)	52 (s1); 65 (s2)	Affect Behaviour Cognitive	Subjective Objective Subjective	0.62 0.69 0.59
Seih et al. (2011)	33	19.05 (s1); 18.83 (s2)	48 (s1); 71 (s2)	Affect	Subjective	0.78

Valenti et al. (2011)	135 (s1); 44 (s2); 62 (s3)	-	44 (s1); 65 (s2); 64 (s3)	Affect	Subjective	-0.58, 0.53, -0.28, 0.45, -0.48
Wimalaweera & Moulds (2008)	30	19.51	65	Affect Cognitive	Subjective	0.37, 1.04, 0.13, 0.54, 0.28, 0.28, 0.27, 0.02, -0.31, -0.53
Yasinski et al. (2016)	102	18.47	75	Affect Cognitive	Subjective Informant-assessed	0.31, 0.10 0.27

Note: [1]Follow-up; (s1) study 1; (s2) study 2; (s3) study 3

Table 2. Moderator Analyses of the Effect of Reflection Interventions on Cognitive, Affective, Behavioural, and Physiological Outcomes

	Primary outcomes	
Moderator (N = 25)	*#ES*	*g* (95% CI)
Outcome method	68	
Objective (n = 4)		0.06 (-0.26, 0.38)
Subjective (n = 17)		0.19 (0.06, 0.34)**
Informant-reported (n = 4)		0.23 (0.01, 0.46)*
Target event for reflection**	68	
Generic stress or adversity (n = 12)		0.06 (-0.11, 0.22)
Generic social experience (n = 1)		0.06 (-0.40, 0.52)
Emotional stressor or adversity (n = 9)		0.45 (0.27, 0.62)***
Discrimination (n = 3)		-0.07 (-0.39, 0.26)
Intervention provider	68	
Experimenter (n = 8)		0.18 (-0.03, 0.39)
Computer technology (n = 14)		0.29 (0.14, 0.45)***
Unclear (n = 3)		-0.32 (-0.68, 0.04)
Written reflection	68	
Yes (n = 16)		0.15 (-0.02, 0.32)
Cognitively processed (n = 9)		0.27 (0.04, 0.50)*
Delivery mode	68	
Self-directed (n = 21)		0.17 (0.01, 0.32)*
Face-to-face (n = 4)		0.30 (-0.03, 0.63)
Intervention temporal frame	68	
1 day (n = 18)		0.22 (0.07, 0.37)**
4 days (n = 2)		0.42 (-0.06, 0.09)
10 days (n = 1)		0.23 (-0.38, 0.83)
2 weeks (n = 2)		-0.50 (-1.02, 0.02)
4 weeks (n = 2)		0.22 (-0.20, 0.63)
Intervention temporal frame – categories	68	
1 day (n = 18)		0.22 (0.06, 0.38)**
1 week (n = 2)		0.42 (-0.08, 0.91)
2-4 weeks (n = 5)		-0.00 (-0.31, 0.30)
Assessment point	68	
Post intervention (n = 24)		0.19 (0.05, 0.33)**
Follow-up (n = 4)		0.17 (-0.07, 0.42)
Outcome category	68	
Affect (n = 20)		0.18 (0.03, 0.33)*
Behaviour (n = 3)		0.60 (0.19, 1.02)**
Cognitive (n = 12)		0.15 (-0.03, 0.33)
Physiological (n = 1)		0.24 (-0.27, 0.75)
Social (n = 1)		0.11 (-0.50, 0.73)

Target event for reflection – temporal	68	
Daily (n = 6)		0.11 (-0.13, 0.36)
Recent (n = 6)		-0.04 (-0.29, 0.20)
Lifetime (n = 13)		0.35 (0.17, 0.52)***
Target event for reflection – magnitude	68	
Low to moderate (n = 16)		0.15 (-0.02, 0.32)
High (n = 9)		0.26 (0.03, 0.48)*
Delivery duration (mins)	51	
Intercept		0.26 (0.09, 0.41)**
Slope		-0.00 (-0.01, 0.00)
Reflection duration (mins)	44	
Intercept		0.22 (0.05, 0.39)*
Slope		-0.02 (-0.05, 0.01)

Note: ES = effect sizes; CI = confidence interval, * = p < .05, ** = p < .01, *** = p < .001.

Table 3. Risk of Bias Summary Table for Primary Outcome.

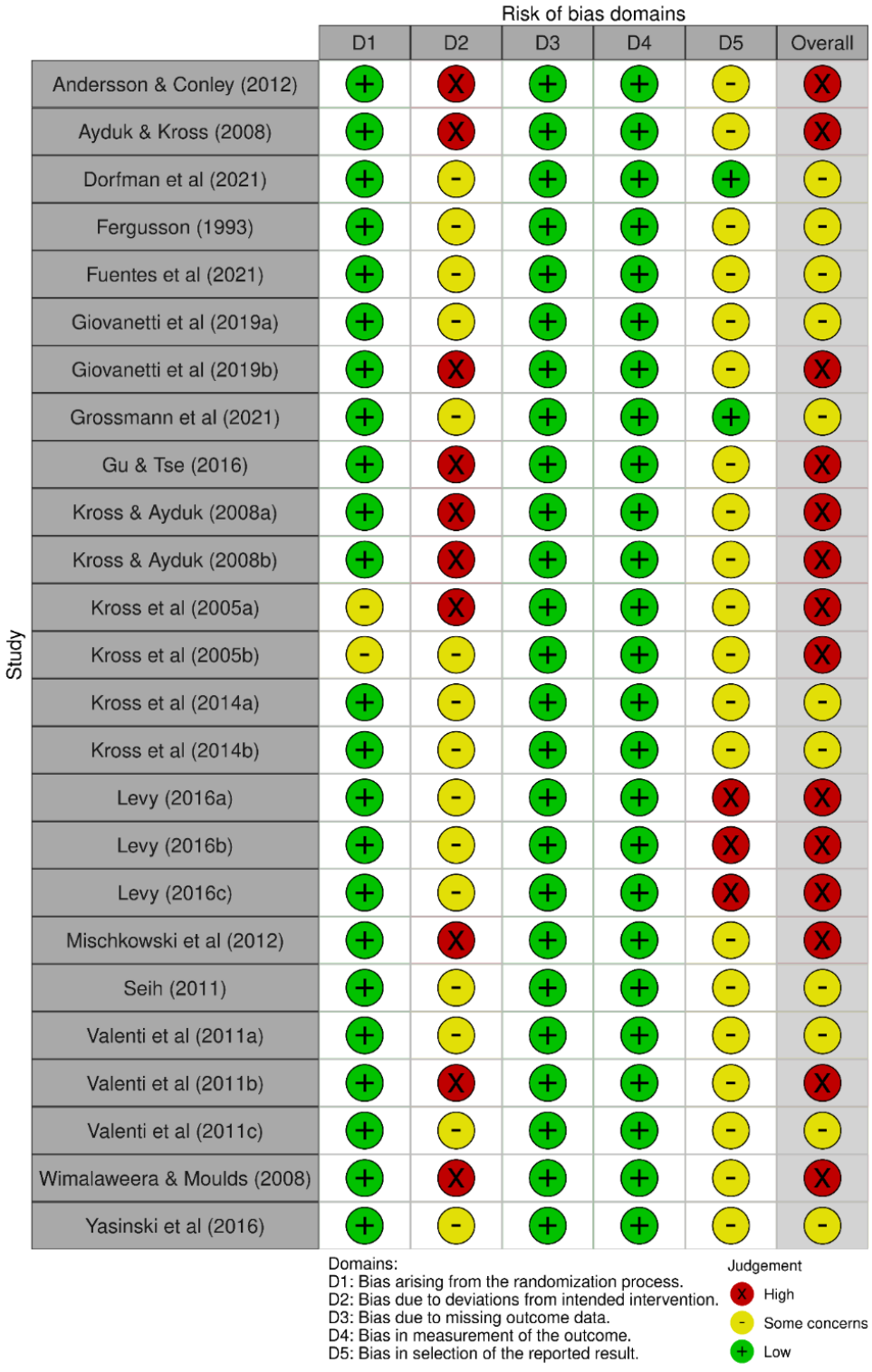


Table 4. GRADE Summary of Findings

Certainty Assessment							Summary of Findings			
Outcome	Number of experiments (#ES)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Other Considerations	Self-distanced reflection	Self-immersed condition	Pooled effect (95% CI)	Certainty
Combined effects	25 (68)	Serious[a]	Serious[b]	Serious	Not serious	-	1146.5/2201.5 (52.1%)	1055/2201.5 (47.9%)	0.19 (.05-.33)	Low

Note: #ES = Number of Effect Sizes; CI = Confidence Interval.

Overview of Chapter 4

This chapter is the first of two empirical papers presented within this thesis where we collected new primary data, namely a qualitative investigation of national/elite athlete self-reflections of stressor events. We utilise a self-reflection approach used across other contexts with emphasis on self-distanced and self-immersed reflection perspectives. Athletes were randomised to a reflection vista and reflected on a stressor event for five weeks. Specifically, we target the development of athletes' coping insights by engaging in weekly self-reflection. This chapter extends upon previous chapters by implementing a stress regulation intervention which is individualised and performed 'in the wild' with focus on athlete's coping insights gained.

Chapter 4: A Qualitative Investigation of Elite Athletes' Coping Insight Patterns from Self-Distanced and Self-Immersed Stressor Reflections

4.1. Introduction

The sporting environment is characterised by numerous potential stressors for athletes, which may occur in training (e.g., team atmosphere and support, coaching interactions), competition (e.g., risk of injury, ability to perform) settings, personal factors (e.g., relationship issues, study commitments), or organisational factors (e.g., competition format, career transitions; for a review, see Arnold & Fletcher, 2021). Psychologically, stress occurs when individuals assess the associated demands of stressors (i.e., an event that represents risk for disruption of optimal functioning; Cohen et al., 2019) as outweighing the personal and social-contextual resources available to them (e.g., Hobfoll, 1989; Lazanis, 1999). Athletes' volitional efforts to regulate their thoughts, feelings, and behaviours when confronted with stressors have important implications for performance (Hase et al., 2019; Sammy et al., 2017), mental health (e.g., Laurin et al., 2008), and injury (e.g., Singh & Conroy, 2017). It is therefore essential that athletes can self-regulate their engagement with stressors to optimise learning, development, performance, and well-being. Stress regulation interventions informed by a transactional perspective of stress (Lazarus & Folkman, 1984) typically target athletes' psychological interpretations of stressors or building capacities of individuals (e.g., self-regulatory skills) and/or their environment (e.g., access to counselling; Murdoch et al., 2021; Simpson et al., 2021). In this paper we examine an alternative, yet complementary approach that has received little attention among sport psychology researchers in which athletes engaged proactively with stressor experiences as a means by which to maximise the individualisation of stress regulation efforts.

4.2. Literature Review

4.2.1. Engaging Proactively with Stressor Experiences via Systematic Reflections

Murdoch et al. (2021) revealed that existing experimental or intervention work has focused primarily on equipping athletes with skills presumed to be effective for regulating stressor experiences. Given the prevalence of stressors in the sporting environment, leveraging stressor experiences as a means by which to acquire and refine self-regulatory skills and strategies represents an untapped approach that could benefit athletes. Exposure to stressors alone is insufficient for optimising the likelihood of resilient outcomes, which we conceptualise as the presence of positive functioning when exposed to stressor events (Crane, Searle, Kangas, et al., 2019; Kalisch et al., 2017). Alternatively, engaging proactively with stressors via introspection and self-reflections is key in this regard (e.g., Crane, Searle, Kangas, et al., 2019; Richardson, 2002) because it fosters psychological skills and strategies that promote resilience to future stressor experiences (Crane, Searle, Kangas, et al., 2019; DeRue et al., 2012; Fletcher & Sarkar, 2016). This meta-cognitive practice targets the understanding and exploration of one's cognitions, emotions, and actions during the coping process, and allows one to learn how best to manage future similar experiences (Crane, Searle, et al., 2019). This meta-cognitive approach differs from a purely cognitive strategy in which mental processes (e.g., attentional engagement or distraction) are implemented to regulate one's thoughts to achieve a goal (Cameron & Jago, 2013).

In their Systematic Self-reflection (SSR) model, Crane, Searle, Kangas, and colleagues (2019) formalised one conceptualisation of this meta-cognitive approach as a means by which to strengthen individual resilience via several means. Interventions based on the SSR model (Crane, Searle, et al., 2019) promote a method for reflecting on daily stressors and coping processes. Self-reflection is proposed to promote coping self-insights that are thought to direct and motivate the development and refinement of resilient capacities (e.g., coping strategies, resources; Crane, Boga, et al., 2019; Falon, Kangas, & Crane, 2021). In

past studies, the self-reflective practices identified and guided via journaling sessions were a reflection on: (1) the emotional, physical, behavioural and cognitive reactions occurring in response to stressor events, (2) identification of contextually relevant values and goals, (3) the self-regulation strategies and resources applied to address the stressor, (4) the effectiveness of self-regulation strategies in relation to values and goals and (5) future plans for modifying and refining strategies for improving one's coping response and to achieve greater alignment with contextually relevant values and goals (Crane, Searle, et al., 2019). These targeted self-reflective practices are proposed to refine and develop resilient capacities and their application in a way that is personalised to the individual and their situational conditions. Experimental research with university students (Crane, Kangas, Karin, et al., 2020), employees (Crane, Kho, Kangas, et al., 2020), and military cadets (Crane, Boga, et al., 2019; Kho et al., 2023) provides preliminary support for the effectiveness of this systematic approach to stressor reflections in terms of reduced anxiety, depression (Crane, Boga, Karin, et al., 2019), negative affect, task-related stress (Crane, Kangas, Karin, et al., 2020), stable levels of perceived stress during increased exposure to stressors (Falon, Karin et al., 2021), and an increase in performance (Kho et al., 2023). This experimental evidence also offers preliminary support for the range of beneficial outcomes possible from engaging in systematic self-reflection, and the effectiveness of this approach across contexts.

Coping insights refer to individual’s conscious awareness of thoughts, feelings, and behaviour during the coping process (Falon, Kangas et al., 2021). These insights naturally develop as individuals engage in self-reflective processes and deeply explore their experiences with stressors and coping strategies, building upon the SSR approach (Falon, Kangas et al., 2021). This extended framework includes 13 distinct coping insights, characterised by the development of self-awareness, a deeper comprehension of responses to stressors across time and contexts, the interplay between stressors and coping strategies, and

the connection between one's coping approach and broader contextual and interpersonal factors. Advancements in these coping insight areas lead to enhanced resilience, improved future responses, and better individual outcomes (Ellis et al., 2014; Schön, 1983). In non-clinical populations, insight is inversely associated with depression, anxiety, stress, and negative affect (Tulver et al., 2023) and positively correlated with resilience, cognitive flexibility, self-regulation, life satisfaction, and subjective happiness (Cowden & Meyer-Weitz, 2016; Grant et al., 2002; Lyke, 2009). Qualitative research involving 68 officer cadets that explored insights developed through the SSR approach, indicated that participants felt this approach strengthened their understanding of their coping strategies and their perception of the relationship between coping responses and broader contextual and intrapersonal factors (Falon et al., 2022).

4.2.2. Value-Add in Sport Psychology by Targeting Reflection Vistas

Initial evaluations of the SSR approach are promising, yet there remain several important considerations for ongoing work in this space. We address two considerations in the current study. First, there is a need to examine the extent to which the effectiveness of SSR generalises to new populations and contexts, given much of the available evidence stems from work in military settings (Crane, Boga, Karin, et al., 2019; Crane, Rapport, Callen, et al., 2019). We focused on elite athletes because the SSR approach aligns well with the overarching framework of ‘plan-perform-review’ widely adopted in sport settings and the prevalent nature of stressors in training, performance, and organisational contexts in sport. Second, there is a need to consider the nuances of the reflection process that might optimise outcomes for individuals, given the inconsistent findings of systematic stressor reflections regarding immediate and long-term effects (Crane, Boga, Karin, et al., 2019; Crane, Kho, Kangas, et al., 2020). We considered the vantage point or lens through which people enact systematic reflections as one possibility in this study. Existing applications of the SSR

process require individuals to adopt a ‘self-immersed’ perspective in which they reflect on a stressor experience from a first-person point of view on specific situational details as if one were reliving the experience. Self-immersed reflections of negative experiences are known to narrow thinking (Grossmann & Jowhari, 2018), cue negative emotionality, depressive symptomatology, and distress (Tackman et al., 2018), and enhance physiological stress, emotional reactivity, and vulnerability to rumination (Kross & Ayduk, 2017). Self-distanced reflections, in contrast, prompt individuals to consider stressor experiences from a third-person perspective in which they ‘step back’ to remove themselves psychologically from the event to focus on elements from the experience most salient to their broader, abstract goals (Kross et al., 2005; MacGregor et al., 2017; Rees et al., 2018). In so doing, people are well positioned to view the situation constructively and with ‘eyes wide open’ rather than focus on the highly arousing features of the experience. Observational and experimental evidence supports the adaptiveness of self-distanced reflections in the short- and long-term in relation to cognitive (e.g., increased reconstrual and decreased recounting), and emotional (e.g., reduced negative emotionality and momentary distress; for reviews, see Kross & Ayduk, 2017; Murdoch et al., 2023) outcomes.

4.2.3. Overview of the Current Study

Self-distanced reflections confer benefits relative to self-immersed reflections, particularly when referenced against stressor events that represents ‘jolts’ to the system (Moran & Eyal, 2022; Murdoch et al., 2023). However, we know little about the causative mechanisms that activate these beneficial features for human functioning. Against this conceptual and empirical backdrop, we conducted a pilot randomised controlled trial with a qualitative analysis in which we examined the similarities and differences in coping insights generated via systematic stressor reflections implemented from self-immersed and self-distanced perspectives across a 5-week period from self-distanced and self-immersed vistas.

In essence, our main goal was to understand patterns – the regularities, differences, and gaps – in how people experience insights from reflecting on stressor events, focusing on what these insights are and how they might facilitate adaptive outcomes.

4.3. Methods

4.3.1. Philosophical Positioning

Our research framework combines elements of critical realism, which considers both the objective reality of phenomena and the subjective ways we understand them. We believe the insights gained from reflecting on stressors are real and exist independently of how we or others think about them, yet the only way we can make some sense of this reality is by how people refer to their experiences. Ontologically, we divide reality into three parts: the real (entities or structures that trigger causal mechanisms), the actual (events and resultant effects engendered by activated causal mechanisms, which exist regardless of our subjective perception), and the empirical (actual events and effects as experienced). Epistemologically, we see knowledge as socially constructed, meaning it is contextually situated (e.g., people involved in the sense-making process) and temporally dynamic (e.g., evolutions in social and cultural contexts).

4.3.2. Participants

[name blinded for peer-review] Human Research Ethics Committee approved this study prior to implementation. We sampled highly trained/national level (McKay et al., 2022) athletes across various sports (e.g., swimming, diving, synchronised swimming, wheelchair basketball) in [location blinded for peer-review]. In total, 66 athletes aged 14 years and over completed the baseline assessment across 13 different sports, including: swimming (n = 4), wheelchair basketball (n = 4), waterpolo (n = 4), surfing (n = 1), artistic swimming (n = 12), diving (n = 3), netball (n = 17), hockey (n = 8), cycling (n = 4), kayaking (n = 6), basketball

(n = 1), rowing (n = 2). There were 33 athletes cluster (sport) randomised to the self-distanced condition (M= 20.3, SD = 3.98) and 33 athletes (M = 22.9, SD = 4.82) to the self-immersed condition (see supplementary material for a CONSORT flow diagram). There were no exclusion criteria other than dissent to participate in the study.

4.3.3. Research Design

We employed a pilot randomised controlled trial, aimed at comprehending participants' written reflections to explore the development of coping insights during the intervention period. The experimental protocol was executed within the context of athlete training and competitions at [location blinded]. The intervention was administered over a 5-week duration; athletes across sporting groups participated in the study from February to September 2022. This temporal frame for the self-reflection period is consistent with prior research in diverse populations, such as military personnel (Crane, Boga, et al., 2019; Kho et al., 2023), university students (Crane, Kangas, et al., 2020), older adults (Crane, Kho, et al., 2020), and military police (Crane, Rapport, et al., 2019).

4.3.4. Self-Reflection Conditions

Athletes were cluster randomised into experimental groups by sporting team or squad to minimise potential contamination effects (e.g., discussing reflection strategies with athletes in their team or squad). We generated the blocked allocation sequence using Sealed Envelope™ (https://www.sealedenvelope.com/simple-randomiser/v1/lists). The randomisation schedule was concealed from the primary analyst (first author) until the moment of group assignment, all of which occurred electronically via email invitations. Using Qualtrics online survey platform, participants in both conditions were prompted weekly to reflect on and write down their reflections of the most stressful event or situation they experienced over the past week for a period of 5 weeks. Participants in the self-distanced group were asked to reflect on their experience from a third-person perspective (e.g.,

visualising yourself as a sports coach standing on the sidelines watching yourself experiencing the event from afar). For the self-immersed condition, participants were asked to reflect on the experience from a first-person perspective, as if they were reliving the experience. Questions in both conditions focused on core elements from the SSR model (Crane, Searle, Kangas, et al., 2019) including: (1) self-awareness and triggers, (2) awareness of one's values in relation to the stressor, (3) awareness of strategies applied to the stressor, (4) evaluation of strategy effectiveness considering one's values, and (5) constructive adaptions of one's strategies in order to improve their coping and emotion regulatory approach to future stressors. Full details of each experimental condition are provided in the supplementary material.

4.3.5. Procedure

We distributed a study invitation email to athletes listed on the [location blind] institute database. Subsequently, consenting athletes were grouped by their sporting team and cluster-randomised to one of two experimental conditions in which they were asked to complete a 15-minute written reflection at the end of each week for a period of 5 weeks using either a self-immersed or self-distanced reflection perspective. Text message reminders were sent to participants on Thursday, Friday, and Saturday mornings to prompt them to complete the reflection online over the weekend in their own time.

4.3.6. Data Analysis

We examined participants' written reflections via framework analysis, as we wished to examine the form and nature of conceptually informed categories of coping insights within participants' self-generated stressor reflections. The entire analytical process was executed by the first author, whereas the last author served the role of a 'critical friend', providing valuable insights throughout the analysis (Smith & McGannon,2017). The primary analyst is a doctoral student with educational qualifications in psychology at undergraduate and Masters

levels, who at the time of completing this study was engaged in the psychologist registration pathway in Australia. The critical friend who supported the primary analyst is an academic psychological scientist with approximately two decades of experience studying stress, resilience, and human performance. Initially, both [EM, DG] worked collaboratively to code a random selection (~20%) of quotes to lay the foundations for a shared mental model of decision-making processes. Subsequently, [EM] led the coding process, with regular check-ins with [DG] to maximise consistency in application of their shared mental model for the 13 coping insights. In accordance with the Self-Reflection and Coping Insight Framework (Falon, Kangas et al., 2021), we assigned codes to each reflection based on the 13 coping insights it encompassed. These 13 exemplar coping insights are characterised by an improvement in understanding the self, deeper interpretations about one's response to stressors across time and contexts, broad principals about the nature of stress and coping, and the interaction between one's choice of coping approach and broader contextual and interpersonal factors. These codes were employed to categorise the representation of each coping insight within an individual's reflection as 'no/little representation,' 'moderate representation,' or 'high representation.' These categorical codes were subsequently aggregated to generate an aggregate score for each coping insight domain, which was normalised relative to the number of participants who had completed the reflection for a particular week. Standardised scores were computed on a weekly basis for both the self-immersed and self-distanced conditions. We charted these results visually across time and coping insight categories using heat maps. Additionally, we assessed the depth of each reflection as an indicator of its quality, using a bespoke 10-point response scale, where a score of 1 signified 'no/little depth' in the reflection and 10 indicated a 'high-level insight and detail provided in the reflection.

4.3.7. Study Rigour

In accordance with our relativist paradigm, we addressed several facets of research quality (Burke, 2016). First, our study contributes to the existing literature by delving into the essence and structure of coping insights as a pivotal mechanism connecting meta-cognitive strategies (reflections), stressor occurrences, and the performance, well-being, and mental health of athletes. Second, the principal author's extensive involvement within the [name blinded] both as a trainee psychologist and a doctoral candidate under the mentorship of sport psychologist [Joanne Ayers], facilitated continuous interaction with athletes and their support staff (e.g., coaches), allowing for an in-depth exploration of the central concepts of this study. In line with this, we present comprehensive narratives alongside pertinent quotations in our findings and examples of our coding framework in the supplementary material to enable readers to arrive at their own conclusion regarding information credibility. Third, we have addressed the principles of transparency and genuineness in our research through a collaborative coding process that incorporated the insights of a critical colleague, who scrutinised the initial and evolving interpretations of participants' reflections.

4.4. Results

4.4.1. Overview of Qualitative Data

An overview of the proportion of self-reflections which we assessed as no/low representation, moderate representation, and high representation for each coping insight category across each week for both groups is presented in Figure 1. Overall, participants across both conditions demonstrated similar levels of coping insight over the 5-week reflection period. Both groups lacked moderate and high level coping insights across the following areas: understanding the potential for coping strategies to be associated with distinct or even oppositional shorter-term and longer-term outcomes (4.1.2); understanding

the nuanced interactions between individual strengths and the effectiveness of coping strategies or resources (4.1.3); understanding the anticipated effect of resilient capacities applied in the future; and understanding the congruence between the type and source of coping resources available, and the anticipated needs of the individual in their future stressor context (5.1.2). These insight categories are thought to emerge from evaluation and future focused based self-reflection activities.

Regarding similarities between the groups, both groups evidenced mostly moderate level insights when understanding the time course of their reaction (1.1.1), and a similar trend in developing moderate level insights over the 5-week period when understanding the inter-relationships between one's various types of stressor reactions (1.1.2). Both these insights are proposed to be related to self-awareness reflection activities seeking to highlight one's coping reactions in response to stressors events.

We inferred potentially meaningful differences between the groups across the remaining coping insights. For the coping insight addressing the influence of personal reactions on others (1.1.3), the self-distanced group demonstrated a tendency for increased moderate and high-level insights by week four, although overall there were more moderate and high-level responses demonstrated by the self-immersed group over the 5-week period. Similarly, when individuals considered their coping resources, alongside their beliefs about coping (1.3.1), participants from the self-distanced group provided high quality reflections across weeks two and three. However, in weeks four and five there were moderate and high-level responses provided from the self-immersed group. When individuals were prompted to identify the trigger to their stress response and make interpretations as to why the trigger caused stress (2.1.1., 2.1.2), the self-immersed group produced moderate and high-level reflections over the five-week period. When individuals were prompted to reflect on the interaction between the stressor and the effectiveness of their coping strategies or resources

(4.1.1), the self-distanced group produced moderate-level insights by the fifth week of reflections. Inspection of the heat maps indicated that most similarities between the groups occurred in week three.

4.4.2. Content of Reflections Across Coping Insight Categories

Self-awareness (1.1.1, 1.1.2, 1.1.3, 1.2.1, 1.3.1). In week one, there were noticeable differences between the two groups regarding the coping insight of understanding the time course of one's reactions, whereby the self-immersed group produced moderate and high-level insights. By week 5 of the intervention, most participants in both groups produced moderate-level insights. In most cases, participants identified the time and context in which the stressor occurred, the people involved, and acknowledged their reaction to the stressor event and how this changed over time. Regarding the coping insight relating to understanding the inter-relationships between one's various types of stressor reactions, both groups developed moderate-level coping insights over the 5-week period. Both groups produced their highest frequency of moderate-level insights in week 4, due to their ability to reflect at times on connections between their cognitive, affective, physiological, and behavioural responses. Participants in the self-immersed group tended to identify the emotional aspects, in comparison to the self-distanced group. One participant in the self-distanced group reported *"Mike initially was surprised by the challenge and questioned why he had to do it but after a while he recomposed himself and did the first 50 and went under the target time, once he hit the wall, he took deep breathes and controlled his emotions for the second 50, and then went under his target on the second one as well, hence finishing the set."*

For the coping insight addressing the influence of personal reactions on others, the self-distanced group showed positive signs of developing greater moderate and high-level insights in week 3. Athletes identified the effect of others on their own cognitions and identified themes across contexts. For example, one participant wrote *"Lisa was overthinking*

people's opinions about her and worrying about things that weren't in her control. She was always seeking approval from her peers". Generally, there were more moderate and high-level responses demonstrated by the self-immersed group over the 5-week period. Participants in the self-immersed group often identified who was involved in the stressor experience, how others influenced their reaction, and/or how the participant's actions influenced other people in their environment. For example, one participant in the self-immersed group wrote *"At the time I completely shut down. For the rest of the day, I was overcompensating for making the mistake, instead of pulling the person up for talking to me like that so they don't think it's okay for them to keep speaking to me like that."*

Both groups tended to lack depth in their responses when considering the coping insight referring to understanding whether one's response to a stressor moves them towards or away from their personal values, aside from week four whereby the self-immersed group exhibited moderate-level insights. During this week, one participant discussed the values of challenge and curiosity. They wrote *"Next time I just need to trust myself going into the process but understand that it's okay to be nervous as well with new things. But definitely give it a go because at first, I declined the offer but then I came back and said yes I will help you out and grade the girls and I'm glad I did as you learn new things by pushing yourself out of your comfort zone."* Aside from this one exception, participants' reflections excluded reference to their values and how they played a part in their coping decision-making process.

The self-distanced group provided high quality reflections across weeks two and three, when considering their coping resources and their effectiveness. Individuals reported a wide array of coping strategies, including cognitive re-structuring, external support, re-direction of attention, suppression of emotions, acceptance/recognition of emotions, mindfulness, planning, avoidance, and physiological (e.g., deep breathing). One participant mentioned *"Laura reached out to her support network straight away including her coach.*

She was confused and disappointed. She was open and honest with her emotions and feelings and allowed herself to understand the situation. She was determined to gain feedback and willing to listen and put the feedback in place, as hard as it is." The self-immersed group reported more moderate and high-level responses in weeks four and five. The coping strategies identified by participants in the self-immersed group included external support, cognitive re-structuring, goal setting, avoidance, physiological techniques (e.g., deep breathing), and distraction/avoidance. Overall, for awareness-based insights, both groups provided fairly stable insights over the duration of the intervention period with the self-immersed condition tending to provide more frequent moderate and high-level insights.

Trigger identification (2.1.1, 2.1.2). The self-immersed group produced moderate and high-level reflections over the five-week period when individuals were prompted to identify the trigger to their stress response and make interpretations as to why the trigger caused stress. Most of the time, individuals in the self-immersed group identified the stressor they encountered or concurrent stressors (e.g., exams and training) they were experiencing across contexts, and whether it was the first time they had experienced the stressor. One participant wrote *"I got COVID last Monday from a school event. It was the most stressful time in the past 2 weeks as I was in fear of falling behind at school and missing my assessments, but also falling behind in netball and not being able to play [competition name]."* Other participants identified their stressor due to similar past experiences and as a result were minimally deterred by their stressor experience. The self-distanced group developed moderate-level insights by the end of the five-week intervention period, meaning their insights increased over time. Regarding participants' interpretations on why the triggering event caused stress, participants in the self-immersed group spoke about the stressor being outside their control (e.g., COVID and housemates isolating), performance/evaluation-related (e.g., coach watching performance), lack of purpose,

uncertainty, potential disappointment from teammates, fear of failure, personal expectations, and outcome-focus. In contrast, the self-distanced group perceived stressors due to social evaluation, injury-related, time pressure, responsibility (e.g., expectation to support friend), de-selection, high expectations, relationship issues, and perfectionistic traits. Thus, participants reported diverse reasons for experiencing stress from certain events.

Re-appraisal (3.1.1). Overall, the self-immersed group produced more moderate-level insights over the five-week intervention period. Participants in the self-immersed group, at times, viewed their stressor experience as a growth opportunity despite the immediate challenges they faced, and gained validation of their actions from a supportive person. One athlete wrote *"I just reminded myself that I had a lot of experience for my age behind me and to trust my instinct and decisions made. I double checked after with one of the managers and we almost agreed on everything so that was helpful."* Other athletes spoke about the potential benefits from facing their stressor, in terms of sporting development, or discussed other areas they could direct their attention to for positive results across contexts (e.g., increasing rest days, directing their attention to study). For the self-distanced group, there was a small percentage of participants who provided moderate-level insights, particularly across week four of the reflections. At times, participants acknowledged the difficult nature of the stressor event, or accepted the stressor event and implemented strategies to cope; most of the time athletes were unable to re-frame their stressor and pivot so they could see the event as a growth opportunity. For example, one participant wrote *"Sophie reacted well, as this injury at the present moment does not hold her back from any sport (hockey), she has found herself feeling upbeat about the situation and optimistic. There is obvious worry that the injury may require surgery and how that may set her back in the near future."* When considering the severity of the stressors reported by the participants, most stressors reported were considered

'mild' and spanned across areas including performance anxiety, interpersonal conflict, health anxiety (e.g., COVID-related), and school-sport balance.

Evaluation and future-focus (4.1.1, 5.1.1., 5.2.1). The self-distanced group produced moderate-level insights by the fifth week of the intervention period, when individuals were prompted to reflect on the interaction between their stressor and the effectiveness of their coping strategies/resources. At times, athletes in this group identified the coping strategies they deployed and provided insight on their effectiveness considering the characteristics of the stressor event. One participant wrote *"[Next time I would] probably say something at the time it happened to set a boundary with the other girl in the situation. She would feel a lot more relieved knowing she said something, even if it made no difference to the other girl's behaviour".* Other times, individuals in the self-distanced group identified how the way/s in which they coped influenced their outcome, or identified key aspects (e.g., pressure, high expectations) of the stressor which were evaluated as being outside of their control and unchangeable in the future. When considering the effectiveness of coping strategies, there was an emphasis on the time in which the coping strategy was implemented. Oftentimes, individuals in both groups were a 'harsh critique' of their actions when writing their reflections and wrote about implementing their coping strategies earlier next time. The self-immersed group showed a very small percentage of moderate-level insights over weeks one and two when attempting to understand the nuanced interactions between individual strengths and the effectiveness of coping strategies/resources. When considering how one's capacities for resilience may be maintained, changed, or optimised in the future, one athlete in the self-immersed group demonstrated moderate-level insights in week four of their reflections. Otherwise, both groups demonstrated no evidence of insight regarding the anticipated benefits of capacities for resilience if applied in the future. Over weeks two and three the self-immersed group also showed a very small percentage of moderate-level insights of

understanding the congruence between the type and source of coping resources available, and their anticipated needs in their future stressor context. Overall, the depth of insights was poor for both groups across these high-level areas of coping insight.

4.5. Discussion

Self-reflections on stressor events confer beneficial outcomes for human functioning (e.g., Crane, Boga et al., 2019; Falon, Karin et al., 2021), with differential effects according to the vista from which one analyses their past experiences (Moran & Eyal, 2022; Murdoch et al., 2023). How different vantage points – specifically self-distanced versus self-immersed perspectives – has received little empirical attention and therefore largely unknown. As one potential causal mechanism, we compared and contrasted the coping insights generated from stressor reflections across a 5-week period between highly trained/national level athletes who reflected from a self-immersed or self-distanced standpoint. Our qualitative analysis of athletes' written reflections revealed several interesting findings regarding coping insights generated from self-immersed and self-distanced reflections. First, all athletes reported moderate and high-level coping insights across multiple areas, except for coping insights which involved evaluation and future-focus components, irrespective of their self-reflection vista. Second, there were similarities in coping insights between experimental groups related to the time course of their reaction, and inter-relationships between one's various types of stressor reactions. Third, differences between the groups related primarily to coping insights characterised by self-awareness, trigger identification, and coping strategy effectiveness.

We interpreted similarities in coping insights across both groups regarding their understanding of the time course of stressor reactions and inter-relationships between those responses. Athletes typically reported the time and context in which the stressor occurred and who was involved and acknowledged their personal reaction to the stressor and how the intensity changed over time. That both reflection groups demonstrated connection with the

temporal elements of stress dynamics is conceptually and practically encouraging. From the standpoint of Event Systems Theory, key temporal elements of event experiences include the duration for which events remain impactful on functioning, the developmental period of event exposure (e.g., adolescence), and changes in event strength over time (Morgeson et al., 2015). Events which trigger stress dynamics and are the focus of self-reflections have an identifiable beginning and end and evolve in a specific setting; the longer timeframe for which a stressor is experienced, the more it may shape an individual's thoughts, feelings, and behaviour (Morgeson et al., 2015; Morgeson & DeRue, 2006). Athletes also reported similarities for coping insights regarding their understanding of the inter-relationships between one's various types of stressor reactions over the five-week reflection period, whereby athletes made connections in their cognitive, affective, physiological, and behavioural responses. Practically, these temporal connections likely serve the foundation for generating knowledge on what works best and when. Self-reflection tools, irrespective of their vista, encourage a person to investigate their inward experience ("what is happening in the body") alongside the outward experience (i.e., behaviour). Conceptually, recognising the link between mind and body is a central component of major psychological practices for stress regulation including Cognitive-Behaviour Therapy (Field et al., 2015) and Acceptance and Commitment Therapy (Fletcher & Hayes, 2005).

We also identified similarities between groups regarding the absence of coping insights within self-reflections, which was particularly prominent for insights that required higher level thinking about the effectiveness of coping strategies and resources alongside a future-focus. Athletes overlooked the potential for coping strategies to be associated with distinct or even oppositional short- and long-term outcomes and were unable to develop insights on the nuanced interactions between individual strengths and the effectiveness of their coping strategies or resources. The 'evaluation' area of the SSR approach encourages

self-reflection on whether one's stressor response aligns with one's values, their strengths, and short- and long-term goals (Crane, Searle, et al., 2019). Doing so means that people can connect their momentary experiences of 'how' things are done (e.g., stress regulation tactics deployed in response to specific situational features) with overarching features of the self which drive 'why' we want things to occur in certain ways (Vallacher & Wegner, 1987). Both groups similarly never reported coping insights directed towards values; failing to recognise or understand that key personal values may result in behaviours incongruent to the self (Cohen & Sherman, 2014) and limit one's ability to evaluate their personal response to the stressor event. Athletes in both groups also rarely addressed the 'future-focus' elements of the SSR framework, which is a culmination of the other four self-reflective practices and targets coping with future stressor events. The key component of this higher-level insight area is being able to transition from processing the stressor event to moving forward so that one can make positive psychological adjustments (Bonanno et al., 2011). Failure to shift from processing the event to the future encourages rumination of the stressor event, a maladaptive emotional strategy that oftentimes leads to an increase in anxiety and depression symptoms (Nolen-Hoeksema, 2000).

We interpreted differences between self-immersed and self-distanced reflections across three coping insights domains. For the self-distanced group, athletes oftentimes provided responses which highlighted moderate insights regarding self-awareness of personal reactions and personal coping strategies, resources, or beliefs deployed during the stressor event, alongside evaluation of strategy fit. At times, athletes reported insights relating to understanding the nuanced interactions between stressor characteristics and the effectiveness of coping strategies or resources, as athletes were able to identify coping strategies they deployed and provide insight on their effectiveness. 'Stepping back' from a stressor event allows one to observe the full stressor experience and evaluate the fit of coping strategies or

resources that were implemented. In doing so, one can adopt a solution-focused stance (Falon, Kangas, et al., 2021), as opposed to one where they ruminate on the event and become ‘stuck’ in worrying about their personal experience (Kross et al., 2023). The self-distanced group also reported promising coping insights in week four regarding personal reactions, where they noticed the effects of others on their own internal experience or identified themes centred around other people (e.g., seeking validation from others). These reflections highlight the balanced perspective gained from adopting a self-distanced viewpoint as opposed to an egocentric viewpoint in the self-immersed condition (Kross et al. 2023), allowing one to identify broader personal themes that occur and their usefulness in that context. The self-distanced condition also allowed individuals to become aware of their coping strategies, resources, or beliefs, which is beneficial for the evaluation of these strategies in a coping context (Falon, Kangas et al., 2021). Generally, across most coping insight domains, it took multiple weeks for athletes in the self-distanced group to generate moderate and high-level coping insights. It is possible the structure and prompts generated for the self-distanced group were unfamiliar in nature to athletes or inconsistent with their tendency to reflect spontaneously via a self-immersed standpoint, thus requiring time to adapt to a third-person approach.

We identified greater instances of moderate and high representations of coping insights related to self-awareness, trigger identification, and re-appraisal among reflections of athletes who utilised a self-immersed vista. Athletes who reflected from a self-immersed standpoint were able to identify their stressor or concurrent stressors, as well as provide interpretations as to why the trigger initiated a stress response. Most stressors reported by athletes were essentially ‘everyday’ or ‘mild’ in nature, rather than significant adversities or traumatic events; thus, it may have been easy for the self-immersed group to embrace their event and ‘lean’ into the reasons why they experienced a reaction. Athletes in the self-

immersed group provided moderate-level insights across the 5-week period for re-appraisal, as they could view their stressor experience as a growth opportunity at times. These findings contradict the research in the self-immersed perspective literature, which argues that when people re-live stressor experiences they accentuate the ‘hot’ features of the event, rather than re-structuring the event and providing a solution-focused lens which aligns with their goals (Kross et al., 2021). Conceptual and empirical investigations pertaining to the contrasting perspectives of self-distanced and self-immersed approaches often adopt a binary 'either-or' framework. Our research findings suggest the necessity of revisiting this standpoint and acknowledging a nuanced 'it depends' perspective as most pertinent. Reconceptualising these divergent modes of self-reflection in response to contextual features aligns with the principles of adaptable self-regulation (Bonanno & Burton, 2013) and, consequently, warrants further scholarly exploration. It is plausible that self-distanced introspection may be best suited to coping with high-impact stressor experiences characterised by moderate-to-high levels of novelty, disruption, and criticality, whereas self-immersed introspection may confer utility in addressing stressors of lower intensity (Morgeson et al., 2015).

Strengths of this study include our sampling of highly trained/national level athletes, and the longitudinal design involving multiple reflections. Nevertheless, we encourage readers to interpret our findings relative to the limitations of our work and the existing literature. First, we asked participants to focus on a stressor event, and requested no information on important contextual elements of the event (e.g., novelty, criticality, disruption; Morgeson at al., 2015) unless it was reported spontaneously by athletes in their written reflections. Capturing the affective aspects of a stress-inducing event, for instance, would have facilitated an in-depth analysis of the subtleties within coping strategies employed in response to stressors that exhibit variability in the ‘hot’ features of stressors that are core the conceptual rationale for self-distanced reflections. Relatedly, our

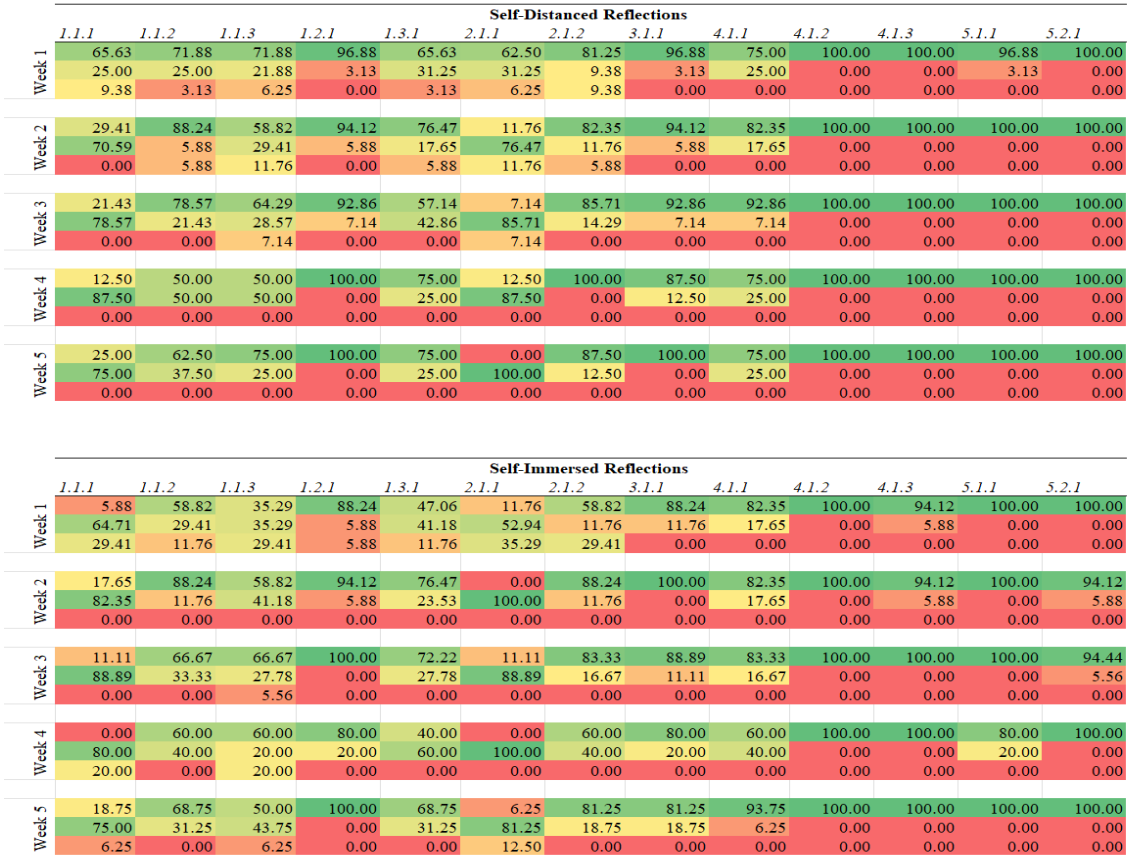
operationalisation of systematic stressor reflections relied on a single stressor exposure each week, which overlooks the complexities of stress dynamics (e.g., co-occurring events) and lifetime exposure (Epel et al., 2018). Second, our prompts reflected an extension of the SSR framework (Crane, Searle et al., 2019) and, as such, may have excluded information helpful for athletes to generate higher-level insights (i.e., evaluation, future-focus). Similarly, our analysis relied on an established conceptual framework of coping insights and therefore may be considered limited in scope given the pre-defined nature of the categories. We also acknowledge that generation of coping insights does not necessarily mean that one coped well with their stressor event. Third, we acknowledge the duration and frequency of the intervention may have been unacceptable for athletes given their busy schedules. There is common knowledge that athletes reflect on their performance and skills enacted in training and competition to improve, but the frequency and degree to which they reflect remains unknown. Future research in this area could benefit from taking these limitations into consideration when working with an athlete population.

4.6. Conclusion

Reflecting on stressor events is fundamental for athletes, yet the mechanisms by which alternative yet complementary vantage points from which to execute self-reflections confer adaptive outcomes remain largely unknown. Our analyses revealed intra-individual and between-group variability among athlete reflections over the 5-week period. Commonly, moderate- and high-level insights were provided across the areas of self-awareness, trigger identification, and re-appraisal; insights were lacking across the higher-level coping insights of evaluation and future-focus. Essentially, the coping insights which required one to identify their values and link their coping strategies to these values and their own belief system across time was absent. Differences existed between the two groups due to athletes' ability to adopt

their assigned reflection perspective and follow the prompts in the written reflections. Most stressors experienced by athletes were largely ‘mild’ in their nature which raises questions moving forward regarding the emotionality experienced by each participant. Our findings, when considered in conjunction with previous work, suggest further investigation is required, particularly regarding the emotionality linked to stressor events and how it influences the vista one adopts when reflecting. There also remains a need to strengthen the operationalisations of the SSR approach to help draw out higher-level insights, particularly by focusing on the recognition of athletes’ values and belief systems.

Figure 1. *Heat map depicting no/low (top row), moderate (middle row), and high coping insights (bottom room) over the 5-week period for the self-distanced and self-immersed groups.*



Self-Distanced Reflections

	1.1.1	1.1.2	1.1.3	1.2.1	1.3.1	2.1.1	2.1.2	3.1.1	4.1.1	4.1.2	4.1.3	5.1.1	5.2.1
Week 1	65.63	71.88	71.88	96.88	65.63	62.50	81.25	96.88	75.00	100.00	100.00	96.88	100.00
	25.00	25.00	21.88	3.13	31.25	31.25	9.38	3.13	25.00	0.00	0.00	3.13	0.00
	9.38	3.13	6.25	0.00	3.13	6.25	9.38	0.00	0.00	0.00	0.00	0.00	0.00
Week 2	29.41	88.24	58.82	94.12	76.47	11.76	82.35	94.12	82.35	100.00	100.00	100.00	100.00
	70.59	5.88	29.41	5.88	17.65	76.47	11.76	5.88	17.65	0.00	0.00	0.00	0.00
	0.00	5.88	11.76	0.00	5.88	11.76	5.88	0.00	0.00	0.00	0.00	0.00	0.00
Week 3	21.43	78.57	64.29	92.86	57.14	7.14	85.71	92.86	92.86	100.00	100.00	100.00	100.00
	78.57	21.43	28.57	7.14	42.86	85.71	14.29	7.14	7.14	0.00	0.00	0.00	0.00
	0.00	0.00	7.14	0.00	0.00	7.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Week 4	12.50	50.00	50.00	100.00	75.00	12.50	100.00	87.50	75.00	100.00	100.00	100.00	100.00
	87.50	50.00	50.00	0.00	25.00	87.50	0.00	12.50	25.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Week 5	25.00	62.50	75.00	100.00	75.00	0.00	87.50	100.00	75.00	100.00	100.00	100.00	100.00
	75.00	37.50	25.00	0.00	25.00	100.00	12.50	0.00	25.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Self-Immersed Reflections

	1.1.1	1.1.2	1.1.3	1.2.1	1.3.1	2.1.1	2.1.2	3.1.1	4.1.1	4.1.2	4.1.3	5.1.1	5.2.1
Week 1	5.88	58.82	35.29	88.24	47.06	11.76	58.82	88.24	82.35	100.00	94.12	100.00	100.00
	64.71	29.41	35.29	5.88	41.18	52.94	11.76	11.76	17.65	0.00	5.88	0.00	0.00
	29.41	11.76	29.41	5.88	11.76	35.29	29.41	0.00	0.00	0.00	0.00	0.00	0.00
Week 2	17.65	88.24	58.82	94.12	76.47	0.00	88.24	100.00	82.35	100.00	94.12	100.00	94.12
	82.35	11.76	41.18	5.88	23.53	100.00	11.76	0.00	17.65	0.00	5.88	0.00	5.88
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Week 3	11.11	66.67	66.67	100.00	72.22	11.11	83.33	88.89	83.33	100.00	100.00	100.00	94.44
	88.89	33.33	27.78	0.00	27.78	88.89	16.67	11.11	16.67	0.00	0.00	0.00	5.56
	0.00	0.00	5.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Week 4	0.00	60.00	60.00	80.00	40.00	0.00	60.00	80.00	60.00	100.00	100.00	80.00	100.00
	80.00	40.00	20.00	20.00	60.00	100.00	40.00	20.00	40.00	0.00	0.00	20.00	0.00
	20.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Week 5	18.75	68.75	50.00	100.00	68.75	6.25	81.25	81.25	93.75	100.00	100.00	100.00	100.00
	75.00	31.25	43.75	0.00	31.25	81.25	18.75	18.75	6.25	0.00	0.00	0.00	0.00
	6.25	0.00	6.25	0.00	0.00	12.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Numerical details represent the % across each level of insights for each week. Green highlight indicates high-level insights, yellow/orange highlight indicates moderate-level insights, and red highlight indicates no/low-level insights.

Overview of Chapter 5

This chapter is the second empirical study within this thesis where we collected new primary data. Specifically, we present another qualitative investigation with highly training/national swimmers engaging in self-distanced or self-immersed reflection of stressor events, over a three-week period before a major swimming competition. This study builds upon Chapter 4 by targeting one sport and examining responses in the lead up to a major sporting competition. Specifically, we target the development of swimmers' coping insights by engaging in the weekly self-reflection. This chapter extends upon previous chapters by altering intervention length, targeting one sport, and collecting data in the lead up to a major swimming event.

Note: This chapter has been published in Stress and Health.

Murdoch, E. M., Ayers, J., Trihy, E., Crane, M., Ntoumanis, N., Brade, C., Quested, E., & Gucciardi, D. F. (in press). Stepping back or stepping in: A qualitative investigation of self-distanced versus self-immersed stressor reflections with competitive swimmers. *Stress and Health.* https://doi.org/10.1002/smi.3434

Chapter 5: Stepping back or stepping in: A qualitative investigation of self-distanced versus self-immersed stressor reflections with competitive swimmers

5.1. Introduction

Sport competitions encompass numerous stressor events in the lead-up and execution phases of athlete performance cycles, many of which include scenarios that vary in the degree to which they demand allocation and utilisation of resources from athletes. Exposure to such stressor events triggers an appraisal process, implicitly or explicitly, in which individuals decide whether there is a need to self-regulate their engagement with those events and, if so, how best to do so (Lazarus & Folkman, 1984; Socastro et al., 2022). From a stress regulation standpoint, athletes require meta-cognitive skills that enable them to engage optimally with this appraisal process so that they can filter out the learnings most useful to them (Trotter et al., 2023; Love et al., 2018). Effective stress regulation is a non-negotiable of high performance (di Fronso & Budnik-Przybylska, 2023) and therefore supporting the development of skills and techniques to regulate stress is core to the services provided by sport psychologists. However, the knowledge base from which to make evidence-based or evidence-informed decisions is largely disconnected from the complexities of stress regulation ‘in the wild’. For example, among randomised controlled trials of stress regulation or psychological skills training, less than half (43%) examined the application of specific strategies or techniques within the context of ecologically rich environments such as training and competition (Brown & Fletcher, 2017; Murdoch et al., 2021). Suffice to say, there are unmeasurable differences between applying a stress regulation technique in the lab in largely artificial settings (e.g., Pelka et al., 2017) or simulated pressure contexts (Low et al., 2020) compared with real-life, high-pressure competitions where performance matters most (Choudhary et al., 2016; McCormick et al., 2018;). We extend knowledge of the differential effectiveness of two specific meta-cognitive strategies (Moran & Eyal, 2022; Murdoch et al.,

2023) by examining qualitative differences in coping insights generated from these stressor reflection tactics in preparation for a major swimming competition.

5.2. Literature Review

5.2.1. Reflect to (Re)Direct: Fostering Adaptive Outcomes via Systematic Self-Reflections on Stressor Experiences

Narrative reviews (e.g., Ellis et al., 2014) and meta-analytic data (Guo, 2022; Lines et al., 2021) support the utility of self-reflections as a means by which to generate knowledge that can be used purposefully to optimise well-being, health, and functioning. Broadly defined, self-reflection is a meta-cognitive approach whereby individuals or collectives evaluate self-regulatory processes enacted during real-world or simulated experiences for compatibility with their values and goals and learn how best to manage future similar situations (Marshall, 2019). Crane and colleagues (Crane, Searle, et al., 2019; Crane, Kangas, et al., 2020) developed a model to operationalise self-regulatory flexibility in practice which lays the foundations for personalised stress regulation. The systematic self-reflection model (SSR) consists of unpacking (i) contextual nuances of the trigger or stressor experienced; (ii) one's initial response to the stressor (e.g., thoughts, emotions during the event); (ii) evaluation of the effectiveness of strategies utilised to cope; (iii) degree to which the strategies adopted align with the individual's values; and (iv) modification of strategies for future stressors which may increase one's capacity to live consistently with their values and achieve relevant goals (Crane et al., 2019). Inherent within this step-by-step process is the notion of 'bracketing' sections, a necessary component of meta-cognition (Kuhn, 2021), so that individuals can be attentive to components in their reflection piece with the flexibility required to explore the personally meaningful elements. Inspired largely from Pennebaker's seminal work on expressive writing (Pennebaker, 1997; see also, Guo, 2023), evidence from randomised controlled trials (e.g., Crane, Boga, et al., 2019; Falon et al., 2020), observational

studies (e.g., Bucknell et al., 2022), and qualitative investigations (e.g., Falon et al., 2022) provide preliminary support for the utility of this approach for optimising resilient outcomes from stressor experiences.

One overlooked consideration with the SSR – and stressor reflections broadly – is the target event may invoke or exacerbate negative emotions (e.g., anger, frustration) and cognitions (e.g., rumination) associated with the autobiographical experience that may minimise the potential benefits, particularly when people reflect on lived experiences as if they are reliving the encounter firsthand through their own eyes. Similarly, peak emotional experiences are disproportionately remembered, which can skew reflections towards more intense emotional recall and therefore exacerbate the negative emotions and cognitions associated with stressful autobiographical memories, as individuals relive these moments with heightened emotional reactivity (Miron Shatz et al., 2009). Self-immersed reflections draw emphasis on the 'hot' features of the individual's stressor event resulting in narrow thinking (Grossmann & Jowhari, 2018), negative emotionality, depressive symptomology, enhanced psychological stress, and vulnerability to rumination (Kross & Ayduk, 2017). In contrast, self-distanced reflections allow individuals to step back and gain perspective on the stressor event experienced, which prompts them to reflect on the broader chain of events. Doing so enables adjustments to the meaning of the autobiographical experience in ways that minimise emotional reactivity (Kross et al., 2005; Kross & Ayduk, 2017) and instead directs focus on elements most salient to broader, abstract goals (Kross et al., 2005; MacGregor et al., 2017; Rees et al., 2018). Meta-analytic evidence supports the adaptiveness of self-distanced reflections in relation to emotional outcomes (e.g., reduced negative emotionality; Moran & Eyal, 2022; Murdoch et al., 2023). Observational and experimental evidence further highlights benefits in relation to cognitive (e.g., increased reconstrual and decreased counting) and emotional (e.g., reduced distress) outcomes (for a review, see Kross & Ayduk,

2017). Thus, there is potential value in deploying a systematic approach to stressor reflections from a self-distanced rather than a self-immersed standpoint to maximise the benefits for human functioning.

How might self-distanced reflections offer greater benefit than self-immersed vistas for stressor reflections? One possibility is that self-distanced reflections maximise the likelihood of new or refined awareness of one's thoughts, feelings, and behaviours within the context of situations or events that place meaningful demands on them (Falon, Karin, et al., 2021; Grant et al., 2002). Coping insight emerges spontaneously as one engages with self-reflective processes and undertakes a deep analysis of their stressor experiences and coping approaches (Falon, Kangas, et al., 2021). The self-reflection and coping insight framework (Falon, Kangas, et al., 2021) incorporates 13 distinct coping insights that may enhance the refinement of resilient capacities, improve future practice (Schön, 1983), and promote optimal individual outcomes (e.g., performance, daily functioning) (Ellis et al., 2014). These 13 exemplar coping insights are characterised by an improvement in understanding the self, deeper interpretations about one's response to stressors across time and contexts, broad principles about the nature of stress and coping, and the interaction between one's choice of coping approach and broader contextual and interpersonal factors. In non-clinical populations, research demonstrates that insight is negatively associated with depression, anxiety, stress, and negative affect (Tulver et al., 2023) and positively associated with resilience (Cowden & Meyer-Weitz, 2016), cognitive flexibility (Grant et al., 2002), self-regulation (Grant et al., 2002), life satisfaction (Lyke, 2009), and subjective happiness (Lyke, 2009).

Regarding coping insights that emerge from systematic stressor reflections, deductive thematic analysis of 68 Officer Cadets' written (self-immersed) reflections across a 5-week period identified several interesting findings regarding their frequency and characterisation

(Falon et al., 2022). Officer Cadets' coping insights were reported less frequently than reflective activities of the systematic stressor reflection framework, likely arising spontaneously during self-reflection on stressors. Despite their lower occurrence, coping insights conveyed meaningful depth regarding why people apply the strategies or access the resources they do, and encompassed self-understanding within the context of stressful situations, stress-coping principles, and contextual nuances. This characterisation of coping insight as proportionally infrequent, yet personally meaningful, aligns with previous research on wisdom development through life experiences (Glück et al., 2019). Aside from the logistical limitations that may have limited coping insight (e.g., 15 min reflection time, concerns regarding a third party reading their personal reflections), the reliance on a self-immersed standpoint potentially prevented Cadets from generating new or refined awareness of their coping self-regulatory capacities, particularly for stressor events which might have been emotionally salient.

5.2.2. Overview of the Current Study

Our original (pre-registered) plan prioritised an experimental test of the differential effectiveness of self-distanced versus self-immersed reflections, yet due to logistical issues we were unable to secure our predetermined sample size for these inferential tests (see here: https://bit.ly/3Qiu7mZ). Accordingly, we deviated to a qualitative investigation in which we aimed to examine the nature and form of coping insights generated via systematic stressor reflections across a 3-week period from self-distanced and self-immersed lenses. Doing so meant we repositioned our work from a question of 'which reflection stance works best?' to 'what coping insights might be generated via each reflection vantage point?'. Reflective practice is well-established as a fundamental component of education, professional training, and service delivery within the sport sciences, where it is increasingly utilised to navigate the complexities of professional practice to foster personal and professional growth through

experiential learning (for a review, see Cropley et al., 2023). As athletes are often overlooked within the empirical literature as 'practitioners' who could stand to benefit from self-reflection (Hunter et al., 2014), we sampled highly trained/national level (McKay et al., 2022) swimmers preparing to compete at major swimming competitions in Western Australia. We prioritised swimming because of its demanding nature in which athletes are exposed to numerous and diverse stressors that have the potential to affect them negatively (Lang et al., 2015; Uzzell et al., 2024). This observational field design maximised authenticity because participants deployed the self-regulatory strategy in relation to something personally meaningful, relative to lab experiments where participants are taken out of their natural environments to maximise internal validity (often at the expense of ecological validity). Acknowledging that sport and non-sport life are inextricably linked, we prioritised a view of stress regulation that cuts across all facets of life rather than one which is siloed in nature (e.g., sport only).

5.3. Methods

5.3.1. Philosophical Positioning

Our research paradigm drew from critical realist perspectives that reflect an interface between realist ontology and relativist epistemology; in essence, coping insights from stressor reflections are a real phenomenon that exist independent of our conception of them, with the only way to infer that reality via our understanding of participants' reports of those experiences (e.g., Archer, 1998; Bhaskar, 1989; Fletcher, 2017). Ontologically, reality is apportioned across the interrelated domains of the real (entities or structures that activate causal mechanisms), actual (events and their effects produced by activated causal mechanisms that exist whether or not we experience or perceive it), and empirical (actual events-effects as we experience them). Epistemologically, knowledge about reality is socially constructed, open to diverse valid perspectives (fallible), and may be rejected, modified, or

extended (transient). Thus, our primary goal was to explain tendencies – regularities, variability, and absence in phenomena – in how people experience coping insights from written reflections of stressor events, with a focus on their nature and form as properties which activate causal mechanisms.

5.3.2. Participants

[name blinded] Human Research Ethics Committee approved this study prior to implementation [insert approval number]. In total, 48 swimmers aged 14 years and over completed the baseline assessment across eight swimming squads, with 29 individuals cluster (squad) randomised to the self-distanced condition (M = 15.57, SD = 1.83) and 19 participants (M = 15.76, SD = 2.05) to the self-immersed condition (see Figure S1 for a CONSORT flow diagram). The imbalance in participant numbers for each experimental group is likely a function of the variations in squad sizes within the Western Australian swimming community. There were no exclusion criteria other than dissent to participate in the study.

5.3.3. Research Design

We utilised a pilot randomised controlled trial where we qualitatively analysed participants' written reflections to examine coping insights developed over the course of the reflection intervention period. We executed the experimental protocol around swimming competitions in Perth, whereby self-reflections occurred across a 3-week period before swimming competitions were held during the swimming season (December to April). Our choice of a 3-week reflection period struck a balance between pragmatics, personal experiences of rolling out the self-reflection intervention with elite athletes, and existing evidence with military personnel (Crane, Boga, et al., 2019), university students (Crane, Kangas, et al., 2020), older adults (Crane, Kho, et al., 2020), and military police (Crane,

Rapport, et al., 2019). Details of the full experimental protocol are available in the registered report (https://bit.ly/3Qiu7mZ).

5.3.4. Self-Reflection Conditions

Athletes reflected weekly over a 3-week period on the most stressful event they experienced during the past week using an online Qualtrics survey with prompts. We provided participants with an option each week to contact the lead researcher or registered psychologist if they recalled an event for which they believed a professional discussion was required. Athletes in the self-distanced group reflected on their stressor experience from a third-person perspective (e.g., visualising yourself as a sports coach standing on the sidelines watching yourself experiencing the event from afar), whereas individuals in the self-immersed condition reflected on their experience from a first-person perspective, as if they are relieved the stressful situation. The prompting questions included in the weekly package targeted core elements from the systematic self-reflection model (Crane, Searle, et al., 2019) including (1) self-awareness and triggers, (2) awareness of one's values in relation to the stressor event, (3) awareness of strategies to cope with the stressor, (4) evaluation of the effectiveness of the strategy adopted considering their values, and (5) modifications of one's strategies to improve their coping and emotion regulatory approach to future stressful events (full details are provided in Table S1).

5.3.5. Procedure

We distributed a study invitation email to athletes listed on the Western Australian swimming database. Consenting athletes were randomised using an in-built function in Qualtrics to one of two experimental conditions in which they were asked to complete their reflection at the end of each week for 3 weeks. Reminders were sent to participants on Thursday, Friday, and Saturday mornings to prompt them to complete the reflection over the

weekend in their own time. We provided participants with a $20 gift voucher for their participation in the study.

5.3.6. Data Analyses

We analysed participants' written reflections using framework analysis because we wished to examine the form and nature of conceptually informed categories of coping insights within participants' self-generated stressor reflections (Ritchie & Spencer, 1994). EM performed all analyses, with DG as a 'critical friend' throughout the analysis process (Smith & McGannon, 2017). The primary analyst is a doctoral student with educational qualifications in psychology at undergraduate and Masters levels, who is also engaged in the psychologist registration pathway in Australia. The critical friend who supported the primary analyst is an academic psychological scientist with approximately two decades of experience studying stress, resilience, and human performance, including recent work on self-reflections. Aligned with our philosophical positioning, we prioritised reflexivity over objectivity, where the results characterise our interpretations of the participants' written reflections of their experiences of reality.

We qualitatively analysed the data by reading through each reflection and assigning codes using the 13 coping insights captured in the Self-Reflection and Coping Insight Framework (Falon, Kangas, et al., 2021). For example, under the 'self-awareness' section of the framework, we considered the coping insight of 'understanding the time course of one's reactions'. After reading an athlete's written reflection, we provided a code (e.g., low, moderate, high) based on whether an athlete had given insights relating to the temporary nature of their stressor event and one's reaction. If the information relating to this area of the framework was absent, we coded it 'no/low'. We completed this process for each of the 13 coping insights in the framework. Initially, both EM and DG worked collaboratively to code a random selection (~20%) of quotes to lay the foundations for a shared mental model of

decision-making processes. Subsequently, EM led the coding process, with regular check-ins with DG to maximise consistency in application of their shared mental model for the 13 coping insights. We coded each coping insight category within each individual reflection as 'no / little representation', 'moderate representation', and 'high representation' to indicate the degree to which participants reported insight to their coping of each area. The codes were summed to create an overall score for each coping insight area, which we standardised based on the number of participants who had completed the reflection for that week. Standardised scores were calculated each week for both the self-immersed and self-distanced conditions. We charted these results visually across time and coping insight categories using heat maps. We also coded the depth of each reflection as an estimate of the quality of each reflection, using a bespoke 10-point response scale (1 = no/little depth to the reflection, to 10 = high-level insight and detail given in the reflection).

5.3.7. Study Rigour

Aligned with our relativist approach, we considered several elements of research quality (Burke, 2016). First, we make an important contribution to the literature with our focus on the nature and form of coping insights as a causal mechanism linking meta-cognitive strategies (reflections), stressor events, and athlete performance, well-being, and mental health. Second, the lead author's immersion within the Western Australian Institute of Sport as a trainee psychologist and PhD scholar under the supervision of sport psychologist JA permitted ongoing engagement with athletes and their support personnel (e.g., coaches) regarding the concepts at the heart of this work. Relatedly, we present rich descriptions alongside salient quotes in the presentation of our results as well as examples of our coding schema (see Table S2) with the goal to provide readers with sufficient information to inform their assessments of credibility. Third, we addressed transparency and sincerity of the work

via a collaborative approach to coding including the use of a critical friend who challenged initial and evolving interpretations of participants' reflections.

5.4. Results

An overview of the proportion of self-reflections which we assessed as no/low representation, moderate representation, and high representation for each coping insight category across each week for both groups is presented in Figure 1. Overall, participants in the self-immersed condition showed greater levels of coping insight over the three-week period compared with the self-distanced group. For both groups, there was low-quality or no insight when participants considered whether their response to the stressor aligned with their values (1.1.2) and when they applied a future-focus (5.2.1). There were similarities across the groups when individuals re-appraised their stressor experience over the three-week period and for the coping insight addressing individual strengths and the effectiveness of their coping strategies or resources (4.1.3). We inferred potentially meaningful differences between the groups across the remaining coping insights. The self-immersed group evidenced moderate and high levels of insight when writing about their cognitive, affective, physical, and/or behavioural reactions to the stressor and its temporal nature (1.1.1, 1.1.2). For the coping insight addressing the influence of personal reactions on others' (1.1.3), there were high quality reflections from the self-distanced group in week one, whereas in week two and three the self-immersed group provided a larger amount of moderate and high-level insights in their reflections. Likewise, when individuals considered their coping resources and their effectiveness, alongside their beliefs about coping (1.3.1), participants from the self-distanced group provided high quality reflections in week one. However, in weeks two and three there were moderate-level responses provided from the self-immersed group. When individuals were prompted to identify the trigger to their stress response and make interpretations as to why the trigger caused stress (2.1.1., 2.1.2), the self-immersed group produced moderate and

high-level reflections over the three-week period. When individuals were prompted to reflect on the interaction between the stressor and the effectiveness of their coping strategies or resources (4.1.1, 4.1.2), the self-immersed group produced moderate-level insight and a small number of high-quality insights. Overall, when considering the temporal dynamics of the reflections, the greatest differences between the groups occurred in week three. Below, we summarise the findings of our qualitative analyses of athletes' written reflections.

5.4.1. Content of Reflections Across Coping Insight Categories

Self-awareness (1.1.1, 1.1.2, 1.1.3, 1.3.1). The self-immersed group provided higher-level insights when considering the time course of their reactions. Participants identified when the stressor started, the intensity at which they experienced the stressor, and its change in intensity over time. Reflections from both groups mostly consisted of where the stressor took place and who was there when it occurred. Reflections from the self-immersed group identified the link in one's cognitive, emotional, and physiological response to their stressor. Comparatively, individuals in the self-distanced group oftentimes lacked insight to their cognitive and emotional response to the stressor. This group was most likely to reveal the 'facts' about the stressor they experienced. One participant reported *"…[we] were working together for two weeks with [a] college teaching the junior school to swim. It was very time and energy consuming, and she did not have enough time to herself during the day before returning to work in the afternoon. Some arguments…resulted which increased the stress."* The depth and length of reflections were greatest, overall, from the self-immersed group for this subgroup of insights.

When individuals reflected on the influence of personal reactions on others and vice versa, the self-distanced group displayed higher-level responses in week one as they were able to, at times, highlight who had been affected by the stressor or how people influenced the individual's response to the stressor. For example, one reflection explained *"I think she*

responded well because she recognised she was very tired and working more than usual and recognised that her friend was in the same situation and was a little more sensitive to feelings of lethargy and stress than she was. She could have diffused the situation [with her friend at work] so it didn't escalate into screaming." Further, individuals reflecting from a self-distanced perspective noticed if the presence of other people (e.g., teammates, coach) directly influenced their stress levels. Across weeks two and three, however, the self-immersed group recognised when there was an absence of support from a particular individual, and/or an individual's influence on the athlete's emotional response. For example, one person wrote *"I was disappointed in the lack of support [from the coach] but sometimes you can't get everything you need from one person. I had family and friends there, so they were the sort of comfort I needed at that time."* The self-distanced group, at times, identified the person or people involved in the stressor, but did not write about the emotional, cognitive, or physiological effect it had on them.

The self-distanced group produced moderate and high-quality insights for the coping insight area of addressing coping strategies and their effectiveness. Individuals reported a wide array of coping strategies, including cognitive re-structuring, external support, re-direction of attention, avoidance, and acceptance/recognition of their emotional state. One participant mentioned *"The biggest thing that Jack used to cope in the situation was staying positive. Whenever he felt overwhelmed by the prospect of studying or doing exams he would stop and reassure himself it would be alright. He often looks to quotes which he has on his wall in his room to motivate him. [He] also takes help from friends who look out for him and ensures that his friends are also ok."* When looking at responses from the self-immersed group, there were fewer coping resources or strategies mentioned by participants. Responses were oftentimes higher in emotionality and self-critical of their response. Across weeks two and three, the self-immersed group displayed a greater proportion of moderate-level

responses and their responses included diverse coping strategies, including external support, distraction, cognitive re-structure, communication, re-direction of attention, and physiological techniques (e.g., breathing). In comparison, across weeks two and three the self-distanced group oftentimes identified that one needed to change their mindset, be more positive, or identified their goal emotional response (e.g., staying calm or less stressed) but were unable to identify the coping strategy or resource.

Trigger identification (2.1.1, 2.1.2). The self-immersed group provided higher level insights when identifying patterns of their triggers across time and contexts, and when reflecting on why particular triggers induced stress. For example, participants were more readily able to identify the following patterns: situations where there is a potential for failure to occur (e.g., coming back from injury), events that involve social evaluation (e.g., delivering a speech to the class), high expectations from others (e.g., the coach), and accumulation of stressors (e.g., study for exams, swimming training, and parental conflict). Accordingly, the reflections from the self-immersed group consisted of links between the trigger to their stress and why these types of triggers typically cause stress to that individual. For example, one person wrote *"The stressor was competing over the weekend in the heat outdoors, at the end of a training week. [My] coach expects the best out of me every time I compete, but I can't always pb. I feel like the expectation is to though. I give my best and place my focus where she asks but it feels like it's just not good enough."* Comparatively, the self-distanced group oftentimes identified the trigger to their specified stressor but were unable to address the patterns that occurred or provide an explanation of why that trigger was delivering a stress response.

Re-appraisal (3.1.1). The self-distanced condition interpreted their stressors as an opportunity for growth across the lifespan. Oftentimes, individuals admitted the uncomfortableness of the stressor, but reflected on its temporary nature. Individuals reported

the stressor "…wasn't that bad" or mentioned the positive emotional response they had after dealing with the stressor. One participant reported *"... [I could write] a list of all the bad things that could happen and then realise it's not that bad of a situation, I could also think of how well I would feel after coping with the stressful situation."* The self-immersed group generally reported efforts to stop the stressor from occurring in the future or adopting a positive mindset the next time the stressor occurs. Generally, the self-immersed group were more focused on the details or 'hot features' of the stressor experience, rather than how the stressor experience may provide growth for similar experiences in the future.

Evaluation (4.1.1, 4.1.2). The self-immersed group provided higher-level responses when considering the interaction between the stressor characteristic and the effectiveness of coping strategies or resources implemented. Oftentimes, those in the self-immersed group provided reflections on the effectiveness of their coping strategies and further exploration of other coping strategies or resources they could use in the future for the specific stressor. They reflected on their stressor and linked to other ways they could cope if they were to face a similar stressor in the future. For example, one person when reflecting on their reoccurring shoulder injury wrote *"...Sometimes having conversations about these things helps, other times it's not as beneficial. Sometimes it's hearing something you know to be true and not wanting to hear or accept it, other times it's just a drag to dwell on. Doing less in training is always an option, but those few bad weeks have almost passed, and sessions are getting easier to get through as the pain in my shoulder returns to the level I'm familiar with. No doubt I'll continue to deal with the injury but remembering that the bad feelings pass generally gets me through."* The self-distanced group were often able to identify why a coping strategy or resource didn't work when they faced a stressor. At times, the group provided other coping strategies they may adopt in the future but didn't link back to the intricacies of the stressor they experienced.

5.5. Discussion

We examined the coping insights generated from stressor reflections across a 3-week period prior to a major competition among highly trained/national level swimming athletes using the Self-Reflection and Coping Insight Framework (Falon, Kangas, et al., 2021) as a guide for our analysis, and compared those insights between athletes who reflected from a self-immersed or self-distanced standpoint. Athletes self-reported a broad range of coping insights of varying depths irrespective of their reflection vista. We identified similarities between reflection vistas for coping insights related to stressor reappraisals and the effectiveness of coping strategies or resources alongside individual strengths. We observed little to no insight into how their coping strategies aligned with their values, and their ability to apply a future-focus when reflecting on the stressor. We identified potentially interesting differences between the groups regarding coping insights related to self-awareness, trigger identification, and evaluation of coping strategies and resources considering stressor characteristics. Differences likely occurred due to participants' ability to lean in and embrace the reflection style they were assigned, and the usage of the prompts to initiate the coping process. Various stressor events were reflected upon, each providing emotionality at differing levels, creating differences in coping insights between the groups.

5.5.1. Commonalities in coping insights between self-distanced and self-immersed groups

We identified similarities in the presence and absence of specific coping insights self-reported by athletes who reflected from self-distanced or self-immersed perspectives. We identified similarities between groups when targeting re-appraisal of the stressor, and when reflecting on the effectiveness of coping strategies or resources alongside individual strengths. Athletes typically reported on the areas they could improve upon, or mentioned different coping strategies they could deploy in the future, relative to the strategies or resources that were already working for them. The notion of reflecting on one's strengths

aligns with conceptual (Seligman, 2011) and applied perspectives (Gordon & Gucciardi, 2011), whereby identifying and building strengths across certain areas is said to promote flourishing and optimal well-being. Reflection tools, irrespective of their vantage point, can act as a stepping stone to raise awareness systematically of potential individual strengths. Considering stressor re-appraisals, heat maps indicated both groups showed signs of interpreting stressors positively for personal growth, which others refer to as a 'stress-as-enhancing' mindset (Crum et al., 2013). The psychological filter one applies in the face of a stressor is critical for self-regulation and is seen to be more effective than exposure to a stressor event alone (Shields et al., 2023). A subtle cognitive shift towards re-interpretation of stressor experiences sheds light on the importance of reflection processes for generating helpful perspectives on the stressor event.

We also identified similarities between groups regarding the absence of coping insights within their self-reflections. Athletes rarely considered their values when responding to their stressor experiences. Values reflect enduring beliefs or principles that guide the activation and evaluation of our thoughts, feelings, and behaviours (Schwartz, 1992). Values clarification is beneficial at times of stress because it helps evaluate one's stressor response and consider the usefulness of coping strategies or resources and prompts a subsequent increase in value-congruent behaviour (Cohen & Sherman, 2014). Failing to recognise or comprehend personal values could result in behaviours incongruent with those values (e.g., responding poorly to a coach or shouting at a teammate) and therefore ineffective stress regulation efforts. This finding is incongruent with the existing work on self-reflections, which potentially alludes to the ineffectiveness of our operationalisation of the SSR protocol in prompting athletes to consider their values when responding to stressor events and capturing this process. Athletes also rarely addressed the 'future-focus' elements of the SSR framework, which is a culmination of the other four self-reflective practices and targets

coping with future stressor events. Failing to shift the reflection of one's experience from the past to the future may encourage rumination of the stressor event, which is a maladaptive emotional strategy that oftentimes leads to an increase in anxiety and depression symptoms (Nolen-Hoeksema, 2000), rather than moving beyond the event and adjusting psychologically (Bonanno et al., 2011).

5.5.2. Coping insights gained by stepping back

Over the three-week reflection period, athletes in the self-distanced group oftentimes provided responses which highlighted moderate and high-level insights regarding re-appraisal, as they were able to 'step-back' from their unique stressor experience and reflect upon the broader chain of events. Observing the full stressor experience enables people to make emotional adjustments (i.e., reduced negative emotionality) to the meaning of the autobiographical experience (Moran & Eyal, 2022; Murdoch et al., 2023) and view their stressor experience as temporary (Kross & Ayduk, 2017). Of those individuals who 'relived' their stressor experience in the self-immersed group, in contrast, reflections emphasised the emotional features of the event and oftentimes zoned in on parts of their stressor experience, possibly due to the (re)activation of emotional states (Mcisaac & Eich, 2002; Williams & Moulds, 2007). The self-distanced group also reported promising coping insights in week one regarding personal reactions, where they considered others in their stressor response or showed understanding that external factors influenced their experience. These reflections highlight the balanced perspective gained from adopting a self-distanced viewpoint as opposed to an egocentric viewpoint in the self-immersed condition (Kross et al., 2023), allowing one to migrate towards rational reasoning which take external features into consideration rather than automatic reasoning that is most likely informed by 'hot' emotional features (Gainsburg et al., 2022). The self-distanced condition also allowed individuals to acknowledge their coping strategies or resources, perhaps due to their ability to orient

themselves to elements of their experience most relevant to their goals (Kross et al., 2005; MacGregor et al., 2017; Rees et al., 2018). Although there were positive signs for the self-distanced group, we expected greater insights to occur due to the promising research on self-distanced reflections and their effectiveness across cognitive and emotional outcomes (Kross & Ayduk, 2017; Moran & Eyal, 2022; Murdoch et al., 2023). Conceptual (e.g., are self-distanced reflections always the preferred vantage point for meaning-making processes?) and methodological (e.g., was our operationalisation via the intervention materials sufficient to prompt people to reflect solely from a self-distanced standpoint?) factors are likely important considerations in this regard.

5.5.3. Coping insights built by leaning in

We identified greater instances of moderate and high representations of coping insights related to self-awareness, trigger identification, and evaluation among reflections of athletes who utilised a self-immersed vista. Athletes who reflected from a self-immersed standpoint recognised links across their cognitive, emotional, physiological, and behavioural reactions, potentially because they relived the event firsthand and recalled the 'hot' features of those experiences. When reliving/recounting a stressor event from the 'first person' standpoint, rather than stepping back to minimise such an experience, one accentuates the highly emotional parts of their experience, allowing for one to be in tune to their body and mind response (Mcisaac & Eich, 2002; Williams & Moulds, 2007) opposed to a self-distanced perspective whereby one might be too distant to recall their emotional and cognitive experience. These findings oppose most research on self-immersed reflections as when people ruminate on their negative experiences, they oftentimes remain stuck focusing narrowly on the aversive features of their experience that pose a threat to themselves, rather than looking outward and questioning broader themes of stressor events over time (Kross et al., 2021). Nevertheless, meta-analytic evidence indicates that expressive writing, often

executed from an immersed perspective, converts to small but important reductions in symptoms associated with depression, anxiety, and stress (Guo, 2023). In a similar nature, the self-immersed group reported moderate and high coping insights regarding their stressor characteristics and the effectiveness of their coping strategies and resources, alongside greater insights regarding the consideration of oppositional short- and long-term outcomes. Again, these findings challenge the first-person perspective, which typically elicits rumination and worry as opposed to evaluation of the ways in which they responded, or a problem-solving approach (Kross et al., 2023). It is possible the structure provided to participants primed their reflections to be solution focused whereby they re-structure the event, opposed to ruminative thoughts occurring (Falon, Kangas, et al., 2021). Stressors reported by the participants across groups were mostly 'everyday' in nature rather than significant adversities or traumatic events. Thus, it may have been easier for self-immersed participants to 'lean in' to their individual experiences and to embrace their 'hot' features as a compass for generating understanding of their trigger and why these situations induced stress. Conceptual and empirical work on self-distanced versus self-immersed perspectives typically focuses on an 'either or' approach; our findings suggest that there is a need to reconsider this position as one in which 'it depends' is most salient. Reconceptualising these two different vistas for self-reflections relative to the contextual demands is consistent with ideas of flexible self-regulation (Bonanno & Burton, 2013) and therefore warrants further investigation. Perhaps self-distanced reflections are most suited to stressor experiences which are high in magnitude – novelty, disruption, and/or criticality – whereas self-immersed reflections work best for stressor events which are low or moderate in magnitude (Morgeson et al., 2015).

5.5.4. Strengths, limitations, and future directions

In terms of key strengths, this study is the first to 'look under the hood' and interrogate the nature of reflections from self-distanced and self-immersed vistas from the standpoint of the coping insights reported by athletes in response to stressor events to develop resilient capacities and manage stressors. Largely absent from the sport psychology literature, our findings point towards the use of a specific framework and certain prompts to guide athletes to build strategies and insights advantageous to the sporting environment. Nevertheless, we encourage readers to interpret our findings relative to the limitations of our work and the existing literature. First, we failed to obtain our sample size target for the pre-registered experimental test of outcome effectiveness between self-distanced and self-immersed reflections. In the absence of such evidence, our findings are best considered preliminary because it is unclear whether greater frequency of coping insights reported by the self-immersed group relative to the self-distanced group translates into differential outcomes for athletes. Second, participants reflected weekly across a three-week period, which may have been insufficient for athletes to engage fully with the self-distanced approach when it is unfamiliar to their spontaneous reflection approach. Third, we asked participants to focus on a stressor event, with no information obtained on important contextual elements of the event (e.g., novelty, criticality, disruption; Morgeson at al., 2015) other than what was reported spontaneously by athletes in their written reflections. Capturing the emotionality of a stressor event, for example, would have enabled us to examine nuances in coping insights from stressors which vary in this feature and therefore shed light on an important conceptual expectation for the usefulness of self-distanced reflections. Relatedly, we targeted single stressor exposures each week, which overlooks the complexities of stress dynamics (e.g., co-occurring events) and lifetime exposure (Epel et al., 2018). Fourth, we coded the coping insights using broad categories (e.g., "no/low") which were self-determined rather than being derived from theory or an established coding system. Finally, we acknowledge that our

operationalisation of the systematic stressor reflection framework (Crane, Searle et al., 2019) may have been insufficient to generate high-quality coping insights; future implementations of this framework would do well to strengthen the prompts for participant reflections and consider the use of audio recordings which might be more acceptable than writing for self-reflections, alongside a values tool to target value-based insights.

5.6. Conclusion

Self-reflection is vital for any athlete who desires to improve their sporting performance, yet the best way to undergo this psychological process remains a question. We conducted a pilot randomised controlled trial with a qualitative analysis of written self-reflections, with the goal to examine the frequency and content of coping insights gained from each reflection vantage point. Our analyses revealed that athletes developed a broad range of coping insights, irrespective of the reflection condition to which they were randomised. There were differences between groups due to their ability to embrace their assigned reflection vista and follow the prompts when writing their reflections. Both groups showed positive signs towards re-interpreting their stressor experience and demonstrated subtle shifts in their psychological filter to embrace their stressor, but coping insights targeting values and future-focus components were lacking. The extent of emotionality described varied across both groups and influenced the development of coping insights as a result. Our findings, when considered in conjunction with previous work, suggest there is a need to strengthen operationalisations of conceptual models of stressor reflection protocols and reconceptualise different types of reflection strategies which considers differing situational demands rather than the ‘either or’ approach in current thinking.

Figure 1.

Heat map depicting no/low (top row), moderate (middle row), and high coping insights (bottom row) over the 3-week period for the self-distanced and self-immersed groups. Numerical details represent the % across each level of insights for each wee

Self-Distanced Reflections

	1.1.1	*1.1.2*	*1.1.3*	*1.2.1*	*1.3.1*	*2.1.1*	*2.1.2*	*3.1.1*	*4.1.1*	*4.1.2*	*4.1.3*	*5.1.1*	*5.2.1*
Week 1	40.00	80.00	66.67	100.00	26.67	40.00	60.00	86.67	80.00	86.67	93.33	100.00	100.00
	46.67	20.00	20.00	0.00	53.33	53.33	40.00	6.67	20.00	6.67	6.67	0.00	0.00
	13.33	0.00	13.33	0.00	20.00	6.67	0.00	6.67	0.00	6.67	0.00	0.00	0.00
Week 2	10.00	100.00	80.00	100.00	70.00	10.00	90.00	70.00	80.00	100.00	100.00	100.00	100.00
	70.00	0.00	20.00	0.00	30.00	90.00	10.00	30.00	20.00	0.00	0.00	0.00	0.00
	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Week 3	54.55	100.00	72.73	100.00	72.73	36.36	72.73	100.00	81.82	100.00	100.00	100.00	100.00
	36.36	0.00	27.27	0.00	27.27	63.64	27.27	0.00	18.18	0.00	0.00	0.00	0.00
	9.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Self-Immersed Reflections

	1.1.1	*1.1.2*	*1.1.3*	*1.2.1*	*1.3.1*	*2.1.1*	*2.1.2*	*3.1.1*	*4.1.1*	*4.1.2*	*4.1.3*	*5.1.1*	*5.2.1*
Week 1	55.56	55.56	55.56	100.00	55.56	66.67	77.78	66.67	44.44	77.78	88.89	77.78	100.00
	22.22	22.22	44.44	0.00	33.33	22.22	11.11	33.33	44.44	11.11	11.11	22.22	0.00
	22.22	22.22	0.00	0.00	11.11	11.11	11.11	0.00	11.11	11.11	0.00	0.00	0.00
Week 2	11.11	88.89	55.56	100.00	44.44	22.22	55.56	88.89	66.67	88.89	88.89	100.00	100.00
	66.67	11.11	33.33	0.00	55.56	66.67	33.33	11.11	33.33	11.11	11.11	0.00	0.00
	22.22	0.00	11.11	0.00	0.00	11.11	11.11	0.00	0.00	0.00	0.00	0.00	0.00
Week 3	0.00	85.71	28.57	100.00	42.86	0.00	14.29	100.00	42.86	85.71	100.00	85.71	100.00
	85.71	14.29	57.14	0.00	57.14	85.71	71.43	0.00	57.14	14.29	0.00	14.29	0.00
	14.29	0.00	14.29	0.00	0.00	14.29	14.29	0.00	0.00	0.00	0.00	0.00	0.00

Chapter 6: Discussion

6.1. Summary of Chapters

My PhD thesis chronicles the exploration, development, implementation, and evaluation of stress regulation among athletes when encountering stressor events spanning training, competition, and personal aspects of their lives. It covers diverse literature on the nature of stress, self-reflection, coping insight as well as various conceptual models and theories related to these areas. The aims of this PhD thesis were accomplished over four parts, as documented in the previous chapters, and are reviewed below. I started my PhD journey in the exploration phase, in which I conducted a systematic review and meta-analysis to examine the effectiveness of stress regulation interventions on athlete performance outcomes and the conditions in which they are strongest. For the 23 experiments analysed, we found a positive, moderate overall effect of stress regulation interventions on performance outcomes and a large effect present for physiological outcomes. The strongest effects on performance were observed at follow-up when compared to post-intervention, which we inferred due to the time it takes for athletes to learn and apply stress regulation techniques when stressors are prevalent in their training and competition schedules. We found approximately half of the eligible studies (n = 10) tested the effectiveness of the target interventions on athlete performance in high stress scenarios. As such, we deemed it essential that future efforts target stress regulation in ‘the wild’ rather than pure experimental scenarios, whereby true stressors encountered in an athlete’s dynamic environment are explored. Our findings indicate an absence of experiments targeting organisational and personal stressors athletes may experience, both of which are factors likely to influence sporting performance. This meta-analysis provided the necessary foundation for the later

phases of my PhD research, which targeted the individual and their context as opposed to generic stress regulation strategies.

In our second phase, we delved into individualised methods to adapt to stressors and build resilient capacities, which led us to question the different cognitive methods that are used when engaging in self-reflection processes. This curiosity alongside gaps in the literature led to our team completing a systematic review and meta-analysis on the topic of self-distanced and self-immersed reflection styles and their influence across cognitive, affective, physiological, and behavioural outcomes for adult populations. A three-level, random effects meta-analysis of 25 experiments revealed a small-to-moderate advantage of self-distanced reflections, which were most effective when they targeted a stressor experience that emphasised one's emotional state or lifetime events. We completed moderator analyses which indicated the target event for reflection, temporal focus of the target event, and the intervention provider meaningfully augmented the overall effectiveness of self-distanced reflections. Our findings revealed self-distancing resembles an adaptive form of reflecting on autobiographical stressor experiences, which was particularly evident when individuals reflected on events linked with high emotionality. Overall, our findings point towards self-distanced reflections being a potential necessary strategy by which to augment small changes in self-regulation that occur organically from stressor experiences high in emotional salience. Nevertheless, our assessment of the overall quality of the evidence suggested uncertainty regarding the benefits of this pragmatic self-regulatory tactic, which calls for further research to alleviate methodological and practical issues identified in our meta-analysis.

The first two phases of my research formed the foundation upon which the third and fourth phases were carried out, where we performed mixed-methods studies to investigate the effectiveness of self-distanced and self-immersed reflection styles with elite athletes on stressor events. Originally, the intent was to conduct two experimental studies in which we

tested self-distanced and self-immersed reflection vistas on psychological well-being, ill-being, and performance outcomes. We also planned to examine stress mindsets, coping insight, and curiosity as moderators and mediators of these effects. However, we were unable to capture the relevant number of participants to take part across both studies which meant we had to pivot in our approach. We repositioned our work from 'which reflection vista works best?' to 'what coping insights are developed via each reflection vantage point?'. This new direction was decided due to increasing interest and importance of coping insights in their contribution towards resilient capacities. In a qualitative sense, using deductive thematic analysis, I assigned codes to each reflection according to the self-reflection and coping insight framework (Falon, Kangas, et al., 2021). For phase three, athletes completed a five-week reflection intervention, whereas we altered the intervention period to three weeks for phase four to maximise participant uptake prior to a major swimming competition.

Results from both studies indicated positive developments of coping insights across both the self-distanced and self-immersed reflection conditions, mainly across the areas of self-awareness, trigger identification, and re-appraisal categories. For phase three, there were 66 athletes assigned to a reflection intervention, of which 28 athletes completed the post-intervention questionnaire targeting psychological well-being and ill-being variables. Qualitative insights revealed the development of moderate- and high-level insights for both groups across the areas of self-awareness, trigger identification, and re-appraisal, and we inferred the greatest differences over the 5-week intervention occurring for the self-immersed group. For phase four, 48 athletes were assigned to reflect from a self-distanced or self-immersed perspective, of which 16 completed the post-intervention questionnaire and 47 athletes provided their swimming performance time. Overall, there were 61 athlete reflections to code, using the 13 coping insights captured in the self-reflection and coping insight framework (Falon et al., 2021) as a guideline. Findings demonstrated that, irrespective of the

group to which they were assigned, athletes showed positive trends towards re-interpreting their stressor experience and embracing their stressor event. Across both studies, consideration of individual values and adoption of a future-focus viewpoint were areas lacking across both studies which are addressed in the future directions for the research.

6.2. Significance and Strengths

6.2.1. Connecting disconnected bodies of evidence on stress regulation interventions

Conducting meta-analyses on the topics spanning athlete stress regulation interventions and self-distanced and self-immersed reflection styles allowed us to interrogate the literature and address gaps for our mixed-method studies. Completing a meta-analysis was warranted across topics due to their fit when comparing many different interventions and their outcomes. Due to such a large range of stress regulation interventions proposed in the sport psychology literature we deemed it important to identify their effectiveness across a range of outcomes and interrogate their active ingredients. Similarly, researchers had produced mixed findings on the effectiveness of self-distanced and self-immersed reflection styles; thus, we were eager to explore intervention details and their outcomes across areas of human functioning (e.g., cognitive, affective). Strengths of carrying out a meta-analysis in phase one included prioritisation of experiments as the evidence source, statistical and narrative synthesis of intervention effectiveness, pre-registration of our protocol, testing of moderators of the effectiveness of stress regulation interventions, and analysis of the active ingredients involved for each intervention. For phase two, strengths of our meta-analysis included a pre-registered protocol and transparency regarding deviations, prioritisation of experiments, multicomponent assessment of risk of bias and overall quality of evidence, and statistical interrogation of intervention characteristics that might augment the effectiveness of self-distanced reflections. Our findings allowed us to move forward with detailed

understanding of each topic, associated theory, and address the gaps to maximise athletes' ability to adapt to their stressor experiences.

6.2.2. Suitability of SSR intervention with athletes

My PhD is the first to deliver and evaluate an individualised stress regulation intervention using the SSR approach with an athlete population, which delivered promising findings in terms of helping athletes adapt to the diverse range of stressors they encountered and build insight to their coping strategies. Athletes wrote about a range of training and competition related stressors alongside personal, university, school, or work-related stressors. These findings showcase the wide range of stressors athletes experience and how concurrent stressors may be experienced. Aligning with Event Systems Theory, the SSR approach allowed athletes to identify the temporal elements of their stressor experiences and identify changes in event strength over time (Morgeson et al., 2015). The SSR approach allowed athletes to consider the implementation of specific coping strategies and their usefulness in that context. Findings across both mixed-method studies allowed us to interrogate the 'common' coping strategies adopted and evaluate their usefulness to the athlete. The wide array of coping strategies reflected upon (e.g., cognitive re-structure, avoidance, physiological, external support, goal setting) confirms the differing strategies one may deploy that are 'fit for purpose', tailoring resources and strategies towards the nature of the stressor event and their environment (Bonanno & Burton, 2013). The intervention maximised authenticity due to athletes writing freely about the stressors they encountered in their dynamic environment. Providing an intervention in an ecologically rich environment ('the wild') provided firsthand insight to the athletes' experience and their processes when coping with stressor events. Thus, these findings are important for sport psychologists to consider when working at the coalface with athletes and teams.

Across both qualitative studies, it was common for athletes to develop insights across self-awareness, trigger identification, and re-appraisal but there were absences of higher-level insights demonstrating, to some extent, the effectiveness of the SSR and coping insight intervention. The guided approach which included prompts for participants, successfully enabled athletes to examine their coping processes by exploring their unique stressor and individual response. Nevertheless, most athletes were unable to continue along the trajectory and build greater insight around their evaluation of the coping response or build an orientation towards future coping. These gaps in coping insight could be accounted for by the possibility that higher-level coping insights emerge in a more protracted manner over the lifespan as a product of life experience (Falon et al., 2021). The median age of participants for phase 3 was 21.6 and for phase 4, 15.6 years of age. Research by Falon and colleagues (2021) similarly identified gaps in their SSR intervention with military cadets, across the areas of acknowledging a diverse range of coping strategies, resources, or beliefs applied during the coping process, understanding that stressors provide an opportunity for growth, and understanding the nuanced interactions between individual strengths and the effectiveness of coping strategies or resources. The depth of insights produced by athletes infers the benefits of engaging in self-reflection, regardless of the vista one adopts, alongside a program in which a structure is provided for processing stressor experiences for strengthening resilience. Other research has found supportive evidence for the effectiveness of self-reflective writing on stressor events (e.g., Bucknell et al., 2023), rather than purely writing unstructured descriptions of the event, particularly when the target events are high in emotionality (Guastella & Dadds, 2009). Along similar lines, our findings showcase the importance of gaining a deeper understanding of the mechanisms at play when an athlete is engaging in their typical reflection piece, rather than a ‘broad-brush’ approach where ‘go-to’

coping strategies (e.g., mindfulness, deep breathing) are appointed during competition and training.

6.2.3. When are self-distanced and self-immersed vistas best utilised?

Our findings revealed there are potential benefits when reflecting on stressor events from both vistas, which draws us to the conclusion perhaps it isn't just 'one or the other' when we are looking at reflection strategies in response to unique stressor experiences. Conceptual and empirical work on self-distanced versus self-immersed perspectives typically focuses on an 'either or' approach (e.g., Ayduk & Kross, 2010; Mischowski et al., 2012; Wisco & Nolen-Hoeksema, 2011), but our findings across studies three and four suggests there is a need to reconsider this position to one where both perspectives can be utilised and test this idea empirically. Reconceptualising these two different vistas for self-reflections relative to the stress event of the target of one's reflection aligns with the concept of self-regulation flexibility (Bonanno & Burton, 2013), whereby to cope effectively one must consider characteristics of their context and the fit between the context and their resources or strategies (Folkman & Moskowitz, 2004). Our research shows that athletes in the self-immersed condition, at times, appeared to respond pro-actively to their 'mild' stressor event and build coping insights across multiple areas. In contrast, it is possible self-distanced reflections are most suited towards stressor experiences higher in magnitude – novelty, disruption, and/or criticality – whereby there is likely high emotionality linked to the stressor event. Having access to a diverse repertoire of regulatory strategies in which one can 'float' from one reflection strategy to another and monitor feedback on their effectiveness is potentially key when considering this approach to stress adaptation. A natural implication of this proposal is *how do different reflection perspectives best work together across different contexts?*

6.3. Limitations

There were key limitations that should be recognised when interpreting the findings of this thesis. First, we failed to obtain our sample size target for the pre-registered experiments for phases three and four to conduct inferential statistical tests of the effectiveness of each reflection vista. In hindsight, completing a feasibility and pilot study would have been beneficial in helping us tailor the SSR approach towards an athlete population and optimise frequency and duration of the intervention. The nature of a feasibility study is to interrogate whether the research can be completed; a pilot study is a subset of this feasibility umbrella which incorporates specific design elements for the intervention (Elridge et al., 2015). Second, we asked participants to focus on a stressor event, with no information obtained on important contextual elements of the event (e.g., novelty, criticality, disruption, Morgeson et al., 2015) other than what was reported spontaneously by athletes in their written reflections. Capturing rich details on the perceived intensity of stressor events is essential to unpacking the effectiveness of a reflection vista, and uncovering why coping strategies or resources are helpful in overcoming individual stressor experiences (Morgeson et al., 2015). Third, the prompts used in our intervention across studies three and four reflected an extension of the SSR framework (Crane, Searle et al., 2019) and, therefore, may have excluded information helpful for athletes to generate insights across high-level insights being evaluation and future-focus. Although research on the reflection process has highlighted the importance of integrating prompts for productive learning and reflection (e.g., Chen et al., 2008; Quinton & Smallbone, 2010), there is a need to interrogate directed prompts (Choi et al., 2023) for the development of individual values and future-focus areas. Finally, self-reflection quality is likely underpinned by key psychological skills well known to athletes, like imagery and self-talk. We presumed athletes possessed some baseline skill in self-reflections, as it is something people generally do (in varying degrees) spontaneously and for which athletes embedded within an elite training institute likely had previous exposure. Nevertheless, it could be that

athletes required some baseline training in the key concepts and processes of distanced versus immerse reflections prior to rolling them out ‘in the wild’ to maximise their potential benefit. In all, despite these limitations, the foundation of knowledge created in this PhD is ripe with opportunities to be built upon in the future.

6.4. Future directions

As a product of the findings of this thesis, we signpost important avenues to consider going forward for research targeting the development of athlete resilience via the self-reflection and coping insight framework. First, we advise co-designing interventions with athletes in the future, initially through a feasibility study, so that recruitment and retention of experimental studies can be optimised. Completing a feasibility study to explore athletes’ acceptance of SSR training, their engagement with the reflection intervention, and the feasibility of recruitment and retention processes as well as selected outcome measures will help answer questions on barriers to participation and intervention design, allowing for maximum effectiveness in the future. Completing a pilot study will also ensure that reflections are complete at an optimal duration and frequency around athletes’ training and competition calendars. Second, due to the unfamiliar nature of reflecting from a self-distanced approach, it is important to consider additional approaches to help athletes understand how to reflect from this vista and give examples of how to do so. Research by Falon and colleagues (2021) completed a 40-minute lecture-style session with Military Cadets that introduced participants to the application of self-reflection for the development of resilient capacities, delivered by a psychologist. Third, it is important to consider the operationalisation of the self-reflection and coping insight framework, particularly the areas that we inferred as largely absent in phases three and four of our research (e.g., values, future-focus). For example, during the session completed by Falon and colleagues, individuals

completed a values exercise that required them to identify their values and value-based goals pertaining to leadership under pressure by rating a list of 32 values. Completing this exercise before the intervention occurred allowed individuals to explore and recognise their key values before engaging with weekly self-reflection. Future research may benefit from considering values-based activities before the occurrence of the intervention.

Athletes across both mixed-methods studies reported on 'spontaneous' stressor events that varied in their contextual elements (e.g., novelty, criticality, disruption; Morgeson et al., 2015), which is an important area to consider going forward for stress regulation interventions. First, stressors reported by participants were mostly 'everyday' in their nature rather than significant adversities or traumatic events. In this sense, it may have been easier for self-immersed participants to *'lean in'* to their stressor experience and embrace their emotional aspect, whereas a self-distanced perspective may be more applicable for events higher in emotionality. There is potential for future research to consider a blended approach whereby participants reflect from a self-immersed or self-distanced condition depending on the emotionality tied to their experience, which contrasts the traditional *'either or'* approach in the field. Second, we asked participants to focus on a stressor event, with no information obtained on important contextual elements of the event other than what was reported spontaneously by athletes in their written reflections. Capturing the affective aspects of a stress-inducing event would have facilitated an in-depth analysis of the subtleties within coping strategies employed in response to stressors that exhibit variability in the 'hot' features of stressors that are core to the conceptual rationale for self-distanced reflections. Third, consideration of a coding system that is derived from theory or an established coding system is warranted to ensure stressor features reported by athletes are assigned to the appropriate 'label' for the development of coping insights. Overall, the results of this PhD

form a valuable platform for which to assess the feasibility of similar interventions, and to further test specific intervention components.

6.5. Conclusion

This PhD produced evidence that athletes have the capacity to adapt to stressors and build their coping insights via a self-reflection intervention, regardless of the vista one adopts. Through chronicling the exploration, development, implementation, and evaluation of a stress regulation intervention with an athlete population, this PhD has produced novel findings on athlete insights to individual stressor experiences and revealed their understanding of coping strategies or resources to adapt and learn for similar situations in the future. Researchers and sport psychologists can benefit from the findings reported in this thesis. Researchers can utilise this thesis as a foundation for feasibility and pilot studies which capture how best to work with athletes and investigate the athlete emotional experience, using this data to consider the vista from which one reflects. Sport psychologists may wish to consider the implementation of the SSR approach to assist athletes in uncovering their individualised coping strategies and resources, and to help athletes increase their self-awareness during stressor experiences. Overall, my research reveals the importance of equipping athletes with an adaptable toolbox to ensure they can respond to the unique demands encountered in their sporting sphere and build self-awareness and coping insights while staying aligned with their values compass.

This PhD thesis laid the groundwork for the next chapter of my personal journey. At the beginning of this pursuit, the theme of ‘resilience’ seemed so broad to me; I was unsure where I would start in terms of research and how I could make a difference in this area when there seemed to be contributions by so many on this ‘hot’ topic. As I began researching, I became quite intrigued when my supervisor introduced me to the idea of using stressor experiences and a reflection process to build resilient capacities. I could see the benefits of

applying this framework and more importantly, I could see how it had the potential to benefit athletes. Despite there being challenges with recruitment, I found the processes of working alongside athletes very rewarding; the potential for changes 'on the ground' was exciting and a big motivating factor in completing this research. Overall, my PhD journey has taught me the importance of persisting strategically in the face of challenges, the importance of being able to adapt and approach situations differently, and the value of collaboration. After speaking with coaches, parents, and athletes about athlete struggles with stress, I can whole-heartedly see the benefits of this thesis and future research in the field.

References

Andersson, M. A., & Conley, C. S. (2012). Optimizing the percieved benefits and health outcomes of writing about traumatic life events. *Stress and Health, 29*, 40-49. https://doi.org/10.1002/smi.2423

Anseel, F., Lievens, F., & Schollaert, E. (2009). Reflection as a strategy to enhance task performance after feedback. *Organizational Behavior and Human Decision Processes*, *110*, 23–35. https://doi.org/10.1016/j.obhdp.2009.05.003

Archer, M. (1998). Introduction: Realism in the social sciences. In M. Archer, R. Bhaskar, A. Collier, T. Lawson, & A. Norrie (Eds.), *Critical realism: Essential readings* (pp. 189–205). Routledge

Arnold, R., & Fletcher, D. (Eds.). (2021). *Stress, well-being, and performance in sport*. Routledge.

Arnold, R., & Fletcher, D. (2012). A research synthesis and taxonomic classification of the organizational stressors encountered by sport performers. *Journal of Sport and Exercise Psychology*, *34*, 397–429. https://doi.org/10.1123/jsep.34.3.397

Arnold, R., Fletcher, D., & Daniels, K. (2013). Development and validation of the organizational stressor indicator for sport performers (OSI-SP). *Journal of Sport and Exercise Psychology*, *35*, 180–196. https://doi.org/10.1123/jsep.35.2.180

Arnold, R., Fletcher, D., & Daniels, K. (2017). Organisational stressors, coping, and outcomes in competitive sport. *Journal of Sports Sciences*, *35*, 694–703. https://doi.org/10.1080/02640414.2016.1184299

Australian Government. (2011). *National Sport and Active Recreation Policy Framework*. Retrieved from https://www.ausport.gov.au/__data/assets/pdf_file/0004/467563/National_Sport_and_Active_Recreation_Policy_Framework.pdf

Ayala, J.-C., & Manzano, G. (2014). The resilience of the entrepreneur. Influence on the success of the business. A longitudinal analysis. *Journal of Economic Psychology, 42*, 126–135. https://doi.org/10.1016/j.joep.2014.02.004

Ayduk, Ö., & Kross, E. (2010). Analyzing Negative Experiences Without Ruminating: The Role of Self-Distancing in Enabling Adaptive Self-Reflection. *Social and Personality Psychology Compass*, *4*(10), 841–854. https://doi.org/10.1111/j.1751-9004.2010.00301.x

Ayduk, Ö., & Kross, E. (2010). From a distance: Implications of spontaneous self-distancing for adaptive self-reflection. *Journal of Personality and Social Psychology*, *98*(5), 809–829. https://doi.org/10.1037/a0019205

Balk, Y. A., Adriaanse, M. A., de Ridder, D. T. D., & Evers, C. (2013). Coping under pressure: employing emotion regulation strategies to enhance performance under pressure. *Journal of Sport & Exercise Psychology*, *35*, 408–418. https://doi.org/10.1123/jsep.35.4.408

Baron-Thiene, A., & Alfermann, D. (2015). Personal characteristics as predictors for dual career dropout versus continuation – A prospective study of adolescent athletes from German elite sport schools. *Psychology of Sport and Exercise*, *21*, 42–49. https://doi.org/10.1016/j.psychsport.2015.04.006

Bhaskar, R. (1989). *Reclaiming reality: A critical introduction to contemporary philosophy.* Verso.

Blascovich, J., & Mendes, W. B. (2000). Challenge and threat appraisals: The role of affective cues. In J. P. Forgas (Ed.), *Studies in emotion and social interaction, second series. Feeling and thinking: The role of affect in social cognition* (pp. 59–82). Cambridge University Press.

Blascovich, J., & Mendes, W. B. (2010). Social psychophysiology and embodiment. In S. T. Fiske, D. T. Gilbert, & G. Lindzey (Eds.), *Handbook of social psychology* (pp. 194–227). John Wiley & Sons, Inc.

Boemo, T., Nieto, I., Vazquez, C., & Sanchez-Lopez, A. (2022). Relations between emotion regulation strategies and affect in daily life: A systematic review and meta-analysis of studies using

ecological momentary assessments. *Neuroscience & Biobehavioral Reviews*, *139*, 104747. https://doi.org/10.1016/j.neubiorev.2022.104747

Bohlen, L. C., Michie, S., de Bruin, M., Rothman, A. J., Kelly, M. P., Groarke, H. N. K., Carey, R. N., Hale, J., & Johnston, M. (2020). Do combinations of behavior change techniques that occur frequently in interventions reflect underlying theory? *Annals of Behavioral Medicine*, *54*, 827–842. https://doi.org/10.1093/abm/kaaa078

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-clinpsy-032210-104526

Bonanno, G., & Burton, C. (2013). Regulatory flexibility: An individual differences perspective on coping and emotion regulation. *Perspectives on Psychological Science*, *8*, 591–612. https://doi.org/10.1177/1745691613504116

Boot, W. R., Simons, D. J., Stothart, C., & Stutts, C. (2013). The pervasive problem with placebos in psychology: Why active control groups are not sufficient to rule out placebo effects. *Perspectives on Psychological Science*, *8*(4), 445–454.

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. TJ International.

Borenstein, M., Higgins, J. P. T., Hedges, L. V., & Rothstein, H. R. (2017). Basics of meta-analysis: I^2 is not an absolute measure of heterogeneity. *Research Synthesis Methods*, *8*, 5–18. https://doi.org/10.1002/jrsm.1230

Braun, V., & Clarke, V. (2021). Can I use TA? Should I use TA? Should I not use TA? Comparing reflexive thematic analysis and other pattern-based qualitative analytic approaches. *Counselling and Psychotherapy Research*, *21*(1), https://doi.org/10.1002/capr.12360

Brown, D., & 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

Bucknell, K. J., Kangas, M., & Crane, M. F. (2022). Adaptive self-reflection and resilience: The moderating effects of rumination on insight as a mediator. *Personality and Individual Differences, 185*, 111234. https://doi.org/10.1016/j.paid.2021.111234

Bühlmayer, L., Birrer, D., Röthlin, P., Faude, O., & Donath, L. (2017). Effects of mindfulness practice on performance-relevant parameters and performance outcomes in sports: A meta-analytical review. *Sports Medicine*, *47*. https://doi.org/10.1007/s40279-017-0752-9

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.

Cafri, G., Kromrey, J. D., & Brannick, M. T. (2010). A meta-meta-analysis: Empirical review of statistical power, type I error rates, effect sizes, and model selection of meta-analyses published in psychology. *Multivariate Behavioral Research*, *45*, 239–270. https://doi.org/10.1080/00273171003680187

Cameron, L. D., & Jago, L. (2013). Cognitive Strategies. In: Gellman M.D., Turner J.R. (Eds.) *Encyclopedia of Behavioral Medicine.* Springer. https://doi.org/10.1007/978-1-4419-1005-9_1120

Chai, K. E. K., Lines, R. L. J., Gucciardi, D. F., & Ng, L. (2021). Research Screener: A machine learning tool to semi-automate abstract screening for systematic reviews. *Systematic Reviews*, *10*(1), 93. https://doi.org/10.1186/s13643-021-01635-3

Cheung, M. W.-L. (2014). Modeling dependent effect sizes with three-level meta-analyses: A structural equation modeling approach. *Psychological Methods*, *19*, 211–229. https://doi.org/10.1037/a0032968

Cheung, M. W.-L. (2014). Modelling dependent effect sizes with three-level meta-analyses: A structural equation modelling approach. *Psychological Methods*, *19*, 211–229. https://doi.org/10.1037/a0032968

Cheung, M. W.-L. (2019). A guide to conducting a meta-analysis with non-independent effect sizes. *Neuropsychology Review*, *29*, 387–396. https://doi.org/10.1007/s11065-019-09415-6

Chmitorz, A., Kunzler, A., Helmreich, I., Tüscher, O., Kalisch, R., Kubiak, T., Wessa, M., & Lieb, K. (2018). Intervention studies to foster resilience – A systematic review and proposal for a resilience framework in future intervention studies. *Clinical Psychology Review*, *59*, 78–100. https://doi.org/10.1016/j.cpr.2017.11.002

Choudhary, R., Trivedi, V., & Choudhary, S. G. (2016). Effect of heart rate variability biofeedback training on the performance of track athlete. *International Journal of Therapies and Rehabilitation Research*, *5*, 166–174. https://doi.org/10.5455/ijtrr.000000159

Christie, S., Bertollo, M., & Werthner, P. (2020). The effect of an integrated neurofeedback and biofeedback training intervention on ice hockey shooting performance. *Journal of Sport & Exercise Psychology*, 1–14. https://doi.org/10.1123/jsep.2018-0278

Cohen, G. L., & Sherman, D. K. (2014). The psychology of change: Self-affirmation and social psychological intervention. *Annual Review of Psychology*, *65*(1), 333–371. https://doi.org/10.1146/annurev-psych-010213-11513

Cohen, S., Murphy, M. L. M., & Prather, A. A. (2019). Ten surprising facts about stressful life events and disease risk. *Annual Review of Psychology*, *70*(1), 577–597. https://doi.org/10.1146/annurev-psych-010418-102857

Cooper, G. A., Kronstrand, R., Kintz, P. (2012). Society of hair testing guidelines for drug testing in hair. *Forensic Science International, 218,* 20–24. https://doi.org/10.1016/j.forsciint.2011.10.024

Côté, J., Murphy-Mills, J., & Abernethy, B. (2012). The development of skill in sport. In N. J. Hodges & A. M. Williams (Ed.), *Skill acquisition in sport, theory and practice* (2nd ed., pp. 269–286). United Kingdom: Routledge. https://espace.library.uq.edu.au/view/UQ:286142

Cowden, R. G., & Meyer-Weitz, A. (2016). Self-reflection and self-insight predict resilience and stress in competitive tennis. *Social Behavior and Personality: An International Journal*, *44*(7), 1133–1149. https://doi.org/10.2224/sbp.2016.44.7.1133

Crane, M. F., Boga, D., Karin, E., Gucciardi, D. F., Rapport, F., Callen, J., & Sinclair, L. (2019). Strengthening resilience in military officer cadets: A group-randomized controlled trial of coping and emotion regulatory self-reflection training. *Journal of Consulting and Clinical Psychology*, *87*(2), 125–140. https://doi.org/10.1037/ccp0000356

Crane, M. F., Hoare, S., Kangas, M., Gucciardi, D.F., & Karin E. (in press). A Coping Self-Insight Scale for Adults: Development and Preliminary Psychometric Properties. *Anxiety, Stress and Coping.*

Crane, M. F., Kangas, M., Karin, E., Searle, B., & Chen, D. (2020). Leveraging the experience of stressors: The role of adaptive systematic self-reflection. *Anxiety, Stress, & Coping*, *33*(3), 231–247. https://doi.org/10.1080/10615806.2020.1732359

Crane, M. F., Kho, M., Kangas, M., Griffin, B., Karin, E., Earl, J. K., & Harris, C. B. (2020). Strengthening resilience in over 50's: A nested clustered-randomized controlled trial of adaptive systematic self-reflection. *Anxiety, Stress, & Coping*, *33*(6), 623–641. https://doi.org/10.1080/10615806.2020.1768375

Crane, M. F., Rapport, F., Callen, J., Boga, D., Gucciardi, D. F., & Sinclair, L. (2019). Military police investigator perspectives of a new self-reflective approach to strengthening resilience: A qualitative study. *Military Psychology, 39*(5), 384-396. https://doi.org/10.1080/08995605.2019.1645537

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), 1–17. https://doi.org/10.1080/10615806.2018.1506640

Crum, A. J., Salovey, P., & Achor, S. (2013). Rethinking stress: The role of mindsets in determining the stress response. *Journal of Personality and Social Psychology*, *104*(4), 716–733. https://doi.org/10.1037/a0031201

Davenport, M. D., Tiefenbacher, S., Lutz, C. K., Novak, M. A., & Meyer, J. S. (2006). Analysis of endogenous cortisol concentrations in the hair of rhesus macaques. *General and Comparative Endocrinology*, *147*(3), 255–261. https://doi.org/10.1016/j.ygcen.2006.01.005

De Witt, D. J. (1980). Cognitive and biofeedback training for stress reduction with university athletes. *Journal of Sport Psychology*, *2*, 288–294. https://doi.org/10.1123/jsp.2.4.288

DeRue, D. S., Ashford, S. J., & Myers, C. G. (2012). Learning agility: In search of conceptual clarity and theoretical grounding. *Industrial and Organizational Psychology*, *5*(3), 258–279. https://doi.org/10.1111/j.1754-9434.2012.01444.x

Dilts, R. & DeLozier, J. (2000). *Encyclopedia of systemic Neuro-Linguistic Programming and NLP new coding.* NLP University Press.

Dirven, T., Turner, C., Thio, S. L., Blom, J., Muth, C., & van Driel, M. L. (2020). Room for improvement in reporting of trials discontinuing long-term medication: A systematic review. *Journal of Clinical Epidemiology*, *119*, 65–74. https://doi.org/10.1016/j.jclinepi.2019.11.013

Dorfman, A., Oakes, H., Santos, H. C., & Grossmann, I. (2021). Self-distancing promotes positive emotional change after adversity: Evidence from a micro-longitudinal field experiment. *Journal of Personality*, *89*(1), 132–144. https://doi.org/10.1111/jopy.12534

Edwards, J. R., & Christian, M. S. (2014). Using accumulated knowledge to calibrate theoretical propositions. *Organizational Psychology Review*, *4*(3), 279–291. https://doi.org/10.1177/2041386614535131

Egger, M., Smith, G. D., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. *BMJ*, *315*, 629–634. https://doi.org/10.1136/bmj.315.7109.629

Ellis, S., Carette, B., Anseel, F., & Lievens, F. (2014). Systematic reflection: Implications for learning from failures and successes. *Current Directions in Psychological Science*, *23*(1), 67–72. https://doi.org/10.1177/0963721413504106

Epel, E. S., Crosswell, A. D., Mayer, S. E., Prather, A. A., Slavich, G. M., Puterman, E., & Mendes, W. B. (2018). More than a feeling: A unified view of stress measurement for population science. *Frontiers in Neuroendocrinology*, *49*, 146–169. https://doi.org/10.1016/j.yfrne.2018.03.001

Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. (2008). Comparison of PubMed, Scopus, Web of Science, and Google Scholar: Strengths and weaknesses. *The FASEB Journal*, *22*, 338–342. https://doi.org/10.1096/fj.07-9492LSF

Falon, S. L., Hoare, S., Kangas, M., & Crane, M. F. (2022). The coping insights evident through self-reflection on stressful military training events: Qualitative evidence from self-reflection journals. *Stress and Health, 38*(5), 902-918. https://doi.org/10.1002/smi.3141

Falon, S. L., Kangas, M., & Crane, M. F. (2021). The coping insights involved in strengthening resilience: The self-reflection and coping insight framework. *Anxiety, Stress, and Coping*, *34*(6), 734–750. https://doi.org/10.1080/10615806.2021.1910676

Falon, S. L., Karin, E., Boga, D., Gucciardi, D. F., Griffin, B., & Crane, M. F. (2021). A clustered-randomized controlled trial of a self-reflection resilience-strengthening intervention and novel mediators. *Journal of Occupational Health Psychology*, *26*(1), 1–19. https://doi.org/10.1037/ocp0000268

Fergusson, P. A. (1994). Writing about traumatic events using the third person pronoun: Psychological and health effects. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 54*, 1-225.

Fernández-Castilla, B., Declercq, L., Jamshidi, L., Beretvas, S. N., Onghena, P., & Noortgate, W. V. den. (2021). Detecting selection bias in meta-analyses with multiple outcomes: A simulation study. *The Journal of Experimental Education*, *89*, 125–144. https://doi.org/10.1080/00220973.2019.1582470

Field, A., Miles, J., & Field, Z. (2012). *Discovering statistics using R*. SAGE Publications.

Field, T. A., Beeson, E. T., & Jones, L. K. (2015). The new ABCs: A practitioner's guide to neuroscience-informed cognitive-behavior therapy. *Journal of Mental Health Counseling*, *37*(3), 206–220. https://doi.org/10.17744/1040-2861-37.3.206

Fletcher, A. J. (2017). Applying critical realism in qualitative research: methodology meets method. *International journal of social research methodology, 20*(2), 181-194.

Fletcher, D., & Sarkar, M. (2016). Mental fortitude training: An evidence-based approach to developing psychological resilience for sustained success. *Journal of Sport Psychology in Action, 7*(3), 135–157. https://doi.org/10.1080/21520704.2016.1255496

Fletcher, D., Hanton, S., & Mellalieu, S. (2006). An organisational stress review: Conceptual and theoretical issues in competitive sport. In S. Hanton, & S. D. Mellalieu (Eds.), *Literature Reviews in Sport Psychology* (pp. 321–374). Nova Science Publishers, Inc.

Fletcher, L., & Hayes, S. (2005). Relational frame theory, acceptance and commitment therapy, and a functional analytic definition of mindfulness. *Journal of Rational-Emotive and Cognitive-Behavior Therapy*, *23*, 315–336. https://doi.org/10.1007/s10942-005-0017-7

Follette, V. M., & Hazlett-Stevens, H. (2016). Mindfulness and acceptance theories. In J. C. Norcross, G. R. VandenBos, D. K. Freedheim, & B. O. Olatunji (Eds.), *APA handbook of clinical psychology: Theory and research, Vol. 2* (pp. 273–302). American Psychological Association. https://doi.org/10.1037/14773-010

Freedland, K. E., King, A. C., Ambrosius, W. T., Mayo-Wilson, E., Mohr, D. C., Czajkowski, S. M., Thabane, L., Collins, L. M., Rebok, G. W., Treweek, S. P., Cook, T. D., Edinger, J. D., Stoney, C. M., Campo, R. A., Young-Hyman, D., & Riley, W. T. (2019). The selection of comparators for randomized controlled trials of health-related behavioral interventions: Recommendations of an NIH expert panel. *Journal of Clinical Epidemiology*, *110*, 74–81. https://doi.org/10.1016/j.jclinepi.2019.02.011

Fuentes, A. M. M., Kahn, J. H., & Lannin, D. G. (2021). Emotional disclosure and emotion change during an expressive-writing task: Do pronouns matter? *Current Psychology: A Journal for Diverse Perspectives on Diverse Psychological Issues, 40*(4), 1672–1679. https://doi.org/10.1007/s12144-018-0094-2

Funder, D. C., & Ozer, D. J. (2019). Evaluating Effect Size in Psychological Research: Sense and Nonsense. *Advances in Methods and Practices in Psychological Science*, *2*(2), 156–168. https://doi.org/10.1177/2515245919847202

Furman, C. R., Kross, E., & Gearhardt, A. N. (2020). *Distanced Self-Talk Enhances Goal Pursuit to Eat Healthier*. *8*(2), 366–373. https://doi.org/10.1177/21677026198963

Gainsburg, I., Sowden, W. J., Drake, B., Herold, W., & Kross, E. (2022). Distanced self-talk increases rational self-interest. *Scientific Reports, 12*(1). https://doi.org/10.1038/s41598-021-04010-3

Ganguly, S., Samanta, M., Roy, P., Chatterjee, S., Kaplan, D. W., & Basu, B. (2013). Patient Health Questionnaire-9 as an effective tool for screening of depression among Indian adolescents. *Journal of Adolescent Health*, *52*(5), 546–551. https://doi.org/10.1016/j.jadohealth.2012.09.012

Garland, E. L., Fredrickson, B., Kring, A. M., Johnson, D. P., Meyer, P. S., & Penn, D. L. (2010). Upward spirals of positive emotions counter downward spirals of negativity: Insights from the broaden-and-build theory and affective neuroscience on the treatment of emotion dysfunctions and deficits in psychopathology. *Clinical Psychology Review*, *30*, 849–864.

Gilbody, S., Richards, D., Brealey, S., & Hewitt, C. (2007). Screening for depression in medical settings with the Patient Health Questionnaire (PHQ): A diagnostic meta-analysis. *Journal of General Internal Medicine, 22*(11), 1596–1602. https://doi.org/10.1007/s11606-007-0333-y

Giovanetti, A. K., Revord, J., Sasso, M., & Haeffel, G. J. (2019). Self-Distancing May Be Harmful: Third-Person Writing Increases Levels of Depressive Symptoms Compared to Traditional Expressive Writing and No Writing. *Journal of Social and Clinical Psychology, 38*, 50–69. https://doi.org/10.1521/JSCP.2019.38.1.50

Glass, C. R., Spears, C. A., Perskaudas, R., & Kaufman, K. A. (2019). Mindful sport performance enhancement: Randomized controlled trial of a mental training program with collegiate athletes. *Journal of Clinical Sport Psychology*, *13*, 609–628. https://doi.org/10.1123/jcsp.2017-0044

Glass, C. R., Spears, C. A., Perskaudas, R., & Kaufman, K. A. (2019). Mindful sport performance enhancement: Randomized controlled trial of a mental training program with collegiate athletes. *Journal of Clinical Sport Psychology*, *13*, 609–628. https://doi.org/10.1123/jcsp.2017-0044

Gleser, L. J., & Olkin, I. (2009). Stochastically dependent effect sizes. In H. Cooper, L. V. Hedges, & J. C. Valentine (Eds.), *The handbook of research synthesis and meta-analysis* (pp. 357–376). Russell Sage Foundation.

Glück, J., Bluck, S., & Weststrate, N. M. (2019). More on the MORE life experience model: What we have learned (so far). *The Journal of Value Inquiry*, *53*(3), 349–370. https://doi.org/10.1007/s10790-018-9661-x

Gold, S. M., Enck, P., Hasselmann, H., Friede, T., Hegerl, U., Mohr, D. C., & Otte, C. (2017). Control conditions for randomised trials of behavioural interventions in psychiatry: A decision framework. *The Lancet Psychiatry*, *4*, 725–732. https://doi.org/10.1016/S2215-0366(17)30153-0

Gordon, S., & Gucciardi, D. F. (2011). A strengths-based approach to coaching mental toughness. *Journal of Sport Psychology in Action*, *2*(3), 143–155. https://doi.org/10.1080/21520704.2011.598222

Grange, L., & Ortiz, J. (2006). Efficacy of relaxation techniques in increasing sport performance in women golfers. *The Sport Journal*, *9*(1).

Grant, A. M., Franklin, J., & Langford, P. (2002). The self-reflection and insight scale: A new measure of private self-consciousness. *Social Behavior and Personality: An International Journal*, *30*(8), 821–835. https://doi.org/10.2224/sbp.2002.30.8.821

Greenland, S., Senn, S. J., Rothman, K. J., Carlin, J. B., Poole, C., Goodman, S. N., Altman, D. G. (2016). Statistical tests, P values, confidence intervals, and power: a guide to misinterpretations. *European Journal of Epidemiology, 31*, 337–350. https://doi.org/10.1007/s10654-016-0149-3

Greenspan, M. J. (1991). *The effects of cognitive-affective stress management training on elite archers* [Doctoral dissertation, Michigan State University]. https://www.elibrary.ru/item.asp?id=5868139

Grossmann, I., & Jowhari, N. (2018). Cognition and the self: Attempt of an independent close replication of the effects of self-construal priming on spatial memory recall. *Journal of Experimental Social Psychology*, *74*, 65–73. https://doi.org/10.1016/j.jesp.2017.08.005

Grossmann, I., & Kross, E. (2010). The impact of culture on adaptive versus maladaptive self-reflection. *Psychological Science*, *21*(8), 1150–1157. https://doi.org/10.1177/0956797610376655

Grossmann, I., Dorfman, A., Oakes, H., Santos, H. C., Vohs, K. D., & Scholer, A. A. (2021). Training for Wisdom: The Distanced-Self-Reflection Diary Method. *Psychological Science*, *32*(3), 381–394. https://doi.org/10.1177/0956797620969170

Gu, X., & Tse, C-S (2016). Narrative perspective shift at retrieval: The psychological-distance-mediated-effect on emotional intensity of positive and negative autobiographical memory. *Consciousness and Cognition, 45*, 159-173. https://doi.org/10.1016/j.concog.2016.09.001

Gucciardi, D. F., Lines, R. L. J., & Ntoumanis, N. (2021). Handling effect size dependency in meta-analysis. *International Review of Sport and Exercise Psychology*, 1–27. https://doi.org/10.1080/1750984X.2021.1946835

Guo, L. (2022). How should reflection be supported in higher education? — A meta-analysis of reflection interventions. *Reflective Practice*, *23*(1), 118–146. https://doi.org/10.1080/14623943.2021.1995856

Gustafsson, H., DeFreese, J. D., & Madigan, D. (2017). Athlete burnout: Review and recommendations. *Current Opinion in Psychology*, *16*, 109–113. https://doi.org/10.1016/j.copsyc.2017.05.002

Guyatt, G. H., Oxman, A. D., Vist, G. E., Kunz, R., Falck-Ytter, Y., Alonso-Coello, P., & Schünemann, H. J. (2008). GRADE: An emerging consensus on rating quality of evidence and strength of recommendations. *BMJ*, *336*, 924–926. https://doi.org/10.1136/bmj.39489.470347.AD

Haehner, P., Kritzler, S., Fassbender, I., & Luhmann, M. (2021). Stability and change of perceived characteristics of major life events. *Journal of Personality and Social Psychology*. https://doi.org/10.1037/pspp0000394

Hall, E. G., & Erffmeyer, E. S. (1983). The effect of visuo-motor behavior rehearsal with videotaped modeling on free throw accuracy of intercollegiate female basketball players. *Journal of Sport Psychology*, *5*, 343–346. https://doi.org/10.1123/jsp.5.3.343

Hanton, S., Fletcher, D., & Coughlan, G. (2005). Stress in elite sport performers: A comparative study of competitive and organizational stressors. *Journal of Sports Sciences*, *23*(10), 1129–1141. https://doi.org/10.1080/02640410500131480

Harris, B. N. (2020). Stress hypothesis overload: 131 hypotheses exploring the role of stress in tradeoffs, transitions, and health. *General and Comparative Endocrinology*, *288*, 113355. https://doi.org/10.1016/j.ygcen.2019.113355

Hart, K. E., & Sasso, T. (2011). Mapping the contours of contemporary positive psychology. *Canadian Psychology*, *52*(2), 82–92. https://doi.org/10.1037/a0023118

Hase, A., O'Brien, J., Moore, L. J., & Freeman, P. (2019). The relationship between challenge and threat states and performance: A systematic review. *Sport, Exercise, and Performance Psychology*, *8*(2), 123–144. https://doi.org/10.1037/spy0000132

Hastings, J., Michie, S., & Johnston, M. (2020). Theory and ontology in behavioural science. *Nature Human Behaviour*, *4*(3), 226–226. https://doi.org/10.1038/s41562-020-0826-9

Hatzigeorgiadis, A., Zourbanos, N., Galanis, E., & Theodorakis, Y. (2011). Self-Talk and Sports Performance: A Meta-Analysis. *Perspectives on Psychological Science*, *6*, 348–356. https://doi.org/10.1177/1745691611413136

Heritier, S. R., Gebski, V. J., & Keech, A. C. (2003). Inclusion of patients in clinical trial analysis: The intention-to-treat principle. *Medical Journal of Australia*, *179*(8), 438–440. https://doi.org/10.5694/j.1326-5377.2003.tb05627.x

Higgins, J. P. T., & Thompson, S. G. (2002). Quantifying heterogeneity in a meta-analysis. *Statistics in Medicine*, *21*, 1539–1558. https://doi.org/10.1002/sim.1186

Higgins, J. P. T., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. *BMJ*, *327*, 557–560. https://doi.org/10.1136/bmj.327.7414.557

Higgins, J., & Green, S. (2011). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0. *The Cochrane Collaboration.* https://handbook-5-1.cochrane.org/

Hinz, A., Klein, A. M., Brähler, E., Glaesmer, H., Luck, T., Riedel-Heller, S. G., Wirkner, K., & Hilbert, A. (2017). Psychometric evaluation of the Generalized Anxiety Disorder Screener GAD-7, based on a large German general population sample. *Journal of Affective Disorders*,

Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist*, *44*(3), 513–524. https://doi.org/10.1037/0003-066X.44.3.513

Hoffmann, T. C., Glasziou, P. P., Boutron, I., Milne, R., Perera, R., Moher, D., Altman, D. G., Barbour, V., Macdonald, H., Johnston, M., Lamb, S. E., Dixon-Woods, M., McCulloch, P., Wyatt, J. C., Chan, A.-W., & Michie, S. (2014). Better reporting of interventions: Template for intervention description and replication (TIDieR) checklist and guide. *BMJ*, *348*, 1–12. https://doi.org/10.1136/bmj.g1687

Hopewell, S., & Clarke, M. (2005). Abstracts presented at the American Society of Clinical Oncology conference: How completely are trials reported? *Clinical Trials*, *2*, 265–268. https://doi.org/10.1191/1740774505cn091oa

Horiuchi, S., Tsuda, A., Aoki, S., Yoneda, K., & Sawaguchi, Y. (2018). Coping as a mediator of the relationship between stress mindset and psychological stress response: A pilot study.

Psychology Research and Behavior Management, *11*, 47–54. https://doi.org/10.2147/PRBM.S150400

Huedo-Medina, T. B., Sánchez-Meca, J., Marín-Martínez, F., & Botella, J. (2006). Assessing heterogeneity in meta-analysis: Q statistic or I^2 index? *Psychological Methods*, *11*, 193–206. https://doi.org/10.1037/1082-989X.11.2.193

IntHout, J., Ioannidis, J. P. A., Rovers, M. M., & Goeman, J. J. (2016). Plea for routinely presenting prediction intervals in meta-analysis. *BMJ Open*, *6*(7). https://doi.org/10.1136/bmjopen-2015-010247

Janelle, C. M., & Hillman, C. H. (2003). Expert performance in sport: Current perspectives and critical issues. In J. L. Starkes & K. A. Ericsson (Eds.), *Expert performance in sports: Advances in research on sport expertise* (pp. 20–47). Human Kinetics.

JASP Team (2023). JASP (Version 0.17.3)[Computer software].

Jiang, Y., Zhang, J., Ming, H., Huang, S., & Lin, D. (2019). Stressful life events and well-being among rural-to-urban migrant adolescents: The moderating role of the stress mindset and differences between genders. *Journal of Adolescence*, *74*, 24–32. https://doi.org/10.1016/j.adolescence.2019.05.005

John, S., Verma, S. K., & Khanna, G. L. (2010). The effect of music therapy on salivary cortisol as a reliable marker of pre-competition stress in shooting performance. *Journal of Exercise Science and Physiotherapy*, *6*(2), 70–77.

John, S., Verma, S. K., & Khanna, G. L. (2011). The effect of mindfulness meditation on HPA-axis in pre-competition stress in sports performance of elite shooters. *National Journal of Integrated Research in Medicine*, *2*(3), 15–21.

Johnson, B. T., & Hennessy, E. A. (2019). Systematic reviews and meta-analyses in the health sciences: Best practice methods for research syntheses. *Social Science & Medicine*, *233*, 237–251. https://doi.org/10.1016/j.socscimed.2019.05.035

Kachanathu, J. K., Verma, S. K., & Khanna, G. L. (2013). Effect of music therapy on heart Rate variability: A reliable marker to pre-competition stress in sports performance. *Journal of Medical Sciences*, *13*, 418–424. https://doi.org/10.3923/jms.2013.418.424

Kalisch, R., Cramer, A. O. J., 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*(5), 765–777. https://doi.org/10.1177/1745691619855637

Kashdan, T. B., & Rottenberg, J. (2010). Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Review*, *30*(7), 865–878. https://doi.org/10.1016/j.cpr.2010.03.001

Kashdan, T. B., DeWall, C. N., Pond, R. S., Silvia, P. J., Lambert, N. M., Fincham, F. D., Savostyanova, A. A., & Keller, P. S. (2013). Curiosity protects against interpersonal aggression: Cross-Sectional, daily Process, and behavioral Evidence. *Journal of Personality*, *81*(1), 87–102. https://doi.org/10.1111/j.1467-6494.2012.00783.x

Kashdan, T. B., Gallagher, M. W., Silvia, P. J., Winterstein, B. P., Breen, W. E., Terhar, D., & Steger, M. F. (2009). The Curiosity and Exploration Inventory-II: Development, Factor Structure, and Psychometrics. *Journal of Research in Personality*, *43*(6), 987–998. https://doi.org/10.1016/j.jrp.2009.04.011

Kashdan, T. B., McKnight, P. E., Fincham, F. D., & Rose, P. (2011). When curiosity breeds intimacy: Taking advantage of intimacy opportunities and transforming boring conversations. *Journal of Personality*, *79*(6), 1369–1402. https://doi.org/10.1111/j.1467-6494.2010.00697.x

Kavussanu, M., Crews, D. J., & Gill, D. L. (1998). The effects of single versus multiple measures of biofeedback on basketball free throw shooting performance. *International Journal of Sport Psychology*, *29*(2), 132–144.

Kenny, D. A., & Judd, C. M. (2019). The unappreciated heterogeneity of effect sizes: Implications for power, precision, planning of research, and replication. *Psychological Methods*, *24*(5), 578–589. https://doi.org/10.1037/met0000209

Keyes, C. L. M. (2002). The mental health continuum: From languishing to flourishing in life. *Journal of Health and Social Behavior*, *43*(2), 207–222. https://doi.org/10.2307/3090197

Keyes, C. L. M. (2005). Mental illness and/or mental health? Investigating axioms of the complete state model of health. *Journal of Consulting and Clinical Psychology*, *73*(3), 539–548. https://doi.org/10.1037/0022-006X.73.3.539

Kho, M. C., Karin, E., Gucciardi, D. F., & Crane, M. F. (2023). Testing a supervisor-led extension of self-reflection resilience training: A controlled trial randomized by platoon at the Royal Military College. *Journal of Occupational and Organizational Psychology*, *96*(2), 397–428. https://doi.org/10.1111/joop.12420

Kilby, C. J., & Sherman, K. A. (2016). Delineating the relationship between stress mindset and primary appraisals: Preliminary findings. *SpringerPlus*, *5*(1), 336. https://doi.org/10.1186/s40064-016-1937-7

Knapp, G., & Hartung, J. (2003). Improved tests for a random effects meta-regression with a single covariate. *Statistics in Medicine*, *22*, 2693–2710. https://doi.org/10.1002/sim.1482

Knittle, K., Heino, M., Marques, M. M., Stenius, M., Beattie, M., Ehbrecht, F., Hagger, M. S., Hardeman, W., & Hankonen, N. (2020). The compendium of self-enactable techniques to change and self-manage motivation and behaviour v.1.0. *Nature Human Behaviour*, *4*, 215–223. https://doi.org/10.1038/s41562-019-0798-9

Kossmeier, M., Tran, U. S., & Voracek, M. (2019). Visual inference for the funnel plot in meta-analysis. *Zeitschrift Für Psychologie*, *227*, 83–89. https://doi.org/10.1027/2151-2604/a000358

Kossmeier, M., Tran, U. S., & Voracek, M. (2020). Power-enhanced funnel plots for meta-analysis: The sunset funnel plot. *Zeitschrift Für Psychologie*, *228*, 43–49. https://doi.org/10.1027/2151-2604/a000392

Kramar, M. (2008). *The effects of mental interventions on competitive anxiety, stress resistance, cardiovascular activity and sport performance of college athletes*. Northcentral University.

Kristiansen, E., & Roberts, G. C. (2010). Young elite athletes and social support: Coping with competitive and organizational stress in "Olympic" competition. *Scandinavian Journal of Medicine & Science in Sports*, *20*(4), 686–695. https://doi.org/10.1111/j.1600-0838.2009.00950.x

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine; New York*, *16*(9), 606–613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x

Kross, E., & Ayduk, O. (2008). Facilitating Adaptive Emotional Analysis: Distinguishing Distanced-Analysis of Depressive Experiences From Immersed-Analysis and Distraction. *Personality and Social Psychology Bulletin*, *34*, 924–938. https://doi.org/10.1177/0146167208315938

Kross, E., & Ayduk, O. (2011). Making Meaning out of Negative Experiences by Self-Distancing. *Current Directions in Psychological Science*, *20*(3), 187–191. https://doi.org/10.1177/0963721411408883

Kross, E., & Ayduk, O. (2017). Self-Distancing. In *Advances in Experimental Social Psychology* (Vol. 55, pp. 81–136). Elsevier. https://doi.org/10.1016/bs.aesp.2016.10.002

Kross, E., Ayduk, O., & Mischel, W. (2005). When asking "why" does not hurt distinguishing rumination from reflective processing of negative emotions. *Psychological Science*, *16*(9), 709–715. https://doi.org/10.1111/j.1467-9280.2005.01600.x

Kross, E., Bruehlman-Senecal, E., Park, J., Burson, A., Dougherty, A., Shablack, H., Bremner, R., Moser, J., & Ayduk, O. (2014). Self-talk as a regulatory mechanism: how you do it matters. *Journal of Personality and Social Psychology, 106*(2), 304-24. https://doi.org/10.1037/a0035173.

Kross, E., Ong, M., & Ayduk, O. (2023). Self-reflection at work: Why it matters and how to harness its potential and avoid its pitfalls. *Annual Review of Organizational Psychology and Organizational Behavior*, *10*(1), 441–464. https://doi.org/10.1146/annurev-orgpsych-031921-024406

Kross, E., Verduyn, P., Sheppes, G., Costello, C. K., Jonides, J., & Ybarra, O. (2021). Social media and well-Being: Pitfalls, progress, and next Steps. *Trends in Cognitive Sciences*, *25*(1), 55–66. https://doi.org/10.1016/j.tics.2020.10.005

Kuhn, D. (2021). Metacognition matters in many ways. *Educational Psychologist*, *57*, 1–14. https://doi.org/10.1080/00461520.2021.1988603

Kvarven, A., Strømland, E., & Johannesson, M. (2020). Comparing meta-analyses and pre-registered multiple labs replication projects. *Nature Human Behaviour*, *4*, 423–434. https://doi.org/10.1038/s41562-019-0787

Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t-tests and ANOVAs. *Frontiers in Psychology*, *4*, 1–12. https://doi.org/10.3389/fpsyg.2013.00863

Lakens, D. (2021). *Sample Size Justification*. Eindhoven University of Technology. https://doi.org/10.31234/osf.io/9d3yf

Lang, M. (2015). “None of the kids are allowed to eat junk at the pool”: Discourses of “Optimal Nutrition” in competitive youth swimming and the impact on athlete welfare”. *The International Journal of Sport and Society, 5*(1). https://doi.org/ 10.18848/21527857/CGP/v05/54117

Lanfear, J. H., Voegel, C. D., Binz, T. M., & Paul, R. A. (2020). Hair cortisol measurement in older adults: Influence of demographic and physiological factors and correlation with perceived stress. *Steroids, 163*, 108712. https://doi.org/10.1016/j.steroids.2020.108712

Larsson, G., Cook-Steffy, C., & Starrin, B. (1988). Time and cost efficient stress inoculation training for athletes: A study of junior golfers. *Scandinavian Journal of Sport Sciences*, *10*, 23–28.

Lau, J., Ioannidis, J. P. A., Terrin, N., Schmid, C. H., & Olkin, I. (2006). The case of the misleading funnel plot. *BMJ*, *333*, 597–600. https://doi.org/10.1136/bmj.333.7568.597

Laurin, R., Nicolas, M., & Lavallee, D. (2008). Effects of a personal goal management intervention on positive and negative moods states in soccer academies. *Journal of Clinical Sport Psychology*, *2*(1), 57–70. https://doi.org/10.1123/jcsp.2.1.57

Lautenbach, F., Laborde, S., Mesagno, C., Lobinger, B. H., Achtzehn, S., & Arimond, F. (2015). Nonautomated pre-performance routine in tennis: An intervention study. *Journal of Applied Sport Psychology*, *27*, 123–131. https://doi.org/10.1080/10413200.2014.957364

Lazanis, R. S. (1999). Stress and emotion, a new synthesis. *Journal of Psychiatric and Mental Health Nursing*, *6*, 410–411. https://doi.org/10.1046/j.1365-2850.1999.00227-9.x

Lazarus, R. S. (2006). Emotions and Interpersonal Relationships: Toward a Person-Centered Conceptualization of Emotions and Coping. *Journal of Personality*, *74*(1), 9–46. https://doi.org/10.1111/j.1467-6494.2005.00368.x

Lazarus, R. S., & Folkman, S. (1984). *Stress, Appraisal, and Coping*. Springer Publishing Company.

Lazarus, R. S., DeLongis, A., Folkman, S., & Gruen, R. (1985). Stress and Adaptational Outcomes. *American Psychologist*, *40*(7), 770-779.

Lehrer, P., Kaur, K., Sharma, A., Shah, K., Huseby, R., Bhavsar, J., & Zhang, Y. (2020). Heart rate variability biofeedback improves emotional and physical health and performance: A systematic review and meta analysis. *Applied Psychophysiology and Biofeedback*, *45*(3), 109–129. https://doi.org/10.1007/s10484-020-09466-z

Levy, D. J. (2016). *The Effects of Emotion Regulation Strategies when Contending with Discrimination Experiences*. Northwestern University.

López-López, J. A., Noortgate, W. V. den, Tanner-Smith, E. E., Wilson, S. J., & Lipsey, M. W. (2017). Assessing meta-regression methods for examining moderator relationships with dependent effect sizes: A Monte Carlo simulation. *Research Synthesis Methods*, *8*(4), 435–450. https://doi.org/10.1002/jrsm.1245

Love, S., Kannis-Dymand, L., & Lovell, G. P. (2018). Metacognitions in Triathletes: Associations with attention, state anxiety, and relative performance. *Journal of Applied Sport Psychology, 30*(4). https://doi.org/10.1080/10413200.2018.1440660

Low, W. R., Sandercock, G. R. H., Freeman, P., Winter, M. E., Butt, J., & Maynard, I. (2020). Pressure training for performance domains: A meta-analysis. *Sport, Exercise, and Performance Psychology*, *38*. https://doi.org/10.1037/spy0000202

Löwe, B., Decker, O., Müller, S., Brähler, E., Schellberg, D., Herzog, W., & Herzberg, P. Y. (2008). Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. *Medical Care*, *46*(3), 266–274. JSTOR. https://doi.org/10.1097/mlr.0b013e318160d093

Luhmann, M., Fassbender, I., Alcock, M., & Haehner, P. (2021). A dimensional taxonomy of perceived characteristics of major life events. *Journal of Personality and Social Psychology*, *121*(3), 633–668. https://doi.org/10.1037/pspp0000291

Lyke, J. A. (2009). Insight, but not self-reflection, is related to subjective well-being. *Personality and Individual Differences*, *46*(1), 66–70. https://doi.org/10.1016/j.paid.2008.09.010

MacGregor, K. E., Carnevale, J. J., Dusthimer, N. E., & Fujita, K. (2017). Knowledge of the self-control benefits of high-level versus low-level construal. *Journal of Personality and Social Psychology*, *112*(4), 607–620. https://doi.org/10.1037/pspp0000130

Maier, M., Bartoš, F., Oh, M., Wagenmakers, E.-J., Shanks, D., & Harris, A. (2022). *Publication Bias in Research on Construal Level Theory*. https://doi.org/10.31234/osf.io/r8nyu

Marsh, H. W., Huppert, F. A., Donald, J. N., Horwood, M. S., & Sahdra, B. K. (2019). The Well-Being Profile (WB-Pro): Creating a theoretically based multidimensional measure of well-being to advance theory, research, policy, and practice. *Psychological Assessment*, *32*(3), 294–313. https://doi.org/10.1037/pas0000787

Marshall, T. (2019). The concept of reflection: A systematic review and thematic synthesis across professional contexts. *Reflective Practice*, *20*(3), 396–415. https://doi.org/10.1080/14623943.2019.1622520

Marshall, T. A. (2002). *The role of gaze behaviour in eye movement desensitization reprocessing (EMDR): Application to an elite athlete population* [Master's thesis, University of Calgary]. https://doi.org/10.11575/PRISM/19957

Mascret, N., Ibáñez-Gijón, J., Bréjard, V., Buekers, M., Casanova, R., Marqueste, T., Montagne, G., Rao, G., Roux, Y., & Cury, F. (2016). The influence of the 'Trier Social Stress Test' on free throw performance in basketball: An interdisciplinary study. *PLOS ONE*, *11*(6), 1–16. https://doi.org/10.1371/journal.pone.0157215

Mathur, M. B., & VanderWeele, T. J. (2020). Estimating publication bias in meta-analyses of peer-reviewed studies: A meta-meta-analysis across disciplines and journal tiers. *Research Synthesis Methods*, 1–16. https://doi.org/10.1002/jrsm.1464

McCormick, A. (2016). *Psychologically-Informed Methods of Enhancing Endurance Performance* [Doctoral dissertation, University of Kent]. https://kar.kent.ac.uk/57284/7/Alister%20McCormick%20PhD%20Thesis.pdf

McCormick, A., Meijen, C., & Marcora, S. (2018). Effects of a motivational self-talk intervention for endurance athletes completing an ultramarathon. *The Sport Psychologist*, *32*(1), 42–50. https://doi.org/10.1123/tsp.2017-0018

McGuinness, L. A., & Higgins, J. P. T. (2021). Risk-of-bias VISualization (robvis): An R package and Shiny web app for visualizing risk-of-bias assessments. *Research Synthesis Methods*, *12*(1), 55–61. https://doi.org/10.1002/jrsm.1411

McIsaac, H. K., & Eich, E. (2002). Vantage point in episodic memory. *Psychonomic Bulletin & Review*, *9*(1), 146–150. https://doi.org/10.3758/BF03196271

McKay, A. K. A., Stellingwerff, T., Smith, E. S., Martin, D. T., Mujika, I., Goosey-Tolfrey, V. L., Sheppard, J., & Burke, L. M. (2022). Defining training and performance caliber: A participant classification framework. *International Journal of Sports Physiology and Performance*, *17*(2), 317–331. https://doi.org/10.1123/ijspp.2021-0451

McLoughlin, E., Fletcher, D., Slavich, G. M., Arnold, R., & Moore, L. J. (2021). Cumulative lifetime stress exposure, depression, anxiety, and well-being in elite athletes: A mixed-method study. *Psychology of Sport and Exercise*, *52*, 1–10. https://doi.org/10.1016/j.psychsport.2020.101823

Meichenbaum, D., & Novaco, R. (1985). Stress inoculation: A preventative approach. *Issues in Mental Health Nursing*, *7*, 419–435. https://doi.org/10.3109/01612848509009464

Mellalieu, S. D., Neil, R., Hanton, S., & Fletcher, D. (2009). Competition stress in sport performers: Stressors experienced in the competition environment. *Journal of Sports Sciences*, *27*(7), 729–744. https://doi.org/10.1080/02640410902889834

Mesagno, C., Marchant, D., & Morris, T. (2008). A pre-performance routine to alleviate choking in 'choking-susceptible' athletes. *Sport Psychologist*, *22*, 439–457. https://doi.org/10.1123/tsp.22.4.439

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., Eccles, M. P., Cane, J., & Wood, C. E. (2013). The Behavior Change Technique Taxonomy (v1) of 93 hierarchically clustered techniques: Building an international consensus for the reporting of behavior change interventions. *Annals of Behavioral Medicine*, *46*(1), 81–95. https://doi.org/10.1007/s12160-013-9486-6

Minozzi, S., Cinquini, M., Gianola, S., Gonzalez-Lorenzo, M., & Banzi, R. (2020). The revised Cochrane risk of bias tool for randomized trials (RoB 2) showed low interrater reliability and challenges in its application. *Journal of Clinical Epidemiology*, *126*, 37–44. https://doi.org/10.1016/j.jclinepi.2020.06.015

Mischkowski, D., Kross, E., & Bushman B. J. (2012). Flies on the wall are less aggressive: Self-distancing "in the heat of the moment" reduces aggressive thoughts, angry feelings and aggressive behaviour. *Journal of Experimental Social Psychology, 48, 1187-1191.* https://doi.org/10.1016/j.jesp.2012.03.012

Moher, D., Jones, A., & Lepage, L. (2001). Use of the CONSORT statement and quality of reports of randomized trials: A comparative before-and-after evaluation. *JAMA*, *285*(15), 1992–1995. https://doi.org/10.1001/jama.285.15.1992

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., Stewart, L. A., & Group, P.-P. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *BMJ*, *4*(1), 1–9. https://doi.org/10.1136/bmj.g7647

Moon, K., & Blackman, D. (2014). A guide to understanding social science research for natural scientists: Social science for natural scientists. *Conservation Biology*, *28*(5), 1167–1177. https://doi.org/10.1111/cobi.12326

Moran, T., & Eyal, T. (2022). Emotion Regulation by Psychological Distance and Level of Abstraction: Two Meta-Analyses. *Personality and Social Psychology Review*, *26*(2), 112-159. https://doi.org/10.1177/10888683211069025

Moreau, D., & Gamble, B. (2022). Conducting a meta-analysis in the age of open science: Tools, tips, and practical recommendations. *Psychological Methods.* https://doi.org/10.1037/met0000351

Morgeson, F. P., & DeRue, D. S. (2006). Event criticality, urgency, and duration: Understanding how events disrupt teams and influence team leader intervention. *The Leadership Quarterly*, *17*(3), 271–287. https://doi.org/10.1016/j.leaqua.2006.02.006

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

Morris, S. B. (2008). Estimating effect sizes from pretest-posttest-control group designs. *Organizational Research Methods*, *11*(2), 364–386. https://doi.org/10.1177/1094428106291059

Murdoch, E. M., Chapman, M. T., Crane, M., & Gucciardi, D. F. (2023). The effectiveness of self-distanced versus self-immersed reflections among adults: Systematic review and meta-analysis of experimental studies. *Stress and Health*, *39*(2), 255–271. https://doi.org/10.1002/smi.3199

Murdoch, E. M., Lines, R. L. J., Crane, M. F., Ntoumanis, N., Brade, C., Quested, E., Ayers, J., & Gucciardi, D. F. (2021). The effectiveness of stress regulation interventions with athletes: A systematic review and multilevel meta-analysis of randomised controlled trials. *International Review of Sport and Exercise Psychology*. 1–37. https://doi.org/10.1080/1750984X.2021.1977974

Muthukrishna, M., & Henrich, J. (2019). A problem in theory. *Nature Human Behaviour*, *3*(3), 221–229. https://doi.org/10.1038/s41562-018-0522-1

Nigro, G., & Neisser, U. (1983). Point of view in personal memories. *Cognitive Psychology*, *15*(4), 467–482. https://doi.org/10.1016/0010-0285(83)90016-6

Nolen-Hoeksema, S. (2000). The role of rumination in depressive disorders and mixed anxiety/depressive symptoms. *Journal of Abnormal Psychology*, *109*(3), 504–511. https://doi.org/10.1037/0021-843X.109.3.504

Nosek, B. A., Ebersole, C. R., DeHaven, A. C., & Mellor, D. T. (2018). The preregistration revolution. *Proceedings of the National Academy of Sciences of the United States of America*, *115*(11), 2600–2606. https://doi.org/10.1073/pnas.1708274114

Obbarius, N., Fischer, F., Liegl, G., Obbarius, A., & Rose, M. (2021). A Modified Version of the Transactional Stress Concept According to Lazarus and Folkman Was Confirmed in a Psychosomatic Inpatient Sample. *Frontiers in Psychology*, *12*. https://www.frontiersin.org/article/10.3389/fpsyg.2021.584333

Orvell, A., Ayduk, Ö., Moser, J. S., Gelman, S. A., & Kross, E. (2019). Linguistic Shifts: A Relatively Effortless Route to Emotion Regulation? *Current Directions in Psychological Science*, *28*(6), 567–573. https://doi.org/10.1177/0963721419861411

Padesky, C. A., & Mooney, K. A. (2012). Strengths-based cognitive–behavioural therapy: A four-step model to build resilience. *Clinical Psychology & Psychotherapy*, *19*(4), 283–290. https://doi.org/10.1002/cpp.1795

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, *372*. https://doi.org/10.1136/bmj.n71

Paul, M., & Garg, K. (2012). The effect of heart rate variability biofeedback on performance psychology of basketball players. *Applied Psychophysiology and Biofeedback*, *37*(2), 131–144. https://doi.org/10.1007/s10484-012-9185-2

Paul, M., Garg, K., & Sandhu, J. S. (2012). Role of biofeedback in optimizing psychomotor performance in sports. *Asian Journal of Sports Medicine*, *3*(1), 29-40. https://doi.org/10.5812/asjsm.34722

Pelka, M., Heidari, J., Ferrauti, A., Meyer, T., Pfeiffer, M., & Kellman, M. (2016). Relaxation techniques in sports: A systematic review on acute effects on performance. *Performance Enhancement and Health, 5*(2), 47-59. https://doi.org/10.1016/j.peh.2016.05.003

Pelka, M., Kölling, S., Ferrauti, A., Meyer, T., Pfeiffer, M., & Kellmann, M. (2017). Acute effects of psychological relaxation techniques between two physical tasks. *Journal of Sports Sciences*, *35*(3), 216–223. https://doi.org/10.1080/02640414.2016.1161208

Pelka, M., Kölling, S., Ferrauti, A., Meyer, T., Pfeiffer, M., & Kellmann, M. (2017). Acute effects of psychological relaxation techniques between two physical tasks. *Journal of Sports Sciences*, *35*(3), 216–223. https://doi.org/10.1080/02640414.2016.1161208

Penner, L. A., Guevarra, D. A., Harper, F. W. K., Taub, J., Phipps, S., Albrecht, T. L., & Kross, E. (2016). Self-Distancing Buffers High Trait Anxious Pediatric Cancer Caregivers Against Short- and Longer-Term Distress. *Clinical Psychological Science*, *4*(4), 629–640. https://doi.org/10.1177/2167702615602864

Peters, J. L., Sutton, A. J., Jones, D. R., Abrams, K. R., & Rushton, L. (2008). Contour-enhanced meta-analysis funnel plots help distinguish publication bias from other causes of asymmetry. *Journal of Clinical Epidemiology*, *61*(10), 991–996. https://doi.org/10.1016/j.jclinepi.2007.11.010

Powers, J. P., & LaBar, K. S. (2019). Regulating emotion through distancing: A taxonomy, neurocognitive model, and supporting meta-analysis. *Neuroscience and Biobehavioral Reviews*, *96*, 155–173. https://doi.org/10.1016/j.neubiorev.2018.04.023

Quintana, D. S. (2015). From pre-registration to publication: A non-technical primer for conducting a meta-analysis to synthesize correlational data. *Frontiers in Psychology*, *6*, 1–9. https://doi.org/10.3389/fpsyg.2015.01549

R Development Core Team. (2019). *The Metafor Package*. https://www.metafor-project.org/doku.php

Rees, H. R., Fujita, K., Han, H. A., Sherman, J. W., & Sklar, A. Y. (2018). An examination of the processes by which construal level affects the implicit evaluation of goal relevant stimuli. *Motivation Science*, *4*(3), 251–261. https://doi.org/10.1037/mot0000089

Richardson, G. E. (2002). The metatheory of resilience and resiliency. *Journal of Clinical Psychology*, *58*(3), 307–321. https://doi.org/10.1002/jclp.10020

Richardson, L. P., McCauley, E., Grossman, D. C., McCarty, C. A., Richards, J., Russo, J. E., Rockhill, C., & Katon, W. (2010). Evaluation of the Patient Health Questionnaire (PHQ-9) for detecting major depression among adolescents. *Pediatrics*, *126*(6), 1117–1123. https://doi.org/10.1542/peds.2010-0852

Riley, R. D., Higgins, J. P. T., & Deeks, J. J. (2011). Interpretation of random effects meta-analyses. *BMJ*, *342*. https://doi.org/10.1136/bmj.d549

Ritchie, J., & Spencer, L. (1994). Qualitative data analysis for applied policy research. In A. Bryman, & R. Burgess (Eds.), *Analyzing qualitative data* (pp. 173–194). Taylor and Francis. https://doi.org/10.4324/9780203413081

Rodgers, M. A., & Pustejovsky, J. E. (2020). Evaluating meta-analytic methods to detect selective reporting in the presence of dependent effect sizes. *Psychological Methods*. https://doi.org/10.1037/met0000300

Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological Bulletin*, *86*(3), 638–641. https://doi.org/10.1037/0033-2909.86.3.638

Rumbold, J. L., Fletcher, D., & Daniels, K. (2012). A systematic review of stress management interventions with sport performers. *Sport, Exercise, and Performance Psychology*, *1*(3), 173–193. https://doi.org/10.1037/a0026628

Sackett, R. S. (1934). The influence of symbolic rehearsal upon the retention of a maze habit. *The Journal of General Psychology*, *10*(2), 376–398. https://doi.org/10.1080/00221309.1934.9917742

Sainani, K. L. (2010). Making Sense of Intention-to-Treat. *PM&R*, *2*(3), 209–213. https://doi.org/10.1016/j.pmrj.2010.01.004

Sammy, N., Anstiss, P. A., Moore, L. J., Freeman, P., Wilson, M. R., & Vine, S. J. (2017). The effects of arousal reappraisal on stress responses, performance and attention. *Anxiety, Stress, & Coping*, *30*(6), 619–629. https://doi.org/10.1080/10615806.2017.1330952

Sarkar, M., & Fletcher, D. (2014). Psychological resilience in sport performers: A review of stressors and protective factors. *Journal of Sports Sciences*, *32*(15), 1419–1434. https://doi.org/10.1080/02640414.2014.901551

Schön, D. A. (1983). *The Reflective Practitioner: How Professionals Think in Action*. Routledge. https://doi.org/10.4324/9781315237473

Schulz, K. F., Altman, D. G., Moher, D., & the CONSORT Group. (2010). CONSORT 2010 Statement: Updated guidelines for reporting parallel group randomised trials. *BMC Medicine*, *8*(1), 18. https://doi.org/10.1186/1741-7015-8-18

Schwartz, S. H. (1992). Universals in the content and structure of values: Theoretical advances and empirical tests in 20 Countries. In *Advances in Experimental Social Psychology* (Vol. 25, pp. 1–65). Elsevier. https://doi.org/10.1016/S0065-2601(08)60281-6

Schweizer, G., & Furley, P. (2016). Reproducible research in sport and exercise psychology: The role of sample sizes. *Psychology of Sport and Exercise, 23*, 114–122. https://doi.org/10.1016/j.psychsport.2015.11.005

Seih, Y-T., Chung, C. K., & Pennebaker, J. W. Experimental manipulations of perspective taking and perspective switching in expressive writing. *Cognition and Emotion, 25*(5), 926-938. https://doi.org/ 10.1080/02699931.2010.512123

Seligman, M. E. P. (2011). *Flourish: A Visionary New Understanding of Happiness and Well-being*. Simon and Schuster.

Serrano, A. (1993). *The effects of a self-directed stress inoculation training program on selected psychological and physiological measures related to anxiety in collegiate volleyball players* [Doctoral dissertation, The Florida State University].

Shamseer, L., Moher, D., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., Stewart, L. A., & Group, P.-P. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: Elaboration and explanation. *BMJ: British Medical Journal, 349*, 1–25. https://doi.org/10.1136/bmj.g7647

Shields, G. S., Fassatt-Carman, A., Gray, Z. J., Gonzales, J. E., Snyder, H, R., Slavich, G. M. (2023). Why is subjective stress severity a stronger predictor of health than stressor exposure? A preregistered two-study test of two hypotheses. *Stress and Health, 39*, 87-102. https://doi.org/10.1002/smi.3165

Simonsohn, U., Nelson, L. D., & Simmons, J. P. (2014). P-curve: A key to the file-drawer. *Journal of Experimental Psychology: General*, *143*(2), 534–547. https://doi.org/10.1037/a0033242

Simpson, R. A. C., Didymus, F. F., & Williams, T. L. (2021). Organizational stress and well-being in competitive sport: a systematic review, *International Review of Sport and Exercise Psychology*. https://doi.org/10.1080/1750984X.2021.1975305

Singh, H., & Conroy, D. E. (2017). Systematic review of stress-related injury vulnerability in athletic and occupational contexts. *Psychology of Sport and Exercise*, *33*, 37–44. https://doi.org/10.1016/j.psychsport.2017.08.001

Siyaguna, T. J. (2019). *Does a Brief Mindfulness Intervention Improve Distress Tolerance Among Athletes?* [Doctoral dissertation, North Dakota State University of Agriculture and Applied Science]. https://search.proquest.com/openview/cdd151ff438e621b43dc5541320803f2/1?pq-origsite=gscholar&cbl=18750&diss=y

Smith, B., & McGannon, K. R. (2017). Developing rigor in qualitative research: problems and opportunities within sport and exercise psychology. *International Review of Sport and Exercise Psychology*. http://dx.doi.org/10.1080/1750984X.2017.1317357

Smith, R. E., & Rohsenow, D. J. (1987). *Cognitive-affective stress management training: A treatment and resource manual. 17(2*), Document #2829.

Socastro, A., Everaert, J., Boemo, T., Blanco, I., Rodríguez-Carvajal, R., & Sanchez-Lopez, A. (2022). Moment-to-moment interplay among stress appraisals and emotion regulation flexibility in Daily Life. *Affective Science*, *3*(3), 628–640. https://doi.org/10.1007/s42761-022-00122-9

Soderberg, C. K., Callahan, S. P., Kochersberger, A. O., Amit, E., & Ledgerwood, A. (2015). The effects of psychological distance on abstraction: Two meta-analyses. *Psychological Bulletin*, *141*(3), 525–548. https://doi.org/10.1037/bul0000005

Solberg, E. E., Berglund, K.-A., Engen, O., Ekeberg, O., & Loeb, M. (1996). The effect of meditation on shooting performance. *British Journal of Sports Medicine*, *30*, 342–346. https://doi.org/10.1136/bjsm.30.4.342

Soliday, E., Garofalo, J. P., & Rogers, D. (2004). Expressive Writing Intervention for Adolescents' Somatic Symptoms and Mood. *Journal of Clinical Child & Adolescent Psychology*, *33*(4), 792–801. https://doi.org/10.1207/s15374424jccp3304_14

Sousa, T. V., Viveiros, V., Chai, M. V., Vicente, F. L., Jesus, G., Carnot, M. J., Gordo, A. C., & Ferreira, P. L. (2015). Reliability and validity of the Portuguese version of the Generalized Anxiety Disorder (GAD-7) scale. *Health and Quality of Life Outcomes*, *13*(1), 1–8. https://doi.org/10.1186/s12955-015-0244-2

Sousa, T. V., Viveiros, V., Chai, M. V., Vicente, F. L., Jesus, G., Carnot, M. J., Gordo, A. C., & Ferreira, P. L. (2015). Reliability and validity of the Portuguese version of the Generalized Anxiety Disorder (GAD-7) scale. *Health and Quality of Life Outcomes*, *13*(1), 1–8. https://doi.org/10.1186/s12955-015-0244-2

Spence, J., & Blanchard, C. (2001). Publication bias in sport and exercise psychology: The games we play. *International Journal of Sport Psychology, 32*, 386–399.

Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Löwe, B. (2006). A brief measure for assessing Generalized Anxiety Disorder: The GAD-7. *Archives of Internal Medicine*, *166*(10), 1092–1097. https://doi.org/10.1001/archinte.166.10.1092

Stanley, T. D., Carter, E. C., & Doucouliagos, H. (2018). What meta-analyses reveal about the replicability of psychological research. *Psychological Bulletin*, *144*(12), 1325–1346. https://doi.org/10.1037/bul0000169

Steel, P., Beugelsdijk., S., & Aguinis, H. The anatomy of an award-winning meta-analysis: Recommendations for authors, reviewers, and readers of meta-analytic reviews. *Journal of International Business Studies, 52,* 23-44. https://doi.org/10.1057/s41267-020-00385-z

Sterne, J. A. C., Savović, J., Page, M. J., Elbers, R. G., Blencowe, N. S., Boutron, I., Cates, C. J., Cheng, H.-Y., Corbett, M. S., Eldridge, S. M., Emberson, J. R., Hernán, M. A., Hopewell, S., Hróbjartsson, A., Junqueira, D. R., Jüni, P., Kirkham, J. J., Lasserson, T., Li, T., … Higgins, J. P. T. (2019). RoB 2: A revised tool for assessing risk of bias in randomised trials. *BMJ*, l4898. https://doi.org/10.1136/bmj.l4898

Swann, C., Moran, A., & Piggott, D. (2015). Defining elite athletes: Issues in the study of expert performance in sport psychology. *Psychology of Sport and Exercise*, *16*, 3–14. https://doi.org/10.1016/j.psychsport.2014.07.004

Tackman, A. M., Sbarra, D. A., Carey, A. L., Donnellan, M. B., Horn, A. B., Holtzman, N. S., Edwards, T. S., Pennebaker, J. W., & Mehl, M. R. (2019). Depression, negative emotionality, and self-referential language: A multi-lab, multi-measure, and multi-language-task research synthesis. *Journal of Personality and Social Psychology: Personality Processes and Individual Differences*, *116*(5), 817–834. http://dx.doi.org/10.1037/pspp0000187

Teasdale, J., Moore, R., Hayhurst, H., Pope, M., Williams, S., & Segal, Z. (2002). Metacognitive Awareness and Prevention of Relapse in Depression: Empirical Evidence. *Journal of Consulting and Clinical Psychology*, *70*, 275–287. https://doi.org/10.1037/0022-006X.70.2.275

Thompson, M. A., Toner, J., Perry, J. L., Burke, R., & Nicholls, A. R. (2020). Stress appraisals influence athletic performance and psychophysiological response during 16.1 km cycling time trials. *Psychology of Sport and Exercise*, *49*, 101682. https://doi.org/10.1016/j.psychsport.2020.101682

Trope, Y., & Liberman, N. (2010). Construal-level theory of psychological distance. *Psychological Review*, *117*(2), 440–463. https://doi.org/10.1037/a0018963

Trotter, M. G., Obine, E. A. C., & Sharpe, B. T. (2023). Self-regulation, stress appraisal, and esport action performance. *Frontiers in Psychology, 14.* https://doi.org/10.3389/fpsyg.2023.1265778

Tulver, K., Kaup, K. K., Laukkonen, R., & Aru, J. (2023). Restructuring insight: An integrative review of insight in problem-solving, meditation, psychotherapy, delusions and psychedelics. *Consciousness and Cognition*, *110*, 103494. https://doi.org/10.1016/j.concog.2023.10349

Turner, L., Shamseer, L., Altman, D. G., Schulz, K. F., & Moher, D. (2012). Does use of the CONSORT Statement impact the completeness of reporting of randomised controlled trials

published in medical journals? A Cochrane review. *Systematic Reviews, 1,* 60. https://doi.org/10.1186/2046-4053-1-60

Uzzell, K. S., Knight, C. J., Pankow, K., & Hill, D. M. (2024). Wellbeing in high-performance swimming: A grounded theory study. *Psychology of Sport and Exercise, 70*. https://doi.org/10.1016/j.psychsport.2023.102557

Valenti, G., Libby, L. K., & Eibach, R. P. (2011). Looking back with regret: Visual perspective in memory images differentially affects regret for actions and inactions. *Journal of Experimental Social Psychology*, *47*(4), 730–737. https://doi.org/10.1016/j.jesp.2011.02.008

Vallacher, R. R., & Wegner, D. M. (1987). What do people think they're doing? Action Identification and human behaviour. *Psychological Review, 94*, 3-15. https://doi.org/10.1037/0033-295X.94.1.3

van Agteren, J., Iasiello, M., Lo, L., Bartholomaeus, J., Kopsaftis, Z., Carey, M., & Kyrios, M. (2021). A systematic review and meta-analysis of psychological interventions to improve mental wellbeing. *Nature Human Behaviour, 5*, 631-652. doi: 10.1038/s41562-021-01093-w

Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software*, *36*(1), 1–48. https://doi.org/10.18637/jss.v036.i03

Viechtbauer, W., & Cheung, M. W.-L. (2010). Outlier and influence diagnostics for meta-analysis. *Research Synthesis Methods*, *1*(2), 112–125. https://doi.org/10.1002/jrsm.11

Webb, T. L., Miles, E., & Sheeran, P. (2012). Dealing with feeling: A meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation. *Psychological Bulletin*, *138*(4), 775–808. https://doi.org/10.1037/a0027600

West, R., Godinho, C. A., Bohlen, L. C., Carey, R. N., Hastings, J., Lefevre, C. E., & Michie, S. (2019). Development of a formal system for representing behaviour-change theories. *Nature Human Behaviour*, *3*(5), 526–536. https://doi.org/10.1038/s41562-019-0561-2

Whitmarsh, B. G. (1992). *The Role of Stress Inoculation Training and Skills Acquisition in Increasing Athletic Pain Tolerance* [Master's thesis, University of Alberta]. https://era.library.ualberta.ca/items/c4b7db7d-78c3-4f8d-8656-05950ddb3f8c/view/91fcd0e6-5a0b-45b7-9af1-9e1aa2b080d7/MM73074.pdf

Wickham, H. (2016). *ggplot2: Elegant Graphics for Data Analysis.* Springer-Verlag New York.

Wickham, H., François, R., Henry, L., & Müller, K. (2021). *Dplyr: A Grammar of Data Manipulation. R package version 1.0.7.* https://CRAN.R-project.org/package=dplyr

Wilke, Claus. O. (2020). *Cowplot: Streamlined Plot Theme and Plot Annotations for 'ggplot2'. R package version 1.1.1.* https://CRAN.R-project.org/package=cowplot

Williams, A. D., & Moulds, M. L. (2007). Cognitive avoidance of intrusive memories: Recall vantage perspective and associations with depression. *Behaviour Research and Therapy*, *45*(6), 1141–1153. https://doi.org/10.1016/j.brat.2006.09.005

Wimalaweera, S. W., & Moulds, M. L. (2008). Processing memories of anger-eliciting events: The effect of asking 'why' from a distance. *Behaviour Research and Therapy, 46*(3), 402-409. https://doi.org/10.1016/j.brat.2007.12.006

Yasinski, C., Hayes, A., & Laurenceau, J.-P. (2016). Rumination in everyday life: The influence of distancing, immersion, and distraction. *Journal of Experimental Psychopathology, 7*(2), 225–245. https://doi.org/10.5127/jep.042714

Yubomirsky, S., & Nolen-Hoeksema, S. (1995). Effects of self-focused rumination on negative thinking and interpersonal problem solving. *Journal of Personality and Social Psychology*, *69*, 176–190. https ://doi.org/10.1037/0022-3514.69.1

Appendix A. A Qualitative Investigation of Elite Athletes' Coping Insight Patterns from Self-Distanced and Self-Immersed Stressor Reflections

Self-reflection condition instructions

SELF-DISTANCED INSTRUCTIONS: We'd like you to spend 5 minutes reflecting on and writing down these reflections of the most stressful event or situation you experienced over the past week in your sport. Think of this situation as something that really challenged you psychologically, emotionally, and/or behaviourally to ensure you weren't negatively affected. There are a series of questions that we'd like you to consider as part of your reflections. To optimise your recall, we'd like for you to visualise and reflect on this event from a third-person perspective, that is, someone who is observing someone else experience the event. A useful analogy is that of sport coaches watching their athletes complete a drill, where in this scenario you're standing on the sidelines watching yourself experience the event.

Please take a moment before you begin answering the questions below.

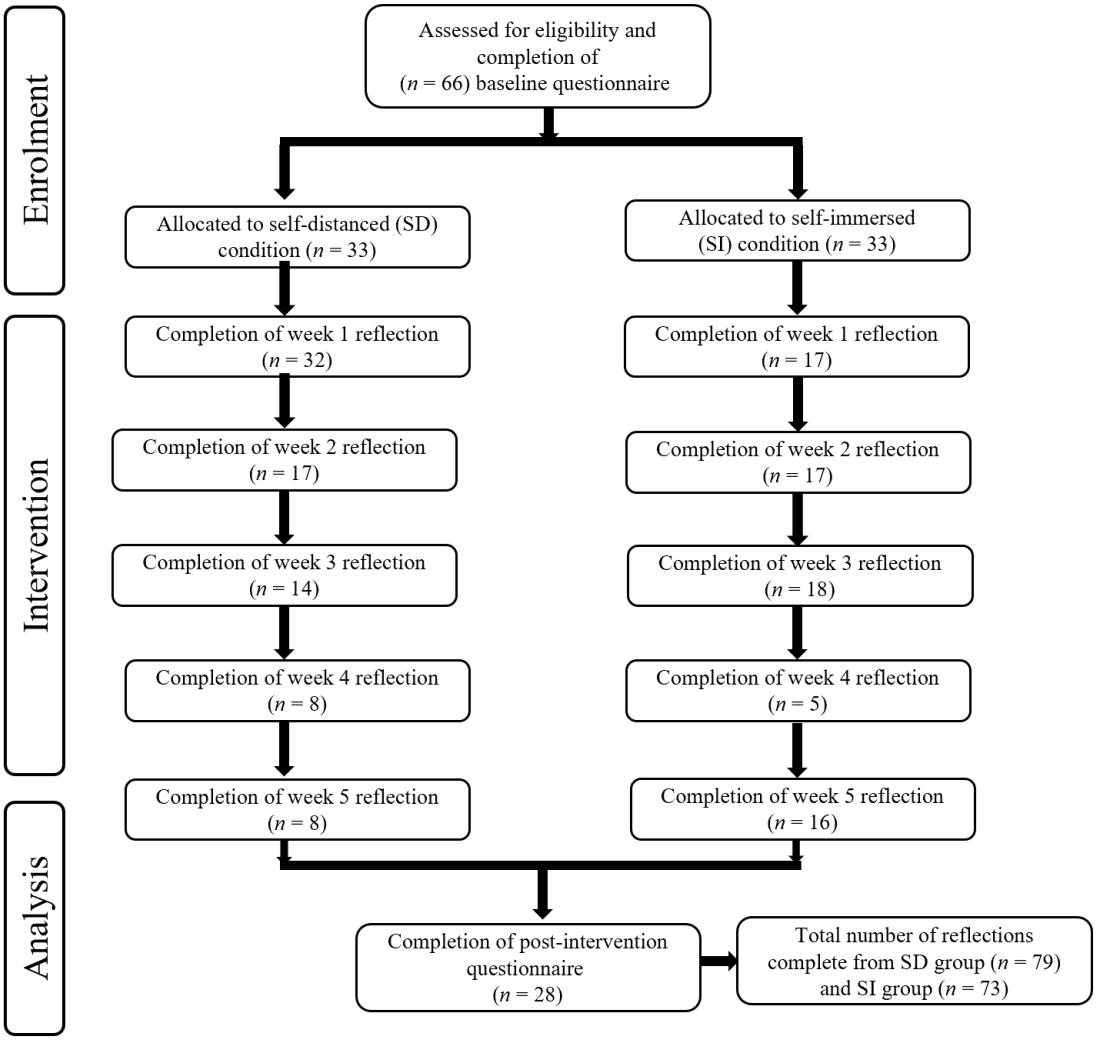
1. Briefly describe the nature of the stressor you see [your name] experiencing (e.g., who was involved, where and when did it occur).
2. Looking back on this experience, how well did [your name] respond to this stressor? (e.g., emotionally, behaviourally)
3. What did [your name] do to cope with the situation? Think of the things you can hear them say or see them do that helped or hindered them in that situation.
4. Do you think these coping strategies align with [name] personal values?
5. What could [your name] do differently next time they experience a stressful event to cope well with that situation?

SELF-IMMERSED INSTRUCTIONS: We'd like you to spend 5 minutes reflecting on and writing down these reflections of the most stressful event or situation you experienced over the past two weeks. Think of this situation as something that really challenged you psychologically, emotionally, and/or behaviourally to ensure you weren't negatively affected. There are a series of questions that we'd like you to consider as part of your reflections. To optimise your recall, we'd like for you to visualise and reflect on this event from a first-person perspective, that is, trying your best to 'relive' the experience as it occurred for you. A useful analogy is that of someone being interviewed by a reporter to recall their first-hand experience of some dramatic event as they experienced it.

Please take a moment before you begin answering the questions below.

1. Briefly describe the nature of the stressor you experienced (e.g., who was involved, where and when did it occur).
2. Looking back on this experience, how well did you respond to this stressor?
3. What did you do to cope with the situation? Think of the things you were thinking, feeling, and how you acted that helped or hindered you in that situation.
4. Do you think these coping strategies align with your personal values?
5. What could you do differently next time you experience a stressful event to cope well with that situation?

Figure S1: *CONSORT Diagram of Participant Flow Through the Study.*



Appendix B. Stepping back or stepping in: A mixed-methods investigation of self-distanced versus self-immersed stressor reflections with competitive swimmers

Supplementary Material

SELF-DISTANCED INSTRUCTIONS: We'd like you to spend 5 minutes reflecting on and writing down these reflections of the most stressful event or situation you experienced over the past week in your sport. Think of this situation as something that really challenged you psychologically, emotionally, and/or behaviourally to ensure you weren't negatively affected. There are a series of questions that we'd like you to consider as part of your reflections. To optimise your recall, we'd like for you to visualise and reflect on this event from a third-person perspective, that is, someone who is observing someone else experience the event. A useful analogy is that of sport coaches watching their athletes complete a drill, where in this scenario you're standing on the sidelines watching yourself experience the event.

Please take a moment before you begin answering the questions below.

6. Briefly describe the nature of the stressor you see [your name] experiencing (e.g., who was involved, where and when did it occur).
7. Looking back on this experience, how well did [your name] respond to this stressor? (e.g., emotionally, behaviourally)
8. What did [your name] do to cope with the situation? Think of the things you can hear them say or see them do that helped or hindered them in that situation.
9. Do you think these coping strategies align with [name] personal values?
10. What could [your name] do differently next time they experience a stressful event to cope well with that situation?

SELF-IMMERSED INSTRUCTIONS: We'd like you to spend 5 minutes reflecting on and writing down these reflections of the most stressful event or situation you experienced over the past two weeks. Think of this situation as something that really challenged you psychologically, emotionally, and/or behaviourally to ensure you weren't negatively affected. There are a series of questions that we'd like you to consider as part of your reflections. To optimise your recall, we'd like for you to visualise and reflect on this event from a first-person perspective, that is, trying your best to 'relive' the experience as it occurred for you. A useful analogy is that of someone being interviewed by a reporter to recall their first-hand experience of some dramatic event as they experienced it.

Please take a moment before you begin answering the questions below.

6. Briefly describe the nature of the stressor you experienced (e.g., who was involved, where and when did it occur).
7. Looking back on this experience, how well did you respond to this stressor?
8. What did you do to cope with the situation? Think of the things you were thinking, feeling, and how you acted that helped or hindered you in that situation.
9. Do you think these coping strategies align with your personal values?
10. What could you do differently next time you experience a stressful event to cope well with that situation?

Analysis of Quantitative Data

Descriptive statistics and preliminary analysis. The Shapiro-Wilk test indicated data were normally distributed for both groups (self-distanced, $p = 0.005$; self-immersed, $p = 0.027$), and variances were not significantly different among the groups (Levene's $p = 0.142$), meaning analyses could be conducted with the raw data. For the swimming performance variable, we relied solely on participants' first performance time from the competition to minimise contributing factors of multiple swim events (e.g., fatigue) and how their reflection style may be affected by their performances (e.g., reverting back to their 'normal' reflection style). Means and standard deviations for study variables studied are presented in Table 1. We assessed the depth of each reflection of the self-distanced group as follows: week 1 (M = 4.47, SD = 2.23), week 2 (M = 4.2, SD = 1.23), and week 3 (M = 3.18, SD = 1.25). Comparatively, we assessed the depth of reflections among the self-immersed group as follows: week 1 (M = 5.3, SD = week 2 (M = 4.66, SD = 2.40), and week 3 (M = 6.14, SD = 2.12). Boxplots are presented in the supplementary material to visualise differences across the self-distanced and self-immersed groups. For the coping insights variable, the self-distanced group self-reported similar levels (Mdn = 5.08) to the self-immersed group (Mdn = 4.85) and similar variability within the group (Min = 4.46, Max = 6) relative to the self-immersed group (Min = 4.46, Max = 6.54). Regarding performance, the self-distanced (Mdn = -0.055) and self-immersed (Mdn = 0) performed roughly equivalently, yet there was larger variability in performance for the self-distanced group (Min = -10.820, Max = 3.310) relative to the self-immersed group (Min = -4.930, Max = 1.190). All other variables produced insignificant differences across the two groups and are reported in the supplementary material.

Reflection condition and swimming performance. Swimming performance in the self-distanced group (M = -0.66, SD = 3.10) was not significantly different to the self-

immersed group (M = -0.70, SD = 1.74) ($t(45) = 0.053$, $p = 0.958$). The remaining variables of interest produced inconsequential outcomes, so these results are provided in the supplementary material.

Table S1.

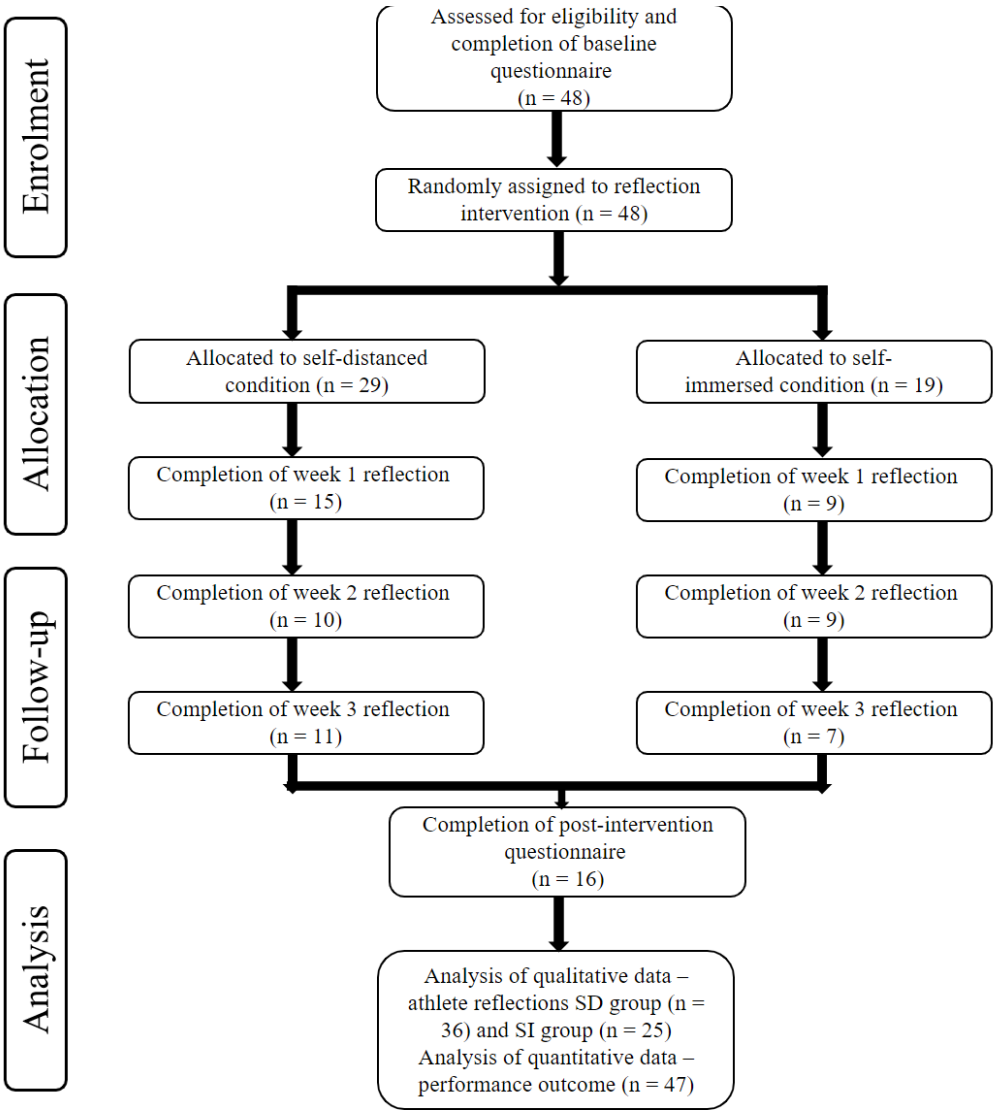
Example of process to code coping insights using an athlete's written reflection.

Coping Insight	**Example quote**	**No/low, moderate, or high representation**
1.1.1. Understanding time course of one's reactions	*"12am Monday night I got up to get a drink of water. I'm used to hearing noises around the place I live, but the noises (crashes and bangs) were louder than usual. It took another few seconds for my parents to be up to."*	High
1.1.2. Understanding the inter-relationships between one's various types of stressor reactions	*"I "zoned out"/dissociated for the first time in a few months when I couldn't sleep… I was shaking a little and when I was on the phone, I can't really recall whether I was speaking quietly out of fear or because my voice couldn't get any louder…seeing my parents calmer after the ordeal settled me down a little. We were all very attentive to sudden noises for the next few days…"*	Moderate
1.1.3. Understanding the influence of one's personal reactions on the behaviour of others and vice versa	*"A man had jumped the shortest part of our fence in our backyard and fallen on the scrap wire and metal we store down there... [I didn't cope] well. There's no preparation for someone trying to break in…seeing my parents calmer after the ordeal settled me down a little."*	High
1.2.1. Understanding whether one's response to a stressor moves them towards or away from their personal values	Not mentioned in reflection.	No / low
1.3.1. Acknowledging diverse range of coping strategies, resources, or beliefs applied during the coping process	*"In true child fashion, looked to parents for confirmation that everything was okay. It was reasonably fine after that. I took my mind off things by reading for a bit…. Seeing my parents calmer after the ordeal settled me down a little. We were all very attentive to sudden noises for the next few days…"*	Moderate
2.1.1. Understanding the overarching patterns of triggers across time and context	*"I'm used to hearing noises around the place I live, but the noises (crashes and bangs) were louder than usual… It's not surprising given the area that I live in, but that doesn't make it at all welcome."*	High
2.1.2. Interpretation of why these situations induce stress	"*He was a very tall and built man, if it were just myself and Mum, I don't want to think about what could happen… There's*	High

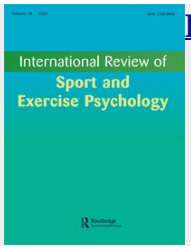
	no preparation for someone trying to break in."	
3.1.1. Understanding that stressors, while uncomfortable, also provide an opportunity for growth across the lifespan	Not mentioned in reflection	No / low
4.1.1. Understanding the nuanced interactions between stressor characteristics and the effectiveness of coping strategies or resources	*"... it isn't something you can predict happening at a certain time. Generally speaking, if anything happens in our area it happens between the hours of 12am-3am"...I looked to parents for confirmation that everything was okay. It was reasonably fine after that"*	Moderate
4.1.2. Understanding the potential for coping strategies to be associated with distinct or even oppositional shorter-term and longer-term outcomes	*"... it isn't something you can predict happening at a certain time. Generally speaking, if anything happens in our area it happens between the hours of 12am-3am. We've been lucky not to have too many experiences like this one, but you can't predict when someone's opportunistic"*	Moderate
4.1.3. Understanding the nuanced interactions between individual strengths and the effectiveness of coping strategies or resources	*"In true child fashion, looked to parents for confirmation that everything was okay. It was reasonably fine after that. I took my mind off things by reading for a bit."*	Moderate
5.1.1. Understanding the anticipated effect of resilient capacities applied in the future	No insights present in reflection.	No / low
5.2.1. Understanding the congruence between the type and source of coping resources available, and the anticipated needs of the individual in their future stressor context	No insights present in reflection.	No / low

Figure S1

CONSORT diagram of participant flow through the study.



Appendix C. Published Journal Article



International Review of Sport and Exercise Psychology

The effectiveness of stress regulation interventions with athletes: A systematic review and multilevel meta-analysis of randomised controlled trials

ABSTRACT

We conducted a pre-registered systematic review of seven databases and meta-analysis of randomised controlled trials with athletes to examine the effectiveness of stress regulation interventions on performance outcomes, and the conditions under which their effects are strongest. We found a positive and significant moderate overall effect of stress regulation interventions on performance outcomes (65 effects, $k = 21$, $N = 2022$, $g = 0.52$, 95% CI = 0.19, 0.84) and a significant large effect on physiological outcomes (28 effects, $k = 10$, $N = 368$, $g = 2.13$, $se = 0.81$, 95% CI = .47, 3.79), yet the effect on psychological dimensions was statistically inconsequential (28 effects, $k = 10$, $N = 787$, $g = 0.35$, 95% CI = −0.12, 0.81). Sensitivity and meta-bias analyses generally supported the robustness of the pooled effect of stress regulation interventions on athlete performance, yet the prediction intervals suggested some interventions may be inefficacious or detrimental for athlete performance. The strongest effects on performance were observed at follow-up when compared with post-test. Collectively, our findings offer a high-quality assessment on the effectiveness of stress regulation interventions for athlete performance and provide direction for future research in terms of conceptual and methodological issues.

KEYWORDS:
Behaviour change techniques
biofeedback
cognitive–behavioural
mindfulness
relaxation
three-level meta-analysis

Athlete performance is complex as it depends on learning skills across multiple domains and executing them in training and high-stakes competition environments. Athletes encounter numerous and varied stressors in their sporting pursuits, which can be broadly classified in terms of training (e.g. teammates' behaviours and interactions, goals), competition (e.g. risk of injury, spectators), organisational (e.g. support staff, selection), or personal non-sporting factors (e.g. romantic or family relationships, finances; Arnold et al., Citation2013; Sarkar & Fletcher, Citation2014). The potentially stressful nature of sport necessitates the need for athletes to be capable of regulating

their engagement with stressors optimally so they can deliver optimal performance. Acute stress, for example, can lead to maladaptive outcomes in terms of physical (e.g. negative effect on basketball free throw and tennis serves; Lautenbach et al., Citation2015; Mascret et al., Citation2016) and cognitive performance (e.g. increased reaction time; Paul et al., Citation2012). Meta-analytic data supports the adaptive nature of psychological interventions for sport performance, the effects of which may endure one month after completion of training (Brown & Fletcher, Citation2017). Yet, our knowledge of the effectiveness of interventions designed specifically to help athletes regulate their engagement with stressors is limited to narrative reviews of the literature (Rumbold et al., Citation2012). Absent from the evidence base is an appreciation of the overall magnitude of their effectiveness, the types of interventions that are most effective, and the conditions for which and athletes for whom we might expect the strongest effects. We address these knowledge gaps in the current study.

Given the breadth and complexity of stress as a scientific concept, it is unsurprising that scholars have proposed numerous hypotheses and models to facilitate the study of stress and its effects on humans (see Harris, Citation2020, for an overview). Transdisciplinary perspectives provide a unified picture of stress as an emergent property that arises from person-situation interactions within the confines of contextual, habitual, historical, and temporal dimensions (Epel et al., Citation2018). Common among this unified perspective is the centrality of situational factors (e.g. frequency and intensity of stressors), cumulative stress exposure (e.g. history of major stressors or traumas), protective factors that potentially buffer the maladaptive effects of stress (e.g. malleable personal resources, social resources), and psychological (e.g. emotion regulation) and physiological (e.g. autonomic, neuroendocrine, and immune systems) responses. Numerous theories exist to explain these core elements of the stress experience. From a psychological standpoint, for example, the transactional theory of stress and coping (Lazarus & Folkman, Citation1984) is one dominant model in which it is proposed that psychological stress occurs when people perceive the demands of their environment outweigh resources available to them to manage or alter the situational demands encountered (Lazarus et al., Citation1985). Cognitive appraisals are core to this process because the initial evaluation of a stressor influences the nature of the stress process for individuals (Lazarus, Citation1999). The biopsychosocial model (Blascovich & Mendes, Citation2000) extends the transactional perspective of stress to consider the interplay between psychological processes and cardiovascular responses in terms of challenge and threat states. A *challenge* state is experienced when people appraise their personal resources as exceeding the demands associated with the stressor, whereas a *threat* state occurs when demands are perceived to outweigh personal resources (for reviews see Blascovich & Mendes, Citation2010; Hase et al., Citation2019). These two stress states have differential effects on physiological systems and, in turn, human function; a challenge state is characterised by increases in cardiac output, decreases in total peripheral resistance, and rapid sympathetic nervous system activation (SNS), whereas a threat state is characterised by no or small increases in cardiac output, increases in total peripheral resistance, and a slow rise in SNS (Epel et al., Citation2018).

Scholars typically leverage key theoretical perspectives of psychological stress when designing stress regulation interventions with athletes. Broadly defined, coping

represents self-regulatory mechanisms by which individuals manage internal or external demands appraised as stressful (Lazarus & Folkman, Citation1984). Interventions informed by the transactional theory of stress and coping (Lazarus & Folkman, Citation1984) might teach athletes coping strategies such as cognitive restructuring (e.g. Larsson et al., Citation1988) or emotion regulation (e.g. cognitive reappraisal, distraction; Balk et al., Citation2013) to enable them to appraise stressor experiences in adaptive ways. In contrast, interventions inspired by a biopsychosocial model might employ biofeedback (e.g. Kavussanu et al., Citation1998; Paul et al., Citation2012) or a combination of self-regulatory skills and enhanced biofeedback (e.g. Kachanathu et al., Citation2013) to help athletes address the interplay between psychological and physiological processes. Holistic approaches that originated from outside of the Western biopsychosocial medical approach, such as Acceptance and Commitment Therapy or Dialectical Behaviour Therapy (Follette & Hazlett-Stevens, Citation2016), may incorporate mindfulness strategies focused on breathing exercises and awareness of present thoughts and feelings (e.g. Glass et al., Citation2019; Siyaguna, Citation2019). At a broader level, multimodal interventions typically encompass multiple dimensions of the stress process including the interface between situational (e.g. coping strategies; Mesagno et al., Citation2008), psychological (e.g. attentional style, mental skills training; Larsson et al., Citation1988), and physiological dimensions (e.g. arousal, relaxation; Lautenbach et al., Citation2015). One such example of a multimodal intervention is stress inoculation training, which incorporates cognitive and behavioural methods to assist individuals in coping with stress. In such interventions, typically there is a primary emphasis on learning coping skills (e.g. problem-solving skills), detecting negative self-talk, and re-directing energy to take constructive action and practicing these strategies during stressful situations (Meichenbaum & Novaco, Citation1985). Given the breadth and diversity of intervention options available, knowledge of which interventions are most effective and the conditions in which and people for whom they work best is required for optimising athletic performance.

In the latest integrative synthesis to date, Rumbold and colleagues (Citation2012) evaluated stress regulationFootnote[1] interventions for athletes via a systematic review of the published literature up until 2010. They identified 64 studies in which scholars evaluated psychosocial interventions designed to help athletes regulate their interactions with stressors via experimental and non-experimental designs. Broadly, these interventions encompassed various cognitive strategies (e.g. self-talk, imagery), multi-modal packages (e.g. stress inoculation training), and alternative approaches (e.g. anger awareness, music interventions). Overall, their narrative synthesis of the literature generally supported the utility of these stress regulation interventions for reducing stressors, modifying cognitive appraisals, facilitating coping behaviours, and reducing negative affective states and increasing positive affective states. Regarding performance outcomes, findings supported the positive effects of cognitive (4 of 6), multimodal (23 of 30), and alternative (3 of 3) approaches for stress regulation interventions. The magnitude of effects for performance were weaker than those for psychosocial outcomes related to the stress process itself, thereby suggesting that changes in psychosocial factors (e.g. cognitive appraisals) may not necessarily translate into performance benefits. Athletes' competitive level, age, and the temporal frame of

the intervention were identified as potentially meaningful moderators of intervention effectiveness, with the strongest effects observed with athletes competing at college level or aged 12–21 years, and when interventions allowed for greater delivery time (2-month period). Collectively, therefore, these findings supported the effectiveness of stress regulation interventions with athletes.

There are several justifications for an update of Rumbold and colleagues' (Citation2012) synthesis. First, the reliance on statistical significance, rather than the magnitude of effect and its precision for making inferences regarding intervention effectiveness, is suboptimal for informing theory and practice (e.g. false positives; Greenland et al., Citation2016). Second, the inclusion of non-experimental designs (e.g. non-random assignment) in their narrative synthesis makes it impossible to infer causal effects with certainty because one cannot discount alternative explanations for associations among determinants and outcomes. Third, the reliance on published research raises concerns regarding potential publication bias in that studies which produce statistically significant findings are more likely to be published and therefore skew the findings and their interpretations in ways that are favourable. Publication bias is a long-standing issue for the psychological sciences (Rosenthal, Citation1979), including the sub-field of sport and exercise psychology (Spence & Blanchard, Citation2001). Fourth, the evidence summarised reflected work completed up until 2010; thus, there is a need for an updated search to capture the past decade of research in this space. Accordingly, we address these considerations in the current study via a systematic review and meta-analysis of stress regulation interventions for athletes tested via randomised field or laboratory-based experiments.

The overarching goal of our work was to synthesise causal evidence on stress regulation interventions with athletes in a way that provides insight into the magnitude of the effectiveness and extent to which such findings generalise across contexts. In so doing, we offer several important contributions to theory and practice on stress, athlete performance, and their interaction. Our first contribution is the assessment of the overall effectiveness of stress regulation interventions in optimising athlete performance. There exists meta-analytic evidence on the effectiveness of individual categories of stress regulation interventions such as mindfulness (Bühlmayer et al., Citation2017), self-talk (Hatzigeorgiadis et al., Citation2011), slow-paced breathing realised with heart rate variability biofeedback (Lehrer et al., Citation2020), and relaxation (Pelka et al., Citation2016). However, absent from the literature is a comprehensive statistical interrogation of stress regulation interventions, which can provide insight to the relative effectiveness of such approaches. Second, we test several moderators or boundary conditions of the effectiveness of stress regulation interventions with athletes that provide new knowledge for theory development, refinement, and elaboration (e.g. differential effectiveness of theory-informed versus theory-absent interventions), as well as practice (e.g. features of intervention programmes including content, duration, and mode). As a complement to these statistical interrogations of the evidence, we narratively examine interventions tested in the literature to characterise the nature of stress regulation programmes with regard to their design (e.g. materials, programme deliverer, temporal elements) and active ingredients (i.e. behaviour change techniques). Finally, we conduct a comprehensive assessment of meta-bias to assess the extent to which elements of the scientific

process (e.g. risk of bias, publication bias) contribute to over- or under-estimated statistical summaries of a body of work (Johnson & Hennessy, Citation2019; Mathur & VanderWeele, Citation2020). This contribution is important for making well-informed inferences regarding the quality of evidence and guiding future research in ways that alleviate methodological concerns present in existing research.

Methods

We registered the protocol for this systematic review on the Open Science Framework on April 15th 2020 using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses-Protocol template (PRISMA-P; Shamseer et al., Citation2015). Pre-registration of systematic review and meta-analysis protocols is considered best practice (Moher et al., Citation2015; Nosek et al., Citation2018) because it minimises bias (Kvarven et al., Citation2020; Quintana, Citation2015). The protocol registration, data files, and analytical scripts and outputs are located on the OSF project page (https://osf.io/fbs4k/). We report the results of this work in accordance with the PRISMA 2020 guidelines (Page et al., Citation2021).

Literature search

We first conducted a search of the following electronic databases on April 29th 2020 to maximise reach (e.g. PsycInfo captures un/published literature) yet minimise redundancy (e.g. Falagas et al., Citation2008): Web of Science (core collection), Scopus, Embase, Medline, PsycInfo, CINHAL Plus, and ProQuest Dissertations and Theses Global. We also updated the search on July 7th 2021 as part of the peer-review process. The search strategy for each database included a combination of terms for the participant group (athlete* OR sport), target concept (stress* OR coping), and study design (intervention OR experiment* OR train* OR trial OR programme* OR inoculation). We subsequently executed backward (i.e. reference lists of eligible studies) and forward searches (i.e. articles that cited the eligible studies using Google Scholar) for completeness.

Eligibility criteria

We considered primary studies for inclusion if they: (i) tested the effectiveness of an intervention or training programme of stress regulation with athletes; (ii) randomised participants to experimental conditions; and (iii) provided sufficient information in the published paper to compute an effect size for performance (i.e. the primary outcome) or this information was available by contacting the authors directly. We excluded studies when: (i) they utilised non-experimental designs (e.g. cross-sectional, longitudinal, quasi-experimental such as non-random assignment); (ii) the article was written in any language other than English; (iii) the full-text was unavailable via our university library subscriptions or directly from the corresponding author (i.e. 2 email requests/reminders, separated by 2 weeks); (iv) information required to compute an effect size was unavailable in the document and via direct requests from the corresponding author (i.e. 2 email requests/reminders, separated by 2 weeks); and (v) the results were published as a conference abstract rather than a full-text report (e.g. dissertation, pre-print) because they are often poorly reported (e.g. Hopewell & Clarke, Citation2005).

Population

Athletes were the focus of this systematic review and meta-analysis. For the purpose of this study, an athlete is defined as an individual who is behaviourally engaged in sport, which is defined as 'involving physical exertion and skill as the primary focus of the activity, with elements of competition where rules and patterns of behaviour governing the activity exist formally through organisations and is generally recognised as a sport' (Australian Government, Citation2011, p. 7). When relevant information (e.g. the type of sport played) was unavailable in primary reports, we relied on authors' descriptions of their participants (e.g. if described as an athlete or sport performer we considered the study eligible for inclusion). There were no restrictions on type of sport or athlete demographics (e.g. competition level, age).

Intervention

We focused on interventions that targeted the regulation of athletes' experiences with stressors. It was expected that interventions would be characterised in ways that align with the definition of psychological stress, that being, a 'process that involves individuals transacting with their environments, making appraisals of the situations they find themselves in, and endeavouring to cope with any issues that may arise' (Fletcher et al., Citation2006, p. 329; adapted from Lazarus, Citation1999). We considered interventions that targeted one intervention component in isolation (e.g. self-talk) or combined two or more components (e.g. stress inoculation training).

Comparators

We included all types of comparators, including waitlist controls, no contact controls, and active controls. We considered the nature of control groups when interpreting findings (see Freedland et al., Citation2019; Gold et al., Citation2017).

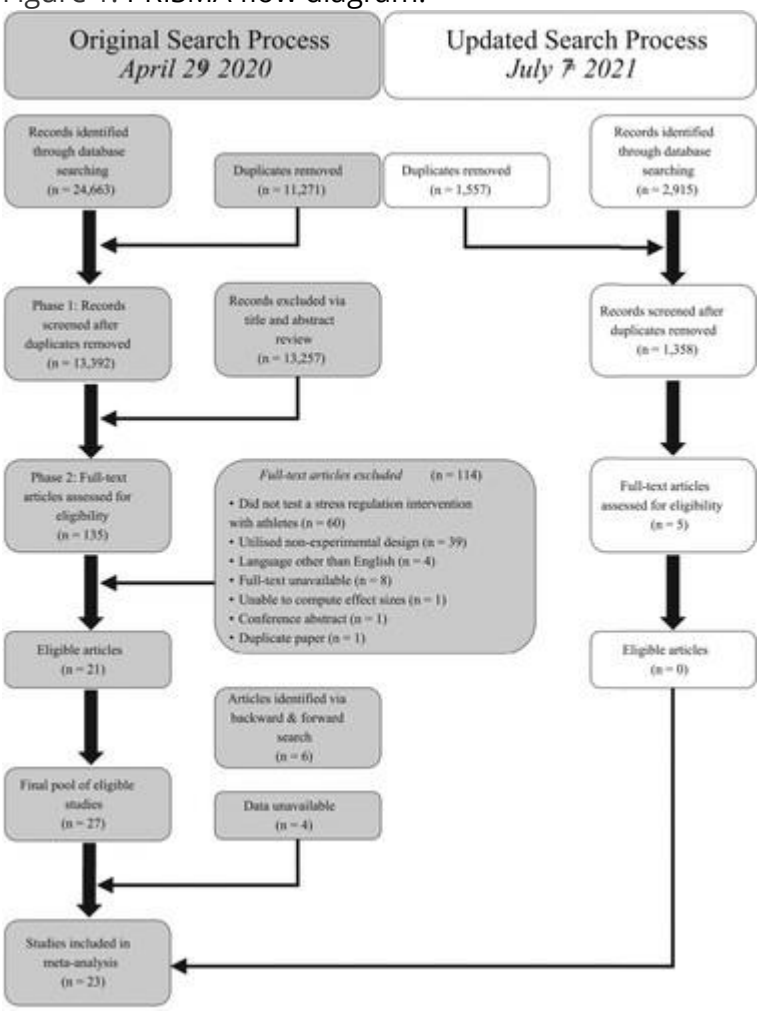
Outcomes

As athletes engage in sport primarily to achieve valued performance outcomes, we focused on performance as the primary outcome for this systematic review and meta-analysis. Within sporting contexts, performance represents the enactment of behavioural or cognitive tasks that characterise assessments of success in one's sporting domain. We considered indices of performance across technical, tactical, or physical domains (Janelle & Hillman, Citation2003). We expected individual performance to be assessed via objective (e.g. competition statistics), informant-reported (e.g. coach assessed), and/or subjective (i.e. self-reported) measures. Given the centrality of athlete appraisals within the stress regulation process (e.g. Hobfoll, Citation1989; Lazanis, Citation1999), we examined athletes' stress perceptions as a secondary outcome. The transactional stress process consists of a wide variety of components including stressors, appraisals, emotions, and coping; it is the balance of, and interrelation among, these components that has the potential to affect athletes' perceptions of stress (Lazarus & Folkman, Citation1984). We also examined physiological markers of the stress process (e.g. heart rate variability, salivary cortisol, respiration rate) as a secondary outcome at the request of reviewers. Nevertheless, we present the findings of these secondary outcomes only rather than discuss their implications because we prioritised identifying literature that included performance as an outcome, so we cannot be certain that we've sourced the full spectrum of work that has examined the effects of stress regulation interventions on psychological or physiological outcomes.

Article screening

Two independent reviewers [EM and RL] executed the screening process independently using a web application – Research Screener (https://researchscreener.com) – allowing assessors to screen titles and abstracts from databases using machine learning. Research Screener ranks the abstracts in order of significance from existing articles known to the team as relevant for inclusion based on the screening criteria, and continuously updates the learning algorithm every 50 abstracts screened based on what is deemed as in/eligible by the reviewer. Preliminary evidence supports the utility of Research Screener for semi-automating the screening process (Chai et al., Citation2021). Briefly, across nine systematic reviews and two scoping reviews, Research Screener delivered a 60–90% workload saving, and estimated a conservative threshold of the need to screen no more than 50% of articles to assure that 100% of eligible articles are identified. EM and RL discussed uncertainty regarding the screening decision for 16 papers with DG, who made the executive decision regarding their suitability for inclusion in the meta-analysis. Reasons for study exclusion were summarised as part of the search and included in the data extraction flow diagram (see Figure 1).

Figure 1. PRISMA flow diagram.



Display full size

Data extraction

EM extracted all data items from primary studies using a pre-determined form or requested information from the corresponding author of eligible studies when the data were unavailable in the full text. We extracted data on the nature of the publication, participants characteristics, key details of the intervention as per the template for intervention description and replication (TIDieR) guidelines (Hoffmann et al., Citation2014), type of outcome, type of comparator, descriptive statistics of key study variables, theoretical framework employed to guide the intervention (if any), source of ratings for moderator and outcome variables, and the statistical technique for the primary analysis. The data extraction form is available on the OSF project page. A second member of the research team [DG] assessed a random sample of 50% of data extraction forms to check accuracy and consistency; DG noted minor errors (e.g. coding of intervention characteristics according to TIDieR) that were subsequently rectified by EM in the remaining 50% of articles.

Statistical and narrative analyses

Coding of studies

Key information from studies, interventions, samples, and outcome variables were coded using a detailed template. We coded performance as either physical or cognitive in nature, whereas psychological outcomes were coded as cognitive, emotional/affective (e.g. stress perception), or motivational/self-efficacy/perceived control. We coded interventions among eligible studies into one of five categories according to the overarching content of the programme: biofeedback (use of an external device to provide information about one's physiological state), cognitive elements (mental strategies designed to regulate stressor interpretations, e.g. reappraisal), mindfulness/meditation (breathing exercises and awareness of present thoughts and feelings or mind–body exercises designed to develop a sense of calmness and balance; see van Agteren et al., Citation2021), relaxation (psychomotor techniques which target the central nervous system and a reduction in sympathetic activation), and multimodal components (incorporation of stress regulation categories over an intervention period). We also coded for participant exposure to low stress (e.g. training, execution of skills in no timeframe) and/or high stress environments (e.g. competition, videotaping performance), and method of assessment for the outcome variable (objective, subjective, informant assessed). Regarding study characteristics, we coded for publication type (peer reviewed paper or dissertation), comparator type (no treatment, waitlist, regular practice, contact control), and the inclusion of a follow-up measurement (an assessment period which occurs after the intervention to examine the degree to which effects are lasting) in the study. We coded for sample characteristics by gathering the percentage of female participants and mean age.

Calculation of effect sizes

To quantify the effect of the intervention against the comparator group, we calculated the standardised mean difference, allowing for synthesis of the same outcome variable across studies when measured using different tools. When studies included primary outcome variables measured at multiple time points post intervention, we computed effects independently for first post-intervention or second post-intervention. Effect sizes were calculated from means, standard deviations, and sample sizes of experimental groups using established formulas for pre–post (Morris, Citation2008) and post-only

(Borenstein et al., Citation2009) designs. When these statistics were missing or unavailable from authors, we used *F* statistics, *t* scores, and *p* values to calculate effect sizes (Lakens, Citation2013). We used an excel file to facilitate the calculation of the effect sizes, which is available on OSF project page. A positive effect size represented the beneficial effects of stress-regulation interventions; in cases where a higher score was indicative of a worse performance (e.g. time taken to run a race), we transformed the effect size direction so that a positive effect size represented better performance for stress regulation conditions.

Statistical synthesis of effect sizes

The majority of included studies ($k = 17$) consisted of two or more effect sizes and/or compared multiple treatments against the same comparator group (i.e. multiple treatment studies; Gleser & Olkin, Citation2009). To account for such dependencies among effect sizes from the same study, we utilised a three-level meta-analytic model to account for sampling variance of individual effects (level 1), and variance of effects within (level 2) and between (level 3) studies (Cheung, Citation2014; Citation2019). Readers are referred elsewhere for a tutorial on three-level meta-analysis (Gucciardi et al., Citationin press). We first estimated an overall effect of stress regulation interventions on performance, psychological, and physiological outcomes separately using an intercept only random-effects model with restricted maximum-likelihood estimation. One-tailed likelihood ratio tests were subsequently applied to test the statistical meaningfulness of the variance distributed within (level 2) and between (level 3) studies; statistically significant ($p < .05$) variance at either level implies that effect sizes are heterogeneous and, therefore, moderator analyses are justified. In such cases, we extended the intercept-only model with the moderator variables noted below using an adjustment to the standard errors to minimise the likelihood of unjustified significant results (Knapp & Hartung, Citation2003). We conducted all statistical analyses using the package *metafor* (Viechtbauer, Citation2010) in the R statistical platform (R Development Core Team, Citation2019). The full analytical script is available on the OSF project page.

Moderator and sensitivity analyses

We examined elements of the study sample (age and percentage of female participants), intervention type (biofeedback, mindfulness/meditation, relaxation, cognitive, and multimodal), assessment time point (first post-intervention and second post-intervention), theory-informed intervention (yes/no), comparison group (contact control, no treatment, regular practice, waitlist), outcome assessment method (informant, objective, subjective), testing session (low or high stress), intervention materials (hardcopy, diary, technology-enhanced, none), intervention provider (healthcare professional, researcher, none mentioned), delivery mode (face-to-face or self-directed/face-to-face in group, face-to-face for individuals, self-directed), temporal frame of the intervention (1 session, 1–2 weeks, 4–8 weeks, 10–12 weeks), intervention delivery duration (continuous), and intervention time (continuous) as moderators of the overall pooled effect. Continuous variables were mean centred prior to moderation analyses. Sensitivity analyses were performed to examine the presence and influence of outlier cases and influential studies on the overall pooled effect.

Statistical heterogeneity

We calculated the I^2 statistic to quantify the proportion of variability in effects that cannot be attributed to sampling variance (Higgins & Thompson, Citation2002; Huedo-Medina et al., Citation2006). An intuitive way to appreciate the I^2 statistic is as an indication of 'the amount of non-overlap among confidence intervals' (Borenstein et al., Citation2017, p. 7). In three-level meta-analysis, total heterogeneity (I^2 statistic) is decomposed across levels, such that there exists within-study heterogeneity$(I_{22})(\hat{\sigma}^2_2)$ and between-study heterogeneity$(I_{23})(\hat{\sigma}^2_3)$. To estimate the absolute amount of variability among effects, we computed the prediction interval to make inferences regarding the 95% likelihood that an effect in future similar studies will fall between an estimated range (Borenstein et al., Citation2017; IntHout et al., Citation2016).

Meta-bias

As a first look at publication bias, we quantified the magnitude and meaningfulness of effect size differences via meta-regressions in which the overall effect is regressed on sample size, publication type (peer-reviewed versus unpublished), and study quality (i.e. risk of bias – see below). We assessed publication bias using the multilevel extension of Egger's regression test (Egger et al., Citation1997), where the overall pooled effect from the three-level model is regressed on some function of the standard error of effect sizes (Fernández-Castilla et al., Citation2021) and contour-enhanced funnel plots including regions for statistical significance at $p < .05$ and $p < .01$ levels (Peters et al., Citation2008), where asymmetry in the plot is interpreted as evidence of publication bias (Lau et al., Citation2006). We also utilised the R package *metaviz* (Kossmeier et al., Citation2019) to produce 'sunset' funnel plots from the meta-analytic data that incorporate information on statistical power of each individual study included in the synthesis (Kossmeier et al., Citation2020). Finally, we conducted a *p*-curve analysis to assess the evidential value via a distribution of statistically significant findings only; a left-skewed curve indicates possible bias and a right-skewed supports evidential value (Simonsohn et al., Citation2014).

Confidence in cumulative evidence

The quality of evidence and strength of recommendations was assessed using the GRADE approach across the domains of risk of bias, consistency, directness, precision, and publication bias (Guyatt et al., Citation2008). The Cochrane revised risk of bias tool (RoB 2; Sterne et al., Citation2019) was used to extract relevant information; the results of this assessment are located on the OSF project page.

Narrative analysis of intervention content

In addition to a statistical synthesis, we narratively synthesised the findings of eligible studies to summarise and explain the characteristics and findings of stress regulation interventions, according to TIDieR guidelines (e.g. content, mode of delivery; Hoffmann et al., Citation2014). Specifically, we captured the nature of interventions (e.g. duration, mode) where stress regulation training was found to be effective. Additionally, we identified the active ingredients present in stress regulation interventions using the behaviour change technique taxonomy (Michie et al., Citation2013).

Deviations from pre-registered protocol

We deviated from the pre-registered protocol in the following ways. First, in cases where a study had more than one comparator group (e.g. placebo group), we decided

to analyse the groups separately rather than to merge the comparator groups because three-level meta-analysis can handle dependency among effects. Second, we did not compute sensitivity analyses for athlete competition level (e.g. elite or non-elite) because in most cases non-elite athletes participated in the included studies and there was insufficient detail by which to categorise samples using recommended guidelines (see Swann et al., Citation2015). Third, the degree of participant attrition was excluded from analyses due to insufficient reporting of this methodological feature within the eligible studies. Fourth, there was substantial variation in the types of scales utilised and concepts assessed for stress perceptions and psychological outcomes; accordingly, we decided to integrate these assessments in broad categories (e.g. cognitive, emotion/affect) because it was a secondary focus of the meta-analysis. Fifth, we planned to synthesise intervention content using the compendium of self-enactable techniques (Knittle et al., Citation2020), yet were unable to do so because the majority of interventions were delivered by a third person/party and often there was insufficient detail regarding intervention content. Sixth, we utilised sunset (power-enhanced) funnel plots to visualise and assess the evidential value of the studies included in this meta-analysis (Kossmeier et al., Citation2020). Seventh, we decided to explore the presence and influence of outliers because they can alter the confidence in one's interpretation of the robustness of the overall pooled effect (Viechtbauer & Cheung, Citation2010). Eighth, we incorporated a *p*-curve analysis as part of our multicomponent investigation of meta-bias. Ninth, we decided against conducting a trim and fill analysis as part of the multicomponent publication bias tests because simulations show that it works best with large numbers of effects and sample sizes (Fernández-Castilla et al., Citation2021), something which was uncharacteristic of our dataset, and has limited power to detect selection bias (Rodgers & Pustejovsky, Citation2020). Finally, we included physiological markers of the stress process as a secondary outcome at the request of reviewers.

Results

Literature search overview

An overview of the search and study selection process is presented in Figure 1. In total, we identified 21 eligible studies from the electronic database search, and an additional 6 eligible studies via forward and backward scans; three papers reported results from the same sample so we coded them as coming from the same Level 3 study (John et al., Citation2010, Citation2011; Kachanathu et al., Citation2013). Of these 27 studies, the information required to compute effect sizes was unavailable in four cases (Christie et al., Citation2020; Marshall, Citation2002; McCormick, Citation2016; Thompson et al., Citation2020), which resulted in a final sample of 23 studies included in the meta-analysis. The 23 studies were published between 1983 and 2019, and yielded 115 effect sizes (ES) of which 93 were deemed relevant for inclusion. The total sample included 899 participants who, on average, were 26.50 years of age and was comprised of 42% female participants (see Table 1 for a detailed overview of included studies).

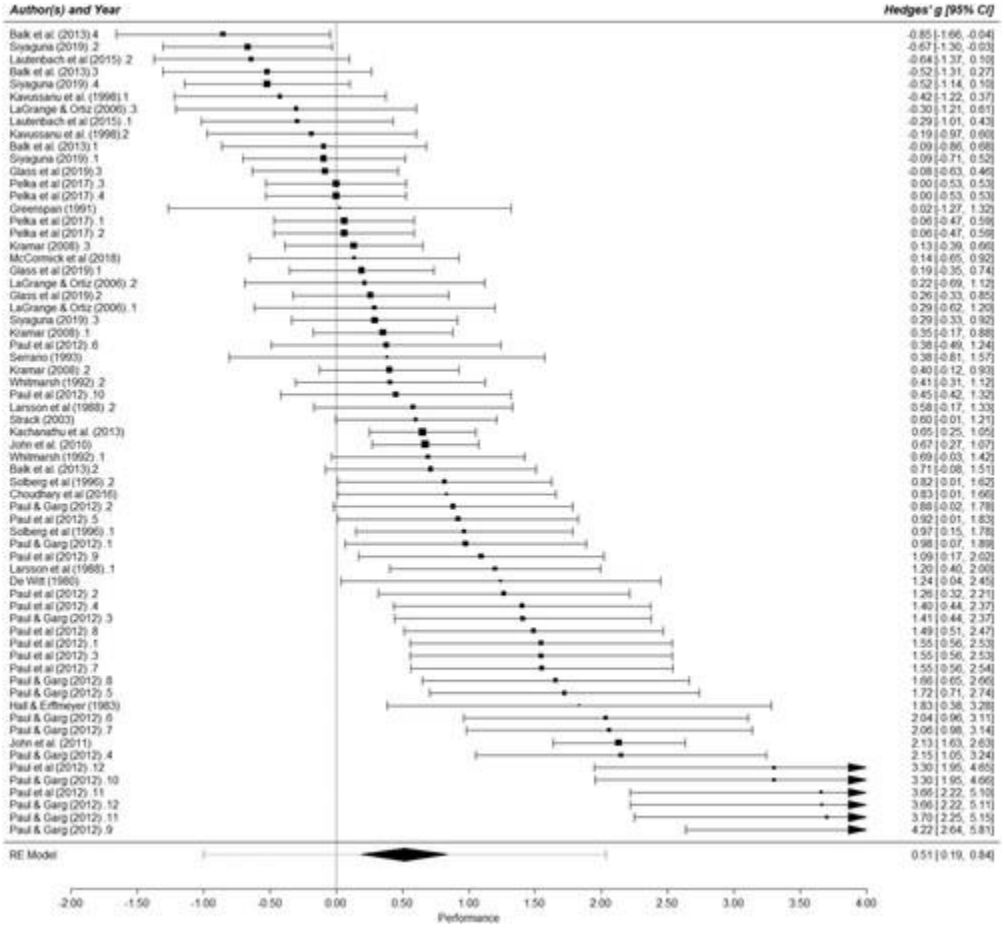
Overall effect of stress regulation interventions

Performance. The overall effect of stress regulation interventions (65 effect sizes, $k = 21$, $N = 2022$) on performance was moderate in magnitude ($g = 0.52$, se = 0.16, 95% CI = 0.19, 0.84; see Figure 2). The 95% prediction interval revealed a 95% chance that the effect of a new study will lie between −1.00 and 2.03 (Hedges' *g*). The likelihood

ratio tests revealed significant variance in effects within studies (level 2; LRT = 14.93, $p < .001$) and between studies (level 3; LRT = 37.93, $p < .001$), which explained 22.19% and 57.16% of the variance, respectively. As there was substantial heterogeneity among effect sizes ($I^2 = 79.35\%$; Higgins et al., Citation2003), we carried out moderator analyses to examine factors that may explain the variance between studies.

Figure 2. Forest Plot of Effect Sizes for Performance Outcomes.

Note: The sizes of the squares represent relative sample sizes. The diamond at the bottom represents the overall effect; the dotted line around the diamond reflects the 95% prediction interval. The dotted vertical line represents an effect size (*g*) of zero. CI = confidence interval; RE = random effects.



Display full size

Psychological dimensions

The overall effect of stress regulation interventions (28 effect sizes, $k = 10$, $N = 787$) on psychological outcomes was small in magnitude and statistically inconsequential ($g = 0.35$, se = 0.23, 95% CI = −0.12, 0.81; see Supplementary Figure 1). The 95% prediction interval revealed a 95% chance that the effect of a new study will lie between −1.10 and 1.80 (Hedges' *g*). The likelihood ratio tests revealed significant variance in effects between studies (level 3; LRT = 16.98, $p < .001$) but not within studies (level 2; LRT = .03, $p = .86$), which explained 73.64% and 1.30% of the variance, respectively. As there was substantial heterogeneity among effect sizes ($I^2 = 74.94\%$; Higgins et al., Citation2003), we carried out moderator analyses to examine factors that may explain the variance between studies.

Physiological dimensions

The overall effect of stress regulation interventions (28 effect sizes, $k = 10$, $N = 368$) on physiological outcomes was large in magnitude and statistically meaningful ($g = 2.13$, se = 0.81, 95% CI = 0.47, 3.79; see Supplementary Figure 2). The 95% prediction interval revealed a 95% chance that the effect of a new study will lie between −4.07 and 8.32 (Hedges' *g*). The likelihood ratio tests revealed significant variance in effects within studies (level 2; LRT = 138.86, $p < .001$) and between studies (level 3; LRT = 9.75, $p = .002$), which explained 59.72% and 38.47% of the variance, respectively. As there was substantial heterogeneity among effect sizes ($I^2 = 98.19\%$; Higgins et al., Citation2003), we carried out moderator analyses to examine factors that may explain the variance between studies.

Sensitivity tests

We conducted a series of sensitivity tests to examine the influence of outliers and influential studies on the overall pooled effects. In terms of performance outcomes, one study reported one effect whose residual exceeded three standard deviations (Paul & Garg, Citation2012). The overall effect of stress regulation interventions on performance reduced by 0.02 with the removal of this one outlier ($g = 0.50$, se = 0.16, 95% CI = 0.19, 0.82). There were four effects with a Cook's distance more than three times the mean (De Witt, Citation1980; Hall & Erffmeyer, Citation1983; John et al., Citation2011; Lautenbach et al., Citation2015); the exclusion of these outliers reduced the overall effect of stress regulation interventions on performance by 0.09 ($g = 0.43$, se = .15, 95% CI = .13, .73). None of the effects for psychological outcomes had residuals that were more than three standard deviations from the mean. Two effects had a Cook's distance more than three times the mean (Larsson et al., Citation1988; Solberg et al., Citation1996); the exclusion of these outliers reduced the overall effect of stress regulation interventions on psychological outcomes by 0.02 ($g = 0.33$, se = 0.26, 95% CI = −0.19, 0.86). Regarding physiological outcomes, one study reported one effect whose residual exceeded three standard deviations (John et al., Citation2010). The overall effect of stress regulation interventions on physiological outcomes reduced by 0.22 with the removal of this one outlier ($g = 1.91$, se = 0.65, 95% CI = 0.57, 3.24). There were five effects with a Cook's distance more than three times the mean (Choudhary et al., Citation2016; John et al., Citation2010, Citation2011; Kachanathu et al., Citation2013); the exclusion of these outliers reduced the overall effect of stress regulation interventions on performance by 1.01 ($g = 1.12$, se = .47, 95% CI = 0.21, 2.02).

Moderator effects

Results of the moderator analyses for performance and psychological outcomes are provided in Table 2. Statistical power for meta-analytic models involving three or more levels is typically optimised because it maximises the available information (López-López et al., Citation2017), yet it is also important to acknowledge that our moderator tests here are potentially underpowered when levels of the moderator are characterised by one or two studies or effects.

Performance

Of 11 candidates, only one variable moderated the overall effect of stress regulation interventions on performance, namely assessment time point, $F(2, 63) = 12.62$, $p < .001$, such that intervention effects were strongest at second post-intervention ($g = 1.32$, 95%

CI = 0.78, 1.86) when compared with first post-intervention (*g* = 0.44, 95% CI = 0.15, 0.74). The inclusion of this moderator to the overall model, Cochran's *Q*(64) = 322.01, *p* <.001, significantly reduced heterogeneity, yet the residual heterogeneity remained statistically meaningful, *QE*(63) = 247.68, *p* <.001. Model comparisons indicated that the best model in terms of parsimony and fit was the one that included assessment time point as a moderator of the pooled effect (AICc = 153.21, BIC = 161.24), relative to the overall model excluding all moderators (AICc = 163.11, BIC = 169.24). Collectively, these findings supported the meaningfulness of assessment time point as a moderator. All other moderators were statistically inconsequential.

Psychological dimensions

Of 11 candidates, two variables moderated the overall effect of stress regulation interventions on psychological outcomes, namely (i) intervention type, *F*(3, 24) = 4.47, *p* = .012, such that intervention effects were strongest and meaningfully different from zero for biofeedback only (*g* = 1.80, 95% CI = 0.79, 2.81); and (ii) temporal frame, *F*(3, 25) = 5.43, *p* = .005, such that intervention effects were strongest and meaningfully different from zero when the intervention lasted between 1–2 weeks (*g* = 1.80, 95% CI = 0.78, 2.82). The inclusion of these two moderators to the overall model, Cochran's *Q*(27) = 92.47, *p* <.001, significantly reduced heterogeneity, yet the residual heterogeneity remained statistically meaningful, *QE*(22) = 39.89, *p* = .01. Model comparisons indicated that the best model in terms of parsimony and fit was the one that excluded intervention type and temporal frame as moderators (AICc = 57.45, BIC = 60.45), relative to the model that included them as moderators (AICc = 60.02, BIC = 63.10). All other moderators were incompatible with a meaningful effect.

Physiological outcomes

Of 10 candidates, two variables moderated the overall effect of stress regulation interventions on psychological outcomes, namely (i) intervention type, *F*(4, 24) = 11.40, *p* <.001, such that intervention effects were strongest and meaningfully different from zero for biofeedback (*g* = 2.82, 95% CI = 1.70, 3.94) and mindfulness/meditation (*g* = 8.08, 95% CI = 5.82, 10.34); and (ii) theory-informed interventions, *F*(1, 26) = 5.43, *p* = .003, such that intervention effects were strongest and meaningfully different from zero when the intervention was developed with no specific mention of theory as a guide (*g* = 3.95, 95% CI = 2.32, 5.57) compared with theory-informed interventions (*g* = 0.28, 95% CI = −1.36, 1.93). The inclusion of these two moderators to the overall model, Cochran's *Q*(27) = 92.47, *p* <.001, significantly reduced heterogeneity, yet the residual heterogeneity remained statistically meaningful, *QE*(22) = 223.04, *p* <.001. Model comparisons indicated that the best model in terms of parsimony and fit was the one that included intervention type and theory-informed intervention as moderators (AICc = 128.24, BIC = 131.32), relative to the model that excluded them as moderators (AICc = 138.15, BIC = 141.15). All other moderators were incompatible with a meaningful effect.

Assessment of meta-bias

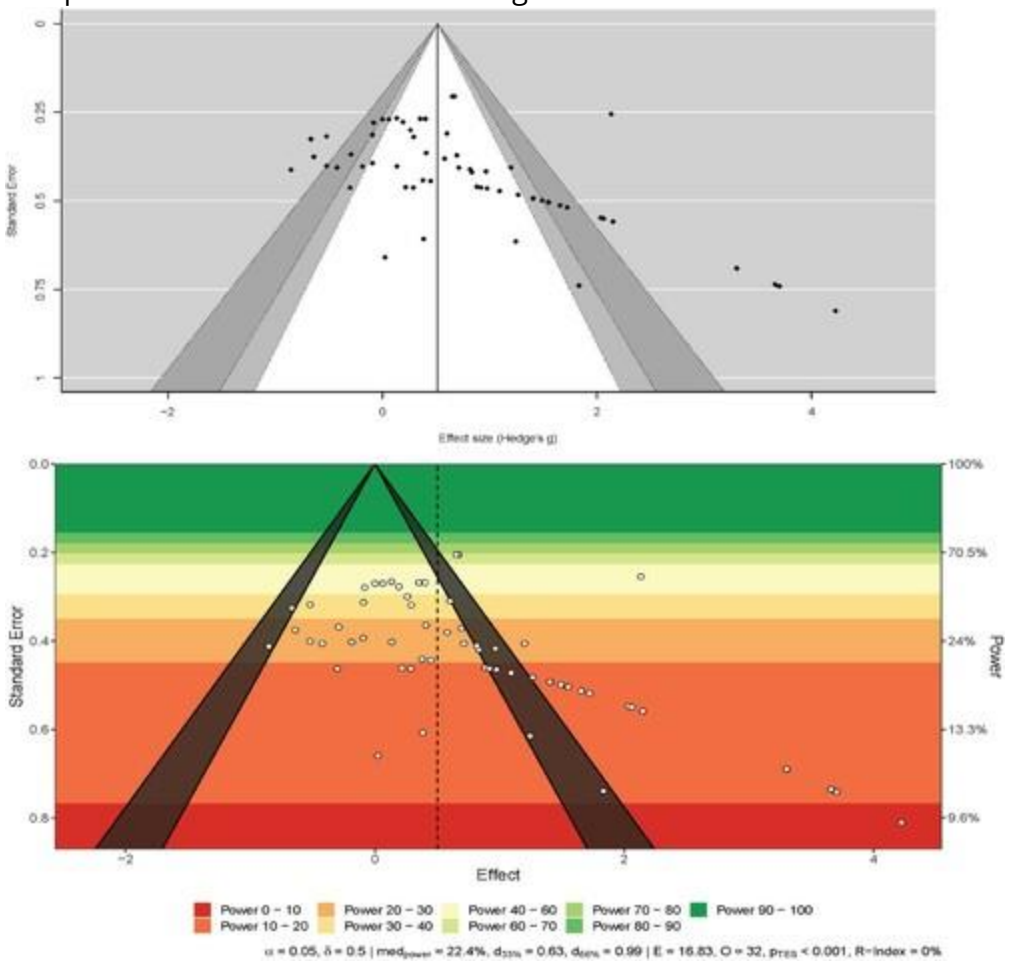
Performance

The multilevel extension of Egger's test, *F* (1,63) = 20.07, *p* < .001, suggested asymmetry in the funnel plot; visual inspection indicates that effects are roughly distributed unevenly on either side of the mean effect, with smaller studies favouring stronger

positive effects of stress regulation interventions on performance (see Figure 3). The sunset enhanced funnel plot depicted in Figure 3 indicated that the median power of all studies is 22.4%, assuming an effect of g = 0.50, and low probability of replication (R-index = 0%). Sample size, $F(1, 63) = 0.18$, $p = .67$, publication status, $F(1, 63) = .91$, $p = .34$, and study quality, $F(1, 63) = 0.002$, $p = .96$, did not alter the strength of effect of stress regulation interventions on performance. The *p*-curve analysis supported evidential value in the summarised literature, with fewer large ($p > .04$) than small ($p \leq .01$) *p* values, with a high power of tests included in the p-curve (97%, 90% CI = 92%, 99%). The visual depiction of the *p*-curve analysis is available on the OSF project page.

Figure 3. Contour-Enhanced and Sunset Plots for Performance Outcomes.

Note: Each dot represents an individual effect size and is plotted as a function of standard error. The vertical line in the contour-enhanced plot represents the random-effects-model estimate ($g = 0.52$). Top panel: light and dark grey triangles denote 95% and 99% confidence intervals, respectively, for the effect sizes, given the absence of publication (or small-study) bias. Bottom panel: significance contours at .05 and .01 levels are noted by dark shaded areas, with discrete colour-coded power regions computed via a two-tailed test with significance at .05.



Display full size

Psychological dimensions

The multilevel extension of Egger's test, $F(1,26) = 3.10$, $p = .09$, suggested symmetry in the funnel plot, which was supported by a visual inspection of the funnel plot (see Supplementary Figure 3). The sunset enhanced funnel plot depicted in Supplementary

Figure 3 indicated that the median power of studies is 24.4%, assuming a true effect of 0.50 (p = .05), and these studies have a low probability of replicating (R-index = 16.7%). Sample size, $F(1, 26) = 1.48$, p = .24, publication status, $F(1, 26) = .51$, p = .48, and study quality, $F(1, 26) = 0.18$, p = .68, did not alter the strength of effect of stress regulation interventions on psychological outcomes. The p-curve analysis supported evidential value in the summarised literature, with fewer large ($p > .04$) than small ($p \leq .01$) p values, with a reasonable degree of power of tests included in the p-curve (78%, 90% CI = 44%, 94%). The visual depiction of the p-curve analysis is available on the OSF project page.

Physiological dimensions

The multilevel extension of Egger's test, $F(1,26) = 27.43$, p <.001, suggested asymmetry in the funnel plot, which was supported by a visual inspection of the funnel plot (see Supplementary Figure 3). The sunset enhanced funnel plot depicted in Supplementary Figure 3 indicated that the median power of studies is 17.6%, assuming a true effect of .50 (p = .05), and these studies have a zero probability of replicating (R-index = 0%). Sample size, $F(1, 26) = 2.15$, p = .15, publication status, $F(1, 26) = 1.68$, p = .21, and study quality, $F(1, 26) = .15$, p = .70, did not alter the strength of effect of stress regulation interventions on physiological outcomes. The p-curve analysis supported evidential value in the summarised literature, with fewer large ($p > .04$) than small ($p \leq .01$) p values, with a high power of tests included in the p-curve (99%, 90% CI = 99%, 99%). The visual depiction of the p-curve analysis is available on the OSF project page.

Risk of bias

We assessed risk of bias on the primary outcome of performance (k = 23) using the RoB2 framework and guidelines (Sterne et al., Citation2019). A summary of all primary studies is depicted in Table 3, whereas individual assessments of each primary study are provided on the OSF project page. Overall bias decisions revealed that 21 outcomes were rated as having some concerns, primarily due to none of these studies being pre-registered. In terms of high risk of bias, two outcomes received the highest risk rating (Choudhary et al., Citation2016; Greenspan, Citation1991). The main sources of bias identified for these two studies were: (1) not pre-registering the protocol, (2) concerns regarding the measurement of performance, and (3) deviations from the intended intervention. For the 21 outcomes assessed as having some concerns, the main sources of bias related to the randomisation process (15 out of 21) and selection of the reported results (21 out of 21). The major reasons outcomes received this rating were due to (1) limited details presented on the randomisation of participants to experimental groups and (2) not preregistering the protocol.

GRADE assessment

An overview of our assessment of quality of evidence contributing to the analyses of the effects of stress regulation interventions using the GRADE system is presented in Table 4. We assessed the overall level of certainty of evidence that stress regulations positively affect performance and psychological outcomes as low. This assessment was due to serious concerns regarding risk of bias outlined above, inconsistency in point estimates of effects and non-overlap in several confidence intervals, large degree of between-study heterogeneity, and a small risk of reporting bias because we were unable to access data for four studies.

Narrative synthesis of stress regulation interventions

All details of the data extracted from each study, according to the 12 TIDieR dimensions (Hoffmann et al., Citation2014) is provided on the OSF project page. We summarise the findings of this review below, with a specific focus on dimensions that characterise the nature of stress regulation interventions within all 23 eligible papers. This narrative synthesis focuses on the core methodological items in the TIDieR checklist, namely items 3–9 (Dirven et al., Citation2020).

Materials used to deliver stress regulation interventions

The majority of studies utilised materials to administer interventions ($k = 22$). In 14 studies, the materials utilised technology (e.g. a cassette, computer, audio recording) to assist with the delivery of stress regulation interventions. Music was delivered via a CD in three studies as a relaxation / mindfulness device, whereas four studies used biofeedback devices to capture physiological data to assist with the delivery of the intervention. There were eight studies that used workbooks or handouts ($k = 5$) or diaries ($k = 3$) as part of the intervention delivery to guide and inform participants about the stress regulation process. The remaining study did not utilise intervention materials (Pelka et al., Citation2017).

Stress regulation intervention providers

The majority of eligible studies ($k = 16$) reported details on who delivered the intervention, yet the information provided was often vague and limited in detail. The primary reason for this interpretation is that limited information was provided on these individuals with regard to their suitability to deliver a stress regulation intervention (e.g. expertise, training); for example, authors often described intervention providers as the experimenter(s) and/or researcher(s) ($k = 11$). There were seven studies where there was no mention of the intervention provider (e.g. Choudhary et al., Citation2016; Hall & Erffmeyer, Citation1983). There were only five studies identified where adequate and detailed information on the providers of the intervention was reported, such as the delivery of the intervention by a licensed/registered psychologist, the psychologist's experience working with athletes, and their involvement throughout the intervention process (e.g. Glass et al., Citation2019; Greenspan, Citation1991).

Mode of delivery

Most studies provided interventions via face-to-face delivery ($k = 19$); seven of these studies were delivered individually and 12 studies were delivered in a group setting. The remaining four studies consisted of interventions that were completed individually in the participants' own time (e.g. listened to a relaxation cassette or completed a Stress Inoculation Manual). In one study, the self-talk manual was emailed to participants for self-completion (McCormick et al., Citation2018).

Dosage of stress regulation interventions

Most studies ($k = 21$) delivered the intervention across multiple sessions or time points; the remaining two studies delivered a booklet/manual to participants in one session (McCormick et al., Citation2018; Serrano, Citation1993). We assessed three criteria to characterise the dosage of interventions, namely time spent in the stress regulation intervention, total study duration, and the number of sessions/temporal frame over which the intervention occurred. All studies reported information for at least one for these areas, with 21 (91%) reporting sufficient detail for all dimensions, and the

remaining two studies reporting one out of three criteria (Balk et al., Citation2013; Serrano, Citation1993). In terms of the temporal frame over which stress regulation interventions occurred, the majority of sessions took place for six weeks ($k = 5$) or for one session ($k = 5$). The remaining studies ($k = 13$) varied in their temporal frame from two sessions (Whitmarsh, Citation1992) to 12 weeks (Grange & Ortiz, Citation2006). Information on the total study duration was reported in the majority of eligible studies ($k = 22$), with time ranging from less than one hour to 720 min. The actual time spent taking part in the stress regulation intervention was reported by the majority of eligible studies ($k = 21$), where total time ranged between 20 min to 75 min ($M_{mins} = 37$, $SD = 18.06$).

Active ingredients of stress regulation interventions

We used the Behaviour Change Technique (BCT) Taxonomy (Michie et al., Citation2013) to examine the active ingredients implemented in the stress regulation interventions of the eligible papers (see Table 5). The most commonly reported behaviour change techniques reported were: (i) behavioural practice/rehearsal ($n = 13$); (ii) self-belief, including mental rehearsal of successful performance, focus on past performance, and/or self-talk ($n = 11$); (iii) regulation, including techniques that target reduced negative emotions ($n = 8$); and (iv) shaping knowledge, which consists of instructions on how to perform the behaviour and/or information about antecedents ($n = 8$). There were seven studies which targeted self-monitoring of behaviour or biofeedback as a mechanism for behaviour change (e.g. Choudhary et al., Citation2016; McCormick et al., Citation2018). Overall, our analysis revealed a wide range of active ingredients present in stress regulation interventions with athletes.

Discussion

Stressors are prevalent within sport settings (Arnold et al., Citation2013; Sarkar & Fletcher, Citation2014), hence interventions are essential to enable athletes to regulate their engagement with such experiences optimally (Brown & Fletcher, Citation2017). Valuable evidence acquired via a narrative synthesis of the literature up to 2010 revealed support for the positive effects of cognitive, multimodal, and alternative approaches for stress regulation interventions on performance outcomes for athletes (Rumbold et al., Citation2012). Nevertheless, this summation of the literature is limited by the reliance on statistical significance for interpretations regarding the value of such work, mixing of non-experimental with experimental evidence, and inclusion of published work only. We addressed these limitations in the current study via a systematic review of the literature on stress regulation interventions and meta-analysis of randomised controlled experiments to estimate the magnitude of their effectiveness, the types of interventions that are most effective, and the conditions in which and athletes for whom we might expect the strongest effects. In so doing, we present the first statistical summary of the effectiveness of stress regulation interventions for optimising athlete performance.

Are stress regulation interventions effective for optimising athlete performance?

Across 21 randomised experiments, we found a significant moderate overall effect of stress regulation interventions on performance outcomes ($g = .52$). This estimate is comparable with the summary effect reported in a previous meta-analysis of

psychological, social, and psychosocial interventions with sport performers (*g* = .57; Brown & Fletcher, Citation2017). Sensitivity and meta-bias analyses generally supported the robustness of the pooled effect of stress regulation interventions on athlete performance. Considered in combination with existing narrative evidence (Rumbold et al., Citation2012), this pooled effect offers an optimistic view regarding the effectiveness of stress regulation interventions for athlete performance. Nevertheless, caution is urged when making inferences regarding the extent to which this summary effect generalises to future studies of a similar nature to those encompassed by our statistical synthesis because the prediction intervals suggested some interventions may be inefficacious or detrimental for athlete performance. In other words, the summary effect reported here may represent an overestimation and, therefore, a true null effect of stress regulation interventions on athlete performance in future experimental trials cannot be discounted.

Our assessments of heterogeneity, meta-bias and risk of bias, methodological quality, and the overall quality of the evidence point towards several possibilities why there may be substantial noise and imprecision in the overall pooled estimate of the effect of stress regulation interventions on athlete performance. Prediction intervals may incorporate heterogeneity in the effect sizes and the quality of studies synthesised (Riley et al., Citation2011). Any biases in primary studies (e.g. poor statistical power) are, therefore, included in the calculation of the prediction interval (Higgins & Green, Citation2011). Substantively, we synthesised a diverse range of stress regulation interventions so there likely is some degree of heterogeneity in the primary effects because of this diversity in the nature of stress regulation interventions. Examples of this variability in the magnitude of effects of specific psychological interventions can be found in terms of mindfulness (SMD = 1.35; Bühlmayer et al., Citation2017), self-talk (*d* = .48; Hatzigeorgiadis et al., Citation2011), biofeedback (*g* = .90; Lehrer et al., Citation2020), or multimodel programmes (*g* = .57; Brown & Fletcher, Citation2017). Variability in elements of the primary studies synthesised in our statistical model as moderators have also likely contributed to the heterogeneity in effect sizes, including sample characteristics (i.e. age, gender), comparator groups (e.g. active control, waitlist), and intervention characteristics (e.g. active ingredients). We also cannot rule out the possible influence of contextual factors of primary studies that we were unable to extract from the information reported in the manuscript (e.g. degree of participants' engagement with the intervention).

Study quality is another important consideration for interpretations of pooled meta-analytic estimates. Our risk of bias assessment indicated all included studies had 'some concerns' or 'high risk'. The main areas of concern related to the randomisation process (e.g. limited details presented on the randomisation of participants to control or experimental groups) and selection of the reported results (e.g. little or no information on the data analyses executed). Randomisation, for example, is the hallmark of high-quality experimental trials, because it reduces selection bias when the allocation sequence is unpredictable and unknown to investigators who enrol participants into a trial (Schulz et al., Citation2010). It is important for scholars to provide such detail on intervention procedures in future research so that findings are transparent, replicable, and enhance understanding in the field. Perhaps most pivotal, our sunset funnel plots indicated that the available evidence in primary studies identified via our systematic

search is insufficiently powered to detect meaningful effects if they exist, and that the pooled effect might be considered a false positive. This finding is consistent with previous snapshots of the sport and exercise psychological literature in which it was revealed that statistical power in this field is often insufficient to detect effects of a magnitude considered typical for psychological research (Schweizer & Furley, Citation2016). Our findings reinforce the importance of justifications for sample sizes in future research so that readers can evaluate the degree to which a study finding is informative (Lakens, Citation2021).

Which type of stress regulation interventions are most effective?

We examined a broad array of substantive and methodological moderators of the effectiveness of stress regulation interventions as a means by which to shed light on boundary conditions. A key consideration in this regard is the substantive focus and content of the stress regulation intervention itself, because this information can offer insights into which ingredients or package of ingredients are most effective for optimising athlete performance. Visual inspection of the individual effect sizes for each intervention suggested that some approaches were more effective than others (see Table 2), yet moderator analyses indicated that the inclusion of intervention type as a predictor of the overall pooled effect was statistically inconsequential and therefore inconclusive. The most likely explanation here is that we were underpowered to detect a meaningful moderator effect, with some intervention categories encompassed by one or two studies or effects. Low statistical power for detecting moderator effects in meta-analyses is common within the psychological sciences (Cafri et al., Citation2010). Harnessing theories of human behaviour optimises intervention development because they help clarify the complexities of behaviour change (e.g. causal determinants, mechanisms of action; Bohlen et al., Citation2020). Theory also provides expectations regarding core concepts and their integration within a nomological network including core determinants, mechanisms, and boundary conditions that ultimately optimises cumulative science and effective practice (Muthukrishna & Henrich, Citation2019). Our narrative synthesis of stress regulation interventions identified limited coherence in or absence of theoretical approaches driving behaviour change techniques utilised within existing stress regulation interventions. In only 9 of 23 cases, the study authors reported the use of psychological theory to guide their intervention approach, which included theories or conceptual models of mental practice (Sackett, Citation1934), person-situation interactions (Smith & Rohsenow, Citation1987), and stress and coping (Lazarus & Folkman, Citation1984). Nevertheless, the translation of guiding theory into intervention design was reported sufficiently in only two of these nine papers (Greenspan, Citation1991; Larsson et al., Citation1988). Larsson and colleagues (Citation1988), for example, leveraged Lazarus and Folkman's theory of stress and coping as a means by which to apply stress inoculation training via elements of problem identification, psychoeducation, and skills training (e.g. cognitive restructuring, relaxation) and their application and refinement in simulated competitive performances. Equally, there were instances of misalignment between an overarching theoretical framework and the BCTs employed in the intervention. As an illustrative example, Whitmarsh (Citation1992) referred to neurobiological theories of pain but implemented a Stress Inoculation Training intervention which targeted a reduction in negative emotions, behavioural practice/rehearsal, and mental rehearsal. The plethora

of competing alternative (yet oftentimes complementary) theoretical perspectives in the behavioural sciences, particularly within the domain of stress (Harris, Citation2020), represents a salient challenge for scholars interested in developing theory-informed interventions (Hastings et al., Citation2020). Integrative work is underway that leverages ontological modelling systems to unify knowledge of entities (e.g. concepts, objects, events) across disciplines (West et al., Citation2019). One consideration for future work is the need to develop a taxonomy of key concepts in theories of stress, mechanisms of action, and potential intervention targets.

What are the conditions in which and for whom are stress regulation interventions most effective?

Our statistical and narrative analyses provided new knowledge on substantive and methodological boundary conditions of the effectiveness of stress regulation interventions for athlete performance. We extracted information on and statistically tested features of the testing context (i.e. low versus high stress, assessment time point, outcome assessment method, comparator group), sample characteristics (i.e. age, gender), and intervention features (i.e. materials, provider, delivery mode, temporal frame, delivery duration, intervention time). Of these factors, only assessment time point was a salient moderator of the overall pooled effect of stress regulation interventions on athlete performance, such that effects were strongest at second post-intervention (g = 1.32, 15 effects) when compared to first post-intervention (g = .44, 78 effects). This finding is comparable with a previous meta-analysis of psychological, social, and psychosocial interventions with sport performers, where it was found the effect on performance was strongest at second post-intervention (g = 1.16), when compared with first post-intervention (g = .57; Brown & Fletcher, Citation2017). The assessment of the primary outcome at first post-intervention was measured firstly after the intervention occurred (k = 15), one-week after the intervention occurred (k = 2), or throughout the intervention over a 3-month period (k = 2). The assessment of the primary outcome at follow-up was measured one month after the completion of the experiment (Paul et al., Citation2012; Paul & Garg, Citation2012) or post-season (Larsson et al., Citation1988). This finding makes intuitive sense as stress regulation techniques likely take time for athletes to apply and learn in the 'real world' where stressors are prevalent in their training and competition schedules. The majority of interventions captured in our statistical synthesis aimed to teach athletes' self-regulatory skills in dealing with stressors (e.g. Glass et al., Citation2019; Larsson et al., Citation1988) which, like any skill, take time to practice and learn (Côté et al., Citation2012). Thus, providing athletes with opportunities to apply in an iterative fashion strategies to optimise their engagement with stressors learned during the intervention phase is likely to augment maintenance effects.

Strengths, limitations, and future research

Key strengths of this systematic review and meta-analysis of stress regulation interventions are the prioritisation of randomised controlled trials as the evidence source, statistical and narrative synthesis of intervention effectiveness, pre-registration of our protocol using PRISMA-P (Shamseer et al., Citation2015), accommodation of dependence among effect sizes within a three-level meta-analytic framework, tests of several moderators or boundary conditions of the effectiveness of stress regulation

interventions, and examination of the active ingredients of each intervention. Nevertheless, there are several limitations of the primary studies synthesised here and methodological approach that need to be considered when interpreting the findings and assessing the contribution to theory and practice. First, our evaluations of study quality indicated that, overall, the strength of evidence is poor and therefore interpretations of the pooled effect summarised require caution. We identified several weaknesses of the methodological features of primary studies that can inform future research on stress regulation interventions with athletes (e.g. randomisation process, statistical power). Second, methodological reporting was often inadequate thereby limiting our ability to test potentially interesting moderators of the effectiveness of stress regulation interventions on athlete performance that may have meaningfully accounted for unexplained heterogeneity. For example, the absence of an overarching theoretical framework in most studies meant it was impossible to test the differential effectiveness of specific types of stress theory (e.g. biopsychosocial versus psychological). The need and guidelines for high-quality reporting of methodological procedures has improved considerably over the past decade, with checklists available for the reporting of trials (CONSORT; Schulz et al., Citation2010) and intervention components (e.g. TIDieR; Hoffmann et al., Citation2014). We encourage scholars in the field of sport and performance psychology to engage proactively with such guidelines and checklists to optimise the conception and reporting of high-quality randomised controlled trials (Moher et al., Citation2001; Turner et al., Citation2012). Third, roughly half of the eligible studies ($k = 10$) tested the effectiveness of the target interventions on athlete performance in high stress scenarios; it is essential that stress regulation interventions are evaluated in future research in settings where the acquired knowledge and skills are required most to maximise the congruency between concept and method. In other words, we require fewer experimental scenarios and greater real-life scenarios. Fourth, there also is a need to broaden the substantive focus of interventions and conceptual work on stress regulations for athlete performance to encompass organisational stressors, with this element of the occupational context representing an ever prominent consideration for the modern athlete (Arnold et al., Citation2013; Citation2017) yet absent from the primary research identified via our systematic review. Finally, our search protocol focused on stressor experiences broadly rather than specific situations or events (e.g. pressure, injury), so our findings reflect knowledge of holistic interventions rather than interventions tailored to specific situations (e.g. pressure training; Low et al., Citation2021).

Conclusion

Stress regulation is pivotal to optimising athletic performance. The findings of this systematic review and meta-analysis offer an optimistic outlook on the effectiveness of stress regulation interventions for athlete performance, yet they underscore several key areas for strengthening in future research. These considerations cover conceptual (e.g. taxonomies of stress regulation techniques) and methodological (e.g. reporting transparency, statistical power) issues. Addressing these considerations in future work will enhance the evidence-based upon which practitioners can develop stress regulation interventions that are most effective for performance in ways that tailored to context and person.

Appendix D. Published Journal Article

STRESS & HEALTH

The effectiveness of self-distanced versus self-immersed reflections among adults: Systematic review and meta-analysis of experimental studies

Abstract
Stressor events can be highly emotional and disruptive to our functioning, yet they also present opportunities for learning and growth via self-reflections. Self-distanced reflections in which one reasons about target events in ways that maximise their removal of the current self from the experiential reality are said to facilitate this reflective process. We tested the expectation that self-distanced reflections offer an advantage over self-immersed vistas via a pre-registered systematic review of seven electronic databases (Scopus, Medline, Web of Science, PsycInfo, CINAHL Plus, Embase, and ProQuest Dissertations and Theses Global) to identify experimental tests with adults aged 18–65 years where the focus of the reflection was a stressor or adverse event that participants had already experienced. A three-level, random effects meta-analysis of 25 experiments (N = 2,397, 68 effects) revealed a small-to-moderate advantage of self-distanced reflections (g = 0.19, SE = 0.07, 95% CI [0.05, 0.33]) and were most effective when they targeted a stressor experience that emphasised one's emotional state or lifetime. Nevertheless, our assessment of the overall quality of evidence including risk of bias suggested uncertainty regarding the benefit of this pragmatic self-regulatory tactic and therefore the need for future high-powered, high-quality experiments.

1 INTRODUCTION

Stressor events are typically viewed as being negative in nature, yet in some instances can provide opportunities for self-insight and personal growth. Stressor events are characterised by high levels of novelty, disruption, and/or criticality (Morgeson et al., 2015). Depending on their intensity and frequency as well as emotional significance, stressor events typically pose heightened vulnerability to maladaptive outcomes and therefore demand the deployment of resources to minimise or mitigate their effects on one's functioning (Luhmann et al., 2021). Viewed from a transactional (Lazarus & Folkman, 1984; Obbarius et al., 2021) person-situation interactionist perspective (Lazarus, 2006), stressor events contain situational cues that individuals cognitively process in relation to salient personal factors (e.g., traits, resources, goals). Introspection and reflection are among the primary means by which people interrogate or psychologically filter autobiographical lived experiences of stressors (Teasdale et al., 2002). The way individuals engage with introspection and reflection can be adaptive (e.g., decreased negative affect, reduced levels of stress; Glass et al., 2019; Soliday et al., 2004) or maladaptive (e.g., increase rumination, increase levels of aggression) for human functioning. Understanding strategies that prompt adaptive forms of self-reflection remains an important avenue for future research.

One important consideration for self-reflection is the vantage point from which individuals frame their (re)appraisal of autobiographical stressor experiences. From an emotion regulation standpoint, reinterpretation and distancing are the two main reappraisal tactics (Ayduk & Kross, 2010; Kross & Ayduk, 2011). Distancing occurs when individuals reason about target events in ways that maximise their removal of the current self from the experiential reality. Doing so allows for reinterpretation (or reconstrual) to occur whereby individuals generate new or alternative meaning from the event. Meta-analytic data supports the superiority of distancing as an emotion regulation strategy (Webb et al., 2012). Individuals can utilise any combination of four distancing methods, namely by taking a perspective (i) that is more *spatially* distant from the stimulus; (ii) in which the stimulus is *temporally* distant from their current self; (iii) in which the stimulus represents a *hypothetical* scenario; and (iv) that is *objective* in nature akin to an imagined observer, neutral party, or contextually salient

professional (Powers & LaBar, 2019). Irrespective of the dimension applied, increasing distance of the current self from the target event prompts more abstract interpretations or cognitive processing (Trope & Liberman, 2010). In so doing, distanced appraisals of target events engage processes of affective self-reflection and cognitive control that help shape new affective responses that are neutral or adaptive in nature (Powers & LaBar, 2019). Meta-analytic data supports psychological distancing as an effective, versatile tactic that can be used by individuals when engaging with reflection of stressor events (Moran & Eyal, 2022).

If self-distancing is an effective, versatile tactic for analysing target events or experiences, particularly those negative in valence, doing so should be superior to the natural opposite in which one adopts an immersed vantage point. Self-immersed reflections occur when individuals visualise target events via a first-person experience, as if they were reliving the event through their own eyes; thus, there is an absence of psychological distancing from the event (Dorfman et al., 2021). For example, individuals may reflect as if they were retelling the event to a news reporter. Self-immersed memories are emotion-laden because individuals relive the experience and the activation of emotional states directly (Mcisaac & Eich, 2002; Williams & Moulds, 2007). Comparatively, reflecting from a distanced perspective with an objective focus prompts the individual to consider target events from a third person perspective, encouraging them to 'step back' psychologically from the experience (Grossmann et al., 2021; Kross et al., 2005). For example, they may adopt the perspective of their sport coach on the sidelines, watching themselves engaging in the experience. Narrative reviews of the literature (Kross & Ayduk, 2017) and meta-analytic data (Moran & Eyal, 2022) support the adaptive nature of self-distanced reflections relative to self-immersed perspectives. Self-distanced reflections optimise emotional (e.g., reduced negative emotions and momentary distress; Kross & Ayduk, 2008, 2017; Penner et al., 2016) and cognitive (e.g., increased reconstrual and decreased recounting of the stressor event; Kross & Ayduk, 2008) states in the short- and long-term. Self-immersed reflections, in contrast, typically produce negative emotional (e.g., increased emotional activation; Ayduk & Kross, 2010; Kross & Ayduk, 2008) and cognitive (e.g., depressive rumination; Ayduk & Kross, 2010; Kross & Ayduk, 2008) outcomes. Collectively, therefore, the available evidence suggests that a self-distanced vantage point is superior to a self-immersed vista.

Despite the apparent effectiveness of self-distanced reflections relative to self-immersed reflections, several unanswered questions remain regarding the nature of their effectiveness. First, what is the magnitude of the differential effectiveness between self-distanced and self-immersed reflections on human functioning beyond that of emotional states (Moran & Eyal, 2022)?[1] Knowledge of the magnitude of an effect via a point estimate and/or a range of plausible values is essential for generating high-quality theoretical summaries and avoids the imprecision and potential falsification that directional hypotheses convey (Edwards & Christian, 2014). Second, what is the nature of self-distanced reflections that offer the greatest adaptiveness for important outcomes? The content and structure of effective reflections is limited to broad descriptions of the nature of the perspective adopted (e.g., a third-person perspective, reliving the experience; Kross & Ayduk, 2008), making it challenging to ascertain how best to execute a psychologically distanced perspective. Accordingly, there is a need to interrogate the descriptions of reflection interventions in ways that clarify the active ingredients and mechanisms by which these different strategies are delivered to inform guidelines for best practice. Third, what other features of people and contexts in which they are examined alter the magnitude of differential effectiveness between self-distanced and self-immersed reflections? Evidence regarding the effectiveness of reflection interventions is somewhat contradictory, with some findings supportive of the adaptive (e.g., Grossman et al., 2021) or maladaptive (e.g., Giovanetti et al., 2019) nature of self-distanced reflections, as well as mixed effects (e.g., Fuentes et al., 2021). Thus, there is a need to examine these differential effects according to key features of the target populations, interventions, and contexts. Meta-analytic investigations are well positioned to alleviate the impracticalities inherent with individual studies that make it challenging to test multiple considerations robustly (e.g., statistical power). Doing so has important implications for theory (e.g., boundary conditions) and practice (e.g., tailor instructional sets to different audiences).

We seek to generate evidence on these unanswered questions regarding the effectiveness of self-distanced reflections via a systematic review and meta-analysis of experimental comparisons of these two vantage points. We expected self-distanced reflections to be superior to self-immersed reflections across all outcome categories (e.g., cognitive, affective), with magnitude of this difference likely small-to-moderate in nature ($g < 0.40$; Moran & Eyal, 2022). Regarding the nature of self-distanced reflections and the people and contexts that may augment the differential effectiveness of these two vantage points, we approached this task in an exploratory manner in the absence of robust evidence to generate hypotheses with confidence. Meta-analyses are advantageous in this regard because they permit tests of substantive and methodological factors that are often challenging to implement within individual studies (e.g., resources).

2 METHODS

The protocol for this systematic review and meta-analysis was registered on 2 August 2021 via the Open Science Framework (OSF; https://osf.io/rx3zw), using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis-Protocol template (PRISMA-P; Shamseer et al., 2015). This document is reported in accordance with the PRISMA 2020 guidelines (Page et al., 2021). Broadly, our methodological and analytical decisions were informed by best practice guidelines for meta-analysis; interested readers are referred to these guidelines for detailed information on specific elements of our methods (e.g., Moreau & Gamble, 2020 Steel et al., 2021).

2.1 Literature search

EM conducted the systematic search from inception until 3 August 2021 via the following databases to capture relevant studies: Scopus, Medline, Web of Science (core collection), PsycInfo, CINAHL Plus, Embase, and ProQuest Dissertations and Theses Global. The search strategy adopted for each database consisted of the following combination of search terms: (adult*) AND ('self distance*' OR 'perspective taking' OR 'psychological distance' OR 'distanced analysis' OR 'self perspective' OR 'third person') AND (intervention OR experiment* OR train* OR trial OR programme* OR random*). Full details of the search protocol are provided in our registered PRISMA-P document. We also manually completed a forward and backward search of eligible studies on 15 November 2021.

2.2 Eligibility criteria

We considered studies for inclusion if they (i) experimentally tested the effectiveness of self-distanced reflections against self-immersed reflections to maximise knowledge on causal effects; (ii) sampled adults aged 18–65 years; and (iii) the focus of the reflection was a stressor or adverse event that participants had already experienced. We excluded papers when (i) they utilised non-experimental designs (e.g., longitudinal, quasi-experimental); (ii) participants completed two or more forms of reflections sequentially (e.g., within-subjects design); (iii) assessed 'spontaneous' rather than experimentally manipulated forms of reflection; (iv) sampled participants with a known medical or health condition; (v) the article was written in any language other than English; (vi) the full-text was unavailable via our university library subscriptions, digital repositories (e.g., ResearchGate), or directly from the corresponding author (i.e., two email requests/reminders, separated by 2 weeks); and (vii) the results were published as a conference abstract rather than a full-text (e.g., dissertation, pre-print) because they are often poorly reported (e.g., Hopewell & Clarke, 2005).

2.2.1 Population

Apparently healthy adults were the focus of this systematic review, that is, individuals (i) aged 18–65 years with (ii) who have no existing health or medical conditions. We decided to exclude samples with a known medical or health condition, particularly individuals with a diagnosed mental illness, because they likely had been exposed to distancing in some shape or form within their therapeutic work (e.g., Acceptance and Commitment Therapy; Zettle & Hayes, 1987). Additionally, our confidence in the quality of evidence and strength of recommendations within the eligible body of work would be diminished when there are substantial differences in the population, intervention, or outcome, particularly 'whether biological or social factors are sufficiently different that one might expect substantial differences in the magnitude of effect' (Guyatt et al., 2011, p. 1303).

2.2.2 Intervention

We focussed on self-distanced reflection interventions where researchers experimentally manipulated individual reflections on a past stressor or adverse experience from a third person perspective; we made no restrictions on the characteristics of stressor or adverse events, such as the temporal focus (e.g., daily or lifetime) or type of event (e.g., everyday stressor or traumatic event). For the purposes of this review, we expected that interventions would be characterised in ways that align with the definition of self-distancing, namely a 'process in which a narrow egocentric focus on the experience in the here and now is diminished and, instead, a focus on the bigger picture is promoted' (Kross & Ayduk, 2017; Orvell et al., 2019).

2.2.3 Comparison

We considered comparators only when they required participants to execute a self-immersed reflection, whereby self-relevant events and emotions are experienced in the first person (Nigro & Neisser, 1983) as if they were reliving the experience firsthand.

2.2.4 Outcomes

Guided by a narrative review of the literature on self-distanced reflections (Kross & Ayduk, 2017), we focussed broadly on adults' cognitions (e.g., recounting vs. reconstruals, cognitive control), affective states (e.g., positive or negative affect), physiological states (e.g., indices of stress), and behaviour (e.g., risk-taking) as primary outcomes.

2.3 Article screening

References identified via the electronic database were imported into a citation management programme (Endnote) and subsequently exported into Research Screener (https://researchscreener.com), a web application that allows titles and abstracts from papers that have been extracted from databases to be screened using machine learning. Evidence supports the utility of Research Screener for semi-automating the screening process (Chai et al., 2021). The machine learning algorithm initially ranks the included abstracts from papers in order of significance based on seed articles supplied by the user. We utilised five seed articles for the purposes of this review (Dorfman et al., 2021; Giovanetti et al., 2019; Grossmann et al., 2021; Kross & Ayduk, 2008; Kross et al., 2005) because they targeted our key areas of interest and captured the breadth of research we wished to examine. The machine learning algorithm is updated every 50 abstracts screened based on what is deemed as in/eligible by the reviewer. EM screened 50% of the total abstracts (n = 5075); EM flagged no articles for full text review in the final 26 rounds of 50 articles (n = 1300). A second reviewer [MC] used Research Screener to screen 20% of the total sample (n = 2030); EM and MC discussed discrepancies and when a decision was unable to be made based upon the title and abstract the paper was retained for full text review. Two reviewers [EM and MC] conducted the full text review stage separately, with a separate member of the research team [DG] judging the eligibility of studies when there was a disagreement. A visual depiction of the article screening and selection process is presented in Figure 1.

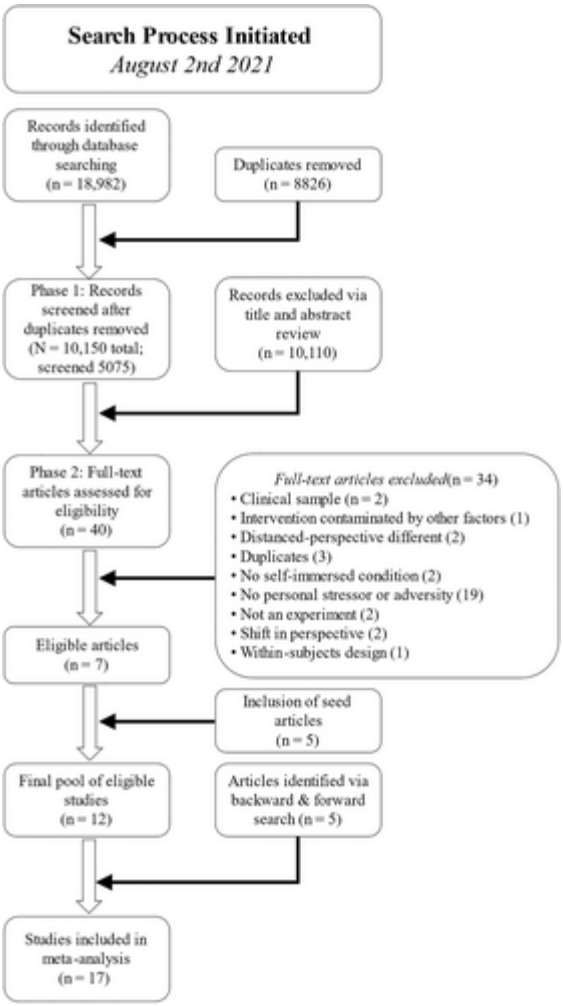


FIGURE 1
PRISMA flow diagram

2.4 Data extraction

EM extracted the relevant data from the included studies using a pre-determined form or requested information from the corresponding author of eligible studies when data were unavailable in the full text, with up to two reminder emails each 7 days apart. DG assessed 50% of data extraction forms to ensure the data was entered correctly and consistently. We extracted data to calculate the relevant effect size and characterise the sample (age, gender), study location, outcome type (cognitive, affective, physiological, behavioural, social), outcome method (subjective, informant-reported, objective), target event for reflection (generic stress or adversity, emotional stress or adversity, discrimination), temporality of the target event (daily, recent, lifetime), magnitude of the target event (low-to-moderate, high), intervention provider (experimenter, not reported), manner by which participants completed the reflection (written down vs. cognitively processed only), mode of delivery (face-to-face, self-directed), time spent reflecting (min), temporal frame of the entire intervention, delivery duration (min), publication type (peer-reviewed manuscript vs. dissertation), outcome assessment point (post-intervention or follow-up), and risk of bias (see below). The complete data extraction sheet is located on the OSF project page (https://osf.io/wtk47/).

2.5 Statistical analyses

2.5.1 Calculation of effect sizes

We statistically synthesised the eligible studies by calculating the standardised mean difference corrected for relative sample size (Hedge's *g*), which allowed for each outcome variable to be compared across studies. To calculate the estimate of effectiveness between self-distanced and self-referenced reflections, we extracted means, standard deviations, and sample sizes of groups using established formulas for pre-

post (Morris, 2008) and post-only (Borenstein et al., 2009) designs. We coded effects so that positively signed effects represented the superiority of the self-distanced reflection group, relative to the nature of the specific outcome of interest, such that we reversed coded effects for outcome variables where lower scores reflect a more positive or adaptive state (e.g., depressive symptoms). In cases where means and standard deviations were unavailable within the paper or via data requests from the authors, we used *F* statistics or *t* scores to calculate the effect size if available (Borenstein et al., 2009). The final dataset is available on the OSF project page.

2.5.2 Statistical synthesis of effect sizes

We utilised a three-level, random effects meta-analysis model with restricted maximum likelihood estimation to test the overall pooled effect and the differential effectiveness of self-referenced reflections via meta-regression. Three level models enable analysts to accommodate non-independence among effects (e.g., multiple indicators of cognitive outcomes within the same study) by decomposing the total random variance into sampling variance (Level 1), and heterogeneity of effects within studies (Level 2) and between studies (Level 3) (Cheung, 2014). Our overarching analytical approach is informed by guidelines for conducting three-level meta-analysis (Gucciardi et al., 2021). We utilised the *metafor* (Viechtbauer, 2010), *metaviz* (Kossmeier et al., 2020), *dplyr* (Wickham et al., 2021), *cowplot* (Wilke, 2020), and *ggplot2* (Wickham, 2016) packages in the *R* statistical platform (R Development Core Team, 2019) to analyse and visualise the data. The full analytical script is available on the OSF project page.

2.5.3 Moderator, sensitivity, and meta-bias analyses

Utilising a meta-regression approach that was informed by guidelines for reporting interventions (Hoffman et al., 2014), we examined 12 moderators of the effect of self-reflection interventions on the primary outcomes including outcome type, outcome method, target event for reflection, temporality of the target event, magnitude of the target event, intervention provider, manner by which participants completed the reflection, mode of delivery, time spent reflecting, temporal frame of the entire intervention, delivery duration, and outcome assessment point. Our moderator analyses are best considered exploratory rather than confirmatory in nature as we excluded a priori predictions in our pre-registered protocol; nevertheless, we use an adjusted alpha ($p < 0.01$) to control for Type I error rates because we assessed 12 different moderators (Borenstein et al., 2009). As assessments of the sensitivity of the overall pooled effect to outliers, we considered effects with large residuals (three standard deviations greater than the mean) or Cook's distance (three times the mean; Viechtbauer et al., 2010). For meta-bias, we examined the moderating effect of publication type, risk of bias, and the multilevel extension of Egger's test (Fernández-Castilla et al., 2021). As an alternative estimation of publication bias, we utilised power-enhanced (sunset) forest plots via the *metaviz* package (Kossmeier et al., 2020) to visualise effect sizes against their standard errors (Kossmeier et al., 2020).

2.5.4 Statistical heterogeneity

We estimated statistical heterogeneity using I^2 (proportion of total variance in effect estimates that is due to heterogeneity rather than sampling error; Higgins et al., 2003) and its multilevel extension, namely $\hat{I}^2_{(2)}$ (estimate of heterogeneity effects within samples; a value of zero is indicative of no heterogeneity) and $\hat{I}^2_{(3)}$ (estimate of heterogeneity effects between samples; a value of zero is indicative of no heterogeneity). Consistent with recommendations (IntHout et al., 2016), we calculated a complementary assessment of between-study heterogeneity using 95% prediction intervals to compute the range in which the effect of estimates of future studies will lie.

2.5.5 Confidence in cumulative evidence

EM and DG assessed the quality of evidence and strength of recommendations within the eligible body of work using the GRADE approach across the domains of consistency in the magnitude of effect (e.g., visual and statistical inspection of heterogeneity in point estimates and confidence intervals); directness of the intervention to target populations and outcomes most important to those populations; precision in the 95% confidence interval for decision-making purposes (e.g., application differences between the lower and upper bounds of the interval); publication bias (e.g., sample sizes, proportion of positive vs. negative results); and risk of bias (Guyatt et al., 2008). Our risk of bias assessment was informed by Cochrane's

guidelines for randomised trials (RoB2; Sterne et al., 2019), which focus on randomisation process, deviations from intended interventions, missing outcome data, measurement of the outcomes, and selection of the reported results. Assessments are made to categorise eligible papers as low, medium ('some concerns'), or high risk of bias. The RoB2 tool is an effective framework for measuring overall bias of experimental designs (Minozzi et al., 2020). We utilised the *robvis* Shiny app (McGuinness & Higgins, 2021) to create the summary visualisation of our risk of bias assessment.

2.6 Deviations from pre-registered protocol

We deviated from the pre-registered protocol in one way. Originally, we identified six articles to utilise as seeds to initiate the algorithm in Research Screener, but ended up using only five seed articles for the formal screening process. We erroneously retained one study (Furman et al., 2020) in the pre-registered protocol, which should have been removed from the protocol registration because the experimental manipulation altered the self-talk that participants utilised to reflect on a food decision task rather than target a stressor event.

3 RESULTS

3.1 Literature search overview

An overview of the search and selection process is depicted in Figure 1. We identified 17 eligible papers with 25 independent experiments and 68 relevant effects that fulfiled the eligibility criteria. This body of work covered approximately 2 decades of research (1993–2021) and studied 2397 participants (M_{age} = 22.02, percentage of females = 63.30%). Full details of these studies are provided in Table 1.

TABLE 1. Characteristics of studies included in the meta-analysis and narrative review

Study	N	Age	Females (%)	Outcomes	Type of measurement	Effect size (Hedges' *g*)
Andersson and Conley (2012)	41	20.5	73	Cognitive	Subjective	0.22[a]
				Behaviour	Subjective	0.31[a]
Ayduk & Kross (2008)	81	20.71	54	Affect	Subjective	0.73
				Physiological	Objective	0.65, 0.53
Dorfman et al. (2021)	130	22.38	78	Affect	Subjective	0.34, 0.45
Fergusson (1994)	61	-	69	Affect	Subjective	0.53[a], 0.67
				Social	Subjective	0.42[a]
Fuentes et al. (2021)	148	19.75	78	Affect	Subjective	−0.15, −0.02, −0.16
Giovanetti et al. (2019)	104 (s1); 51 (s2)	18.91	80	Affect	Subjective	−0.26, −0.83
Grossmann et al. (2021)	149	22.28 (s1); 35.04 (s2)	77 (s1); 45 (s2)	Cognitive	Subjective	0.06, 0.07, −0.01, 0.07, 0.07, 0.09
Gu and Tse (2016)	102	19.84	54	Affect	Subjective	0.02, 0.13
Kross and Ayduk (2008)	96 (s1); 78 (s2); 191	23.88 (s1);		Affect	Informant-assessed	0.46[a], 0.46, 0.34

Study	N	Age	Females (%)	Outcomes	Type of measurement	Effect size (Hedges' *g*)
	(s2); 96 (s2); 113 (s2)	21.90 (s2)	53 (s1); 61 (s2)	Cognitive	Informant-assessed	0.53, 0.45, 0.22, 0.34[a]
Kross et al. (2005)	155 (s1): 123 (s2)	21.48 (s1); 21.60 (s2)	55 (s1); 53 (s2)	Affect	Subjective	0.45, 0.23, 0.38, 0.43
				Cognitive	Informant-assessed	0.49, 0.35, 0.64, 0.43
Kross et al. (2014)	56 (s1a); 93 (s1b)	18.95 (s1); 32.23 (s2)	67 (s1); 54 (s2)	Cognitive	Subjective	0.64, 0.43
Levy (2016)	45 (s1); 48 (s2); 77 (s3)	-	-	Affect	Subjective	0, 0.25, 0.32, −0.42
				Behaviour	Objective	0.78
				Cognitive	Objective	−0.73, −0.71, −0.10
Mischkowski et al. (2012)	58	21.5 (s1); 21.0 (s2)	52 (s1); 65 (s2)	Affect	Subjective	0.62
				Behaviour	Objective	0.69
				Cognitive	Subjective	0.59
Seih et al. (2011)	33	19.05 (s1); 18.83 (s2)	48 (s1); 71 (s2)	Affect	Subjective	0.78
Valenti et al. (2011)	135 (s1); 44 (s2); 62 (s3)	-	44 (s1); 65 (s2); 64 (s3)	Affect	Subjective	−0.58, 0.53, −0.28, 0.45, −0.48
Wimalaweera and Moulds (2008)	30	19.51	65	Affect	Subjective	0.37, 1.04, 0.13, 0.54, 0.28, 0.28, 0.27, 0.02, −0.31, −0.53
				Cognitive		
Yasinski et al. (2016)	102	18.47	75	Affect	Subjective	0.31, 0.10
				Cognitive	Informant-assessed	0.27

[a] Follow-up; (s1) study 1; (s2) study 2; (s3) study 3.

3.2 Effectiveness of self-distanced reflections

The overall pooled effect (68 effects, *k* = 25) indicated that self-distanced reflections fostered more adaptive outcomes than self-immersed reflections (*g* = 0.19, *SE* = 0.07, 95% CI [0.05, 0.33]; see Figure 2). Heterogeneity was substantial (I^2 = 65.59%), which a log-likelihood ratio test (LRT) confirmed is due solely to between-study (I^2 = 65.59%; level 3; LRT = 14.54, *p* < 0.001) rather within-study (I^2 = 0%; level 2; LRT = 0, *p* = 1) variation in effects. The 95% prediction intervals suggests that for a new study there is a 95% chance that the effect will be between −0.42 and 0.80 (Hedges' *g*).

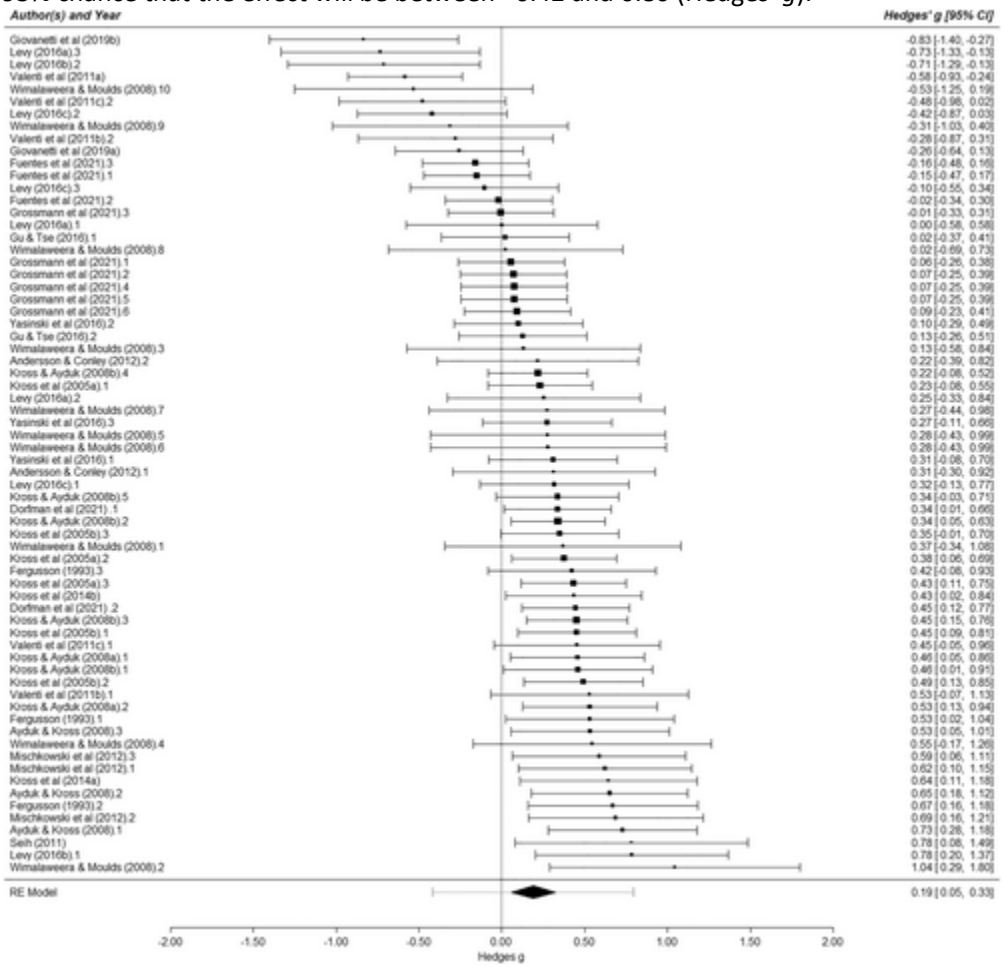


FIGURE 2

Forest plot of the overall pooled difference between self-distanced and self-referenced reflections (see the OSF project page for a version in which effect sizes (ES) are grouped by study to visualise the low within-study variance in effects; https://osf.io/wtk47/)

3.2.1 Sensitivity tests

None of the effects had residuals that exceeded three standard deviations from the mean. Six effects across five experiments had a Cook's distance that exceeded three times the mean (Giovanetti et al., 2019 [experiments 1 and 2]; Levy, 2016; Valenti et al., 2011) [experiments 1 and 3]). The exclusion of these six effects increased the magnitude of the overall pooled effect by 0.10 (*g* = 0.29, SE = 0.06, 95% CI [0.18, 0.40]) suggesting some sensitivity in the meta-analytic estimate to influential effects.

3.2.2 Moderator effects

Results of the meta-regression analyses are provided in Table 2. Only one of the 13 moderators was a statistically meaningful predictors of the overall pooled effect, namely the target event for reflection, *F* (3, 64) = 4.63, *p* = 0.005; the temporal focus of the target event, *F* (2, 65) = 3.72, *p* = 0.03, and the intervention provider, *F* (2, 65) = 4.77, *p* = 0.012, were also potentially interesting moderators at the widely adopted alpha level of 0.05 (see Figure 3). Self-distanced reflections were most effective when they targeted a stressor experience that emphasised one's emotional state or the emotional significance of the event (*g* = 0.44, 95% CI = 0.27, 0.62).

TABLE 2. Moderator analyses of the effect of reflection interventions on cognitive, affective, behavioural, and physiological outcomes

Moderator (*N* = 25)	**Primary outcomes**	
	#ES	***g* (95% CI)**
Outcome method	68	
Objective (*n* = 4)		0.06 (−0.26, 0.38)
Subjective (*n* = 17)		0.19 (0.06, 0.34)**
Informant-reported (*n* = 4)		0.23 (0.01, 0.46)*
Target event for reflection**	68	
Generic stress or adversity (*n* = 12)		0.06 (−0.11, 0.22)
Generic social experience (*n* = 1)		0.06 (−0.40, 0.52)
Emotional stressor or adversity (*n* = 9)		0.45 (0.27, 0.62)***
Discrimination (*n* = 3)		−0.07 (−0.39, 0.26)
Intervention provider	68	
Experimenter (*n* = 8)		0.18 (−0.03, 0.39)
Computer technology (*n* = 14)		0.29 (0.14, 0.45)***
Unclear (*n* = 3)		−0.32 (−0.68, 0.04)
Written reflection	68	
Yes (*n* = 16)		0.15 (−0.02, 0.32)
Cognitively processed (*n* = 9)		0.27 (0.04, 0.50)*
Delivery mode	68	
Self-directed (*n* = 21)		0.17 (0.01, 0.32)*
Face-to-face (*n* = 4)		0.30 (−0.03, 0.63)
Intervention temporal frame	68	
1 day (*n* = 18)		0.22 (0.07, 0.37)**
4 days (*n* = 2)		0.42 (−0.06, 0.09)
10 days (*n* = 1)		0.23 (−0.38, 0.83)
2 weeks (*n* = 2)		−0.50 (−1.02, 0.02)
4 weeks (*n* = 2)		0.22 (−0.20, 0.63)
Intervention temporal frame—categories	68	
1 day (*n* = 18)		0.22 (0.06, 0.38)**
1 week (*n* = 2)		0.42 (−0.08, 0.91)

Moderator (*N* = 25)	Primary outcomes	
	#ES	*g* (95% CI)
2–4 weeks (*n* = 5)		−0.00 (−0.31, 0.30)
Assessment point	68	
Post intervention (*n* = 24)		0.19 (0.05, 0.33)**
Follow-up (*n* = 4)		0.17 (−0.07, 0.42)
Outcome category	68	
Affect (*n* = 20)		0.18 (0.03, 0.33)*
Behaviour (*n* = 3)		0.60 (0.19, 1.02)**
Cognitive (*n* = 12)		0.15 (−0.03, 0.33)
Physiological (*n* = 1)		0.24 (−0.27, 0.75)
Social (*n* = 1)		0.11 (−0.50, 0.73)
Target event for reflection—temporal	68	
Daily (*n* = 6)		0.11 (−0.13, 0.36)
Recent (*n* = 6)		−0.04 (−0.29, 0.20)
Lifetime (*n* = 13)		0.35 (0.17, 0.52)***
Target event for reflection—magnitude	68	
Low to moderate (*n* = 16)		0.15 (−0.02, 0.32)
High (*n* = 9)		0.26 (0.03, 0.48)*
Delivery duration (mins)	51	
Intercept		0.26 (0.09, 0.41)**
Slope		−0.00 (−0.01, 0.00)
Reflection duration (mins)	44	
Intercept		0.22 (0.05, 0.39)*
Slope		−0.02 (−0.05, 0.01)

Abbreviations: CI = confidence interval; ES = effect sizes.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

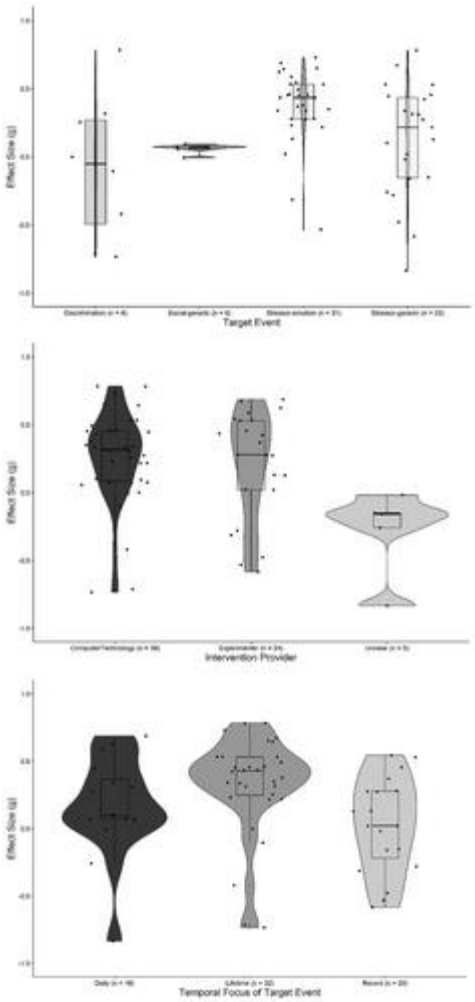


FIGURE 3

Visual depiction of the statistically significant moderators of the overall pooled effect statistically significant at $p < 0.01$ (target event) and $p < 0.05$ (intervention provider and temporal focus of target event)

3.2.3 Meta-bias assessment

Visual inspection of the funnel plot including Egger's linear regression test of within-study effects only suggests symmetry in the distribution of effects relative to their standard error, with a roughly equal number of effects on either side of the overall pooled effect (see Figure 4). The multilevel extension of Egger's test, F (1, 66) = 0.22, p = 0.64, supported an interpretation of symmetry in the funnel plot. Power-enhanced (sunset) funnel plots indicated that roughly half of eligible studies were sufficiently powered (>80%) to detect large effects (g = 0.80), yet all were insufficient powered to detect moderate (g = 0.50) or small (g = 0.20) effects (see Figure 5). Publication status (p = 0.54), risk of bias (p = 0.96), and sample size (p = 0.70) were statistically inconsequential predictors of the overall pooled effect.

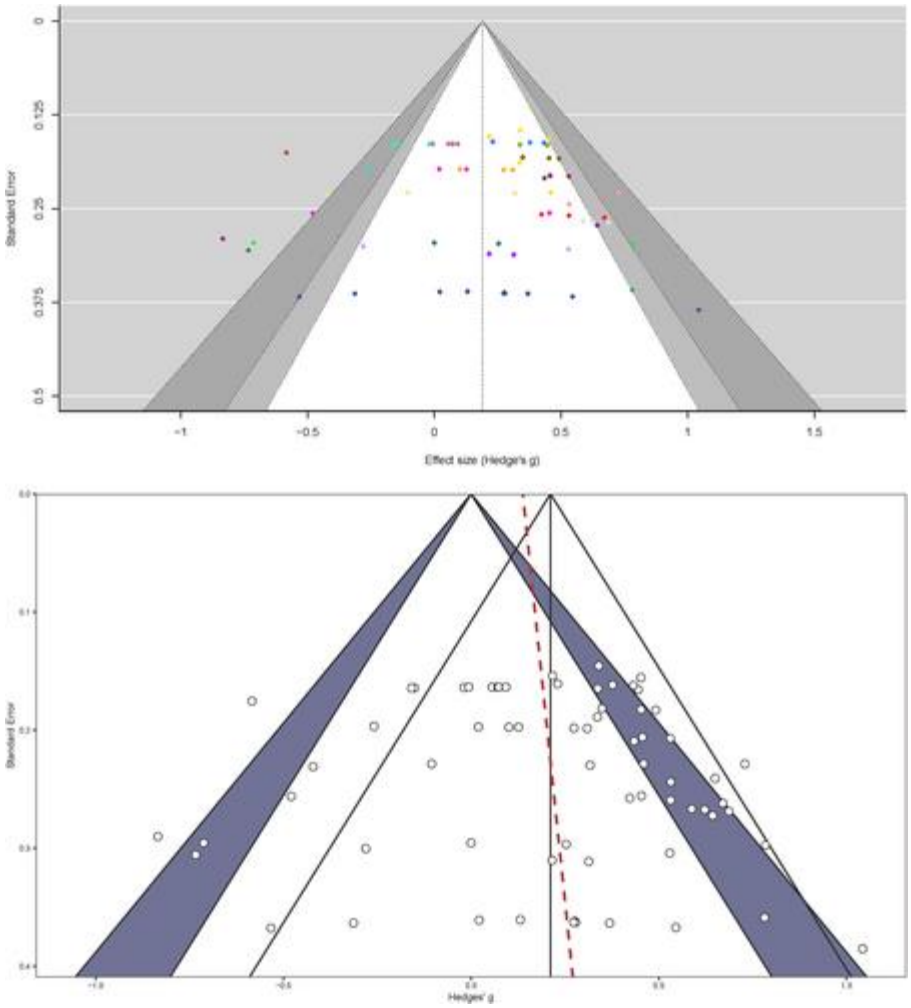


FIGURE 4

Contour-enhanced funnel plot (top) including Egger's linear regression test (bottom) for the overall pooled difference between self-distanced and self-referenced reflections (Note: different colours as used to visualise effects from within the same study; triangle with white background colour indicates $p > 0.05$, triangle with light grey background colour indicates $p < 0.05$, triangle with dark grey background colour indicates $p < 0.01$, and grey section outside of the triangle indicates $p < 0.001$)

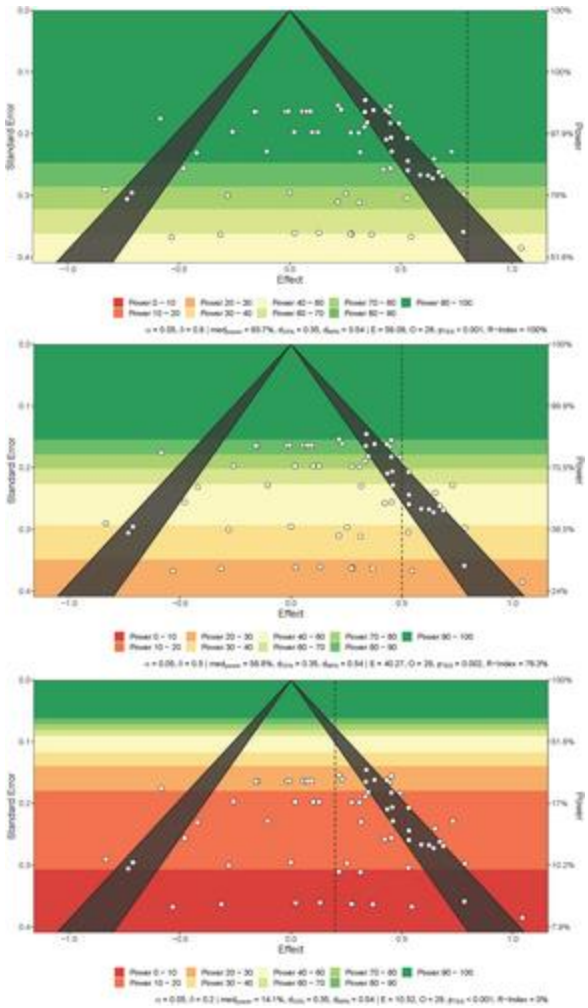


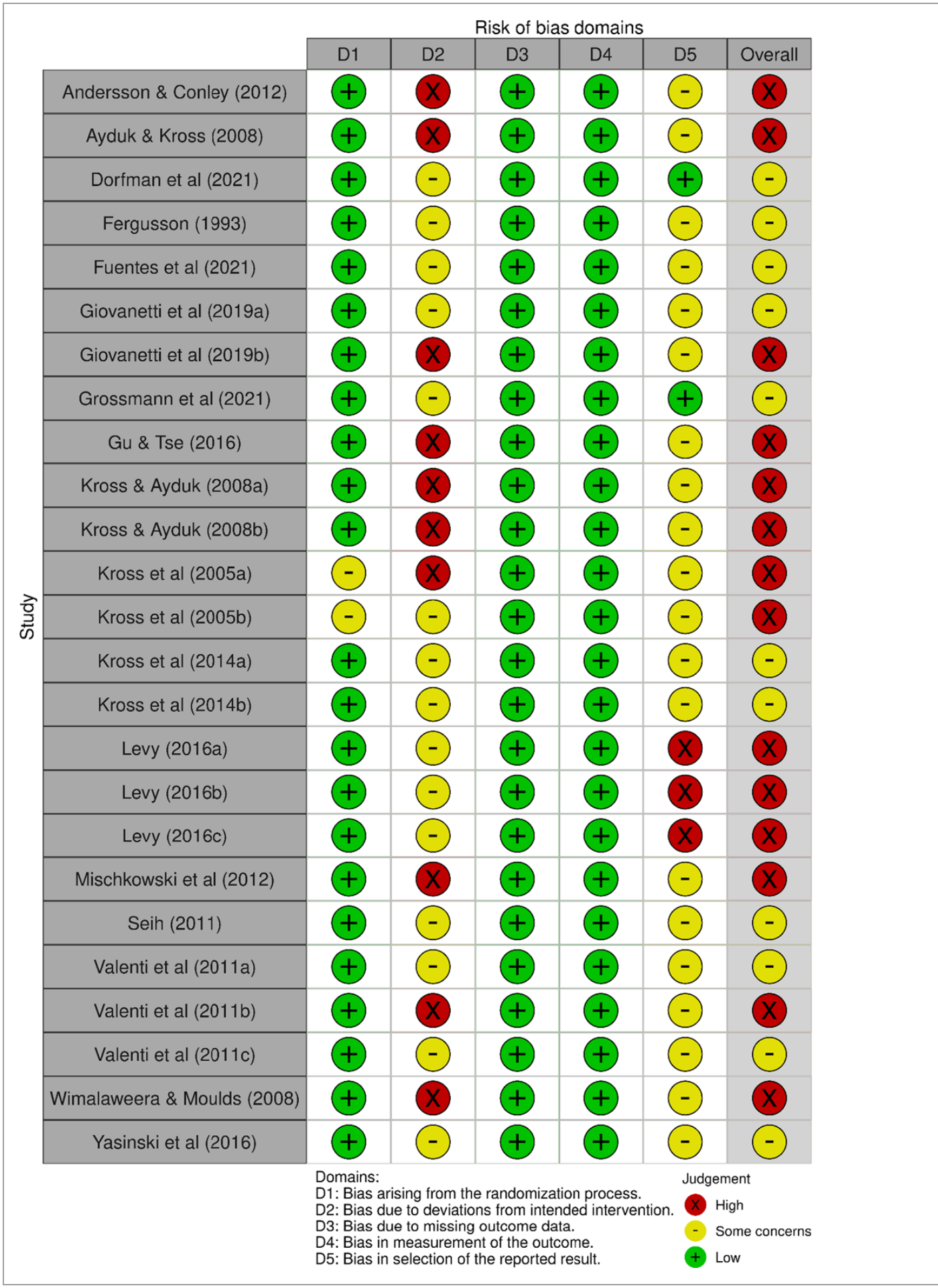
FIGURE 5
Sunset (power-enhanced) funnel plots for the overall pooled difference between self-distanced and self-referenced reflections

3.3 Quality of eligible studies and overall body of evidence

3.3.1 Risk of bias

We assessed risk of bias on the cognitive, affective, physiological, and behavioural outcomes of the included studies (*n* = 25) using the RoB2 framework and guidelines (Sterne et al., 2019). A summary of all eligible studies is depicted in Table 3. Overall, our bias ratings summarised 11 experiments as 'some concerns' and 14 experiments as 'high concerns', primarily due to considerations within the deviations from the intended intervention category. The primary and most critical consideration for this assessment related to the degree to which authors checked the validity of their experimental manipulation of the two types of reflections. Authors reported manipulation checks or activities that could be used to infer the quality of their experimental manipulation or intervention in 14 of the 25 experiments. Among the 19 experiments that required participants to write down their self-reflections, authors checked the quality of the manipulation in 11 (~58%) of their protocols, including participants' self-reporting their adherence to the instructions (*n* = 3), checks on the proportion of first and/or third person pronouns according to their experimental assignment (*n* = 7), and direct removal of participants who did not follow the experimental instructions for pronoun use (*n* = 1). With the exception of one study (Gu & Tse, 2016), authors rarely excluded participants who deviated from their intended experimental manipulation or assessed the sensitivity of their findings by comparing a per-protocol and intention-to-treat analysis (Heritier et al., 2003; Sainani, 2010).

TABLE 3. Risk of bias summary table for primary outcome


Risk of bias domains
Study
D1
D2
D3
D4
D5
Overall
Andersson & Conley (2012)
Ayduk & Kross (2008)
Dorfman et al (2021)
Fergusson (1993)
Fuentes et al (2021)
Giovanetti et al (2019a)
Giovanetti et al (2019b)
Grossmann et al (2021)
Gu & Tse (2016)
Kross & Ayduk (2008a)
Kross & Ayduk (2008b)
Kross et al (2005a)
Kross et al (2005b)
Kross et al (2014a)
Kross et al (2014b)
Levy (2016a)
Levy (2016b)
Levy (2016c)
Mischkowski et al (2012)
Seih (2011)
Valenti et al (2011a)
Valenti et al (2011b)
Valenti et al (2011c)
Wimalaweera & Moulds (2008)
Yasinski et al (2016)
Domains:
D1: Bias arising from the randomization process.
D2: Bias due to deviations from intended intervention.
D3: Bias due to missing outcome data.
D4: Bias in measurement of the outcome.
D5: Bias in selection of the reported result.
Judgement
High
Some concerns
Low

3.3.2 GRADE assessment

An overview of our assessment of the overall quality of evidence contributing to the analyses of the effects of self-distanced versus self-immersed reflections is presented in Table 4. We assessed the overall level of certainty of evidence regarding the differential effectiveness of self-distanced versus self-immersed reflections on autobiographical stressor experiences among apparently healthy adults across cognitive, affective, physiological, social, and behavioural outcomes to a low extent. This decision is underpinned primarily due to some concerns regarding risk of bias (as noted above), inconsistency, and indirectness. Regarding inconsistency, large heterogeneity (I^2 = 65.59%), variable point estimates that reflect negative and positive effects (ranging from −0.83 to 1.04), and moderate degrees of overlapping confidence intervals (see Figure 2) all contributed to the downgraded assessment. We downgraded indirectness because of the dominance of undergraduate student samples (24 of 25 experiments), differences in the intended intervention and what the participants utilised in several experiments (e.g., individuals assigned to self-distanced reflections referred to themselves in the first person on occasion), and the reliance on affective (62%) or cognitive (29%) outcomes to assess the differential effectiveness of self-distanced versus self-immersed reflections.

4 DISCUSSION

Via a systematic review of approximately 10,000 articles and statistical synthesis of 25 experiments and 68 effects, we found that self-distanced reflections offer a small-to-moderate advantage over self-immersed reflections (Funder & Ozer, 2019). Moderation analyses indicated that the target event for reflection, temporal focus of the target event, and the intervention provider meaningfully augmented the overall effectiveness of self-distanced reflections. Sensitivity and meta-bias analyses alongside assessments of methodological quality indicated some uncertainty in the evidence base.

Taken together with meta-analytic estimates of psychological distancing strategies (Moran & Eyal, 2022; Soderberg et al., 2015) our findings suggest that self-distancing resembles an adaptive form of reflecting on autobiographical stressor experiences, relative to self-immersed reflections. Importantly, our meta-analytic estimate extends existing summaries to encompass cognitive, behavioural, social, and physiological outcomes alongside emotional factors as well as published and unpublished evidence thereby offering a holistic assessment of the evidence base. Despite our intentions to broaden the scope of view, we found that most available experiments comparing self-distanced and self-immersed reflections prioritised affective outcomes (56%) as the primary focus for assessments of effectiveness, followed by cognitive outcomes (33%). The magnitude of effect for cognitive outcomes (e.g., intrusive thoughts, thought content, reasoning) was roughly equivalent to affective outcomes, yet there was greater imprecision in this estimate. This finding makes intuitive sense because stressor experiences narrow one's cognitive focus (Garland et al., 2010) and trigger ruminative thoughts that disrupt adaptive self-regulatory processes (Crane et al., 2019). Unfortunately, due to the absence of available data for the other outcome categories (i.e., behaviour, psychophysiology), we are unable to make any sound conclusions regarding the robustness of the effectiveness of self-distanced reflections across outcome categories. Theoretically, our findings lend support to the central premise of construal level theory (Trope & Liberman, 2010) that ego-decentred vistas enable individuals to focus and extract knowledge on salient features of autobiographical experiences rather than the emotionally charged elements, thereby fostering adaptive reasonings for future functioning. The low cost and ease with which self-distancing can be applied to make sense of autobiographical experiences represents a potentially ‘scalable’ amendment to existing psychological approaches that rely on introspection or self-reflections. In so doing, self-distanced reflections might permit individuals to transcend and connect ‘lessons learned’ across diverse stressor experiences for optimising human health, well-being, and functioning (e.g., Crane et al., 2020; Kalisch et al., 2019).

Despite the encouraging findings regarding the overall pooled effect, meta-regression analyses indicated that interpretations regarding the relative effectiveness of self-distanced reflections and therefore their application in research and practice require consideration of the target event for reflection. Given the centrality of the emotional intensity of one's reaction when reflecting on autobiographical experiences as a core mechanism of psychological distancing (Trope & Liberman, 2010), it's unsurprising that roughly

one-third of experiments (*n* = 9 or 36%, 31 effects) required participants to reflect on autobiographical experiences that emphasised emotional states explicitly (e.g., overwhelming feelings of sadness, anger) and that self-distanced reflections evidenced their strongest effects for emotionally salient events. This finding has important conceptual and practical implications within the context of autobiographical events. The emotional salience of events makes such experiences potentially disruptive to healthy functioning, personally significant, and memorable to people (Luhmann et al., 2021), and represent the most stable elements of people's perceptions of such autobiographical experiences over time (Haehner et al., 2021). Conceptually, this finding supports a core theoretical proposition of psychological distancing, that is, distanced appraisals of target events engage processes of effective self-reflection and cognitive control that help shape new affective responses that are adaptive in nature (Powers & LaBar, 2019). Self-immersed reflections draw people towards the 'hot' features of their stressor event resulting in recollections of the experience that are high in physiological and subjective emotional reactivity (Mcisaac & Eich, 2002; Williams & Moulds, 2007) and which evoke rumination (Ayduk & Kross, 2010; Lubomirsky & Nolen-Hoeksema, 1995), thereby deterring adaptive cognitive and emotional processing of the event. In contrast, self-distanced reflections allow individuals to interrupt cycles of rumination by stepping back from the event and taking a broader outlook on the chain of events, thereby promoting alterations to the meaning of the autobiographical experience in ways that minimise emotional reactivity (Kross & Ayduk, 2017; Kross et al., 2005). Thus, proactively applied self-distanced reflections might provide a necessary strategy by which to augment small changes in self-regulation that occur organically from autobiographical stressor experiences high in emotional salience.

Our findings also suggest caution is required regarding the optimism of the adaptiveness of self-distanced reflections relative to self-immersed vistas and the evidence base on which they are founded. First, the prediction interval indicated that future tests of the effectiveness of self-distanced relative to self-immersed reflections on autobiographical stressor events among apparently healthy adults could differ substantially from the point estimate reported here, including null or small-to-moderate negative effects. Second, power-enhanced (sunset) funnel plots visualised concerns regarding the credibility of individual effects of the pooled estimate, with all 25 experiments underpowered to detect small (g = 0.20) or moderate (g = 0.50) or effects. Third, the overall quality of evidence synthesised is low, with downgrades due primarily to inconsistency (e.g., large heterogeneity, influential experiments), indirectness (e.g., manipulation checks of experimental instructions), and risk of bias (e.g., underpowered). Taken together with recent re-analyses of the evidential base of construal level theory broadly (Maier et al., 2022), these statistical and methodological considerations potentially render our pooled estimate inconclusive until future high-powered, high-quality experiments are executed.

Key strengths of this systematic review and meta-analysis include a pre-registered protocol and transparency regarding deviations from those plans; prioritisation of experiments to maximise insights into causal evidence; capture of un/published literature as well as a broad range of indicators of human functioning assessed via self-reports, informants, or objective methods; multicomponent assessment of risk of bias and overall quality of evidence; and statistical interrogation of intervention characteristics that might augment the differential effectiveness of self-distanced reflections. Nevertheless, we encourage readers to interpret our findings relative to the limitations of our work and the existing literature. First, we limited our meta-analytic focus on apparently healthy adults aged 18–65 years who utilised self-distanced or self-immersed reflections on lived experiences. Second, we made subjective decisions regarding the categorisation of moderator variables that others might reconstrue differently. Relatedly, we examined several substantively interesting elements of experimental manipulations or interventions for self-distanced reflections, yet remain cognisant that several of these tests are likely underpowered, primarily due to imbalance in data between levels of the moderator (e.g., outcome method, temporal frame). Third, most effects synthesised here targeted affective (62%) or cognitive outcomes (29%); thus, there remains a need to ascertain if the small advantages of self-distanced reflections translate into important behaviour (e.g., health-related).

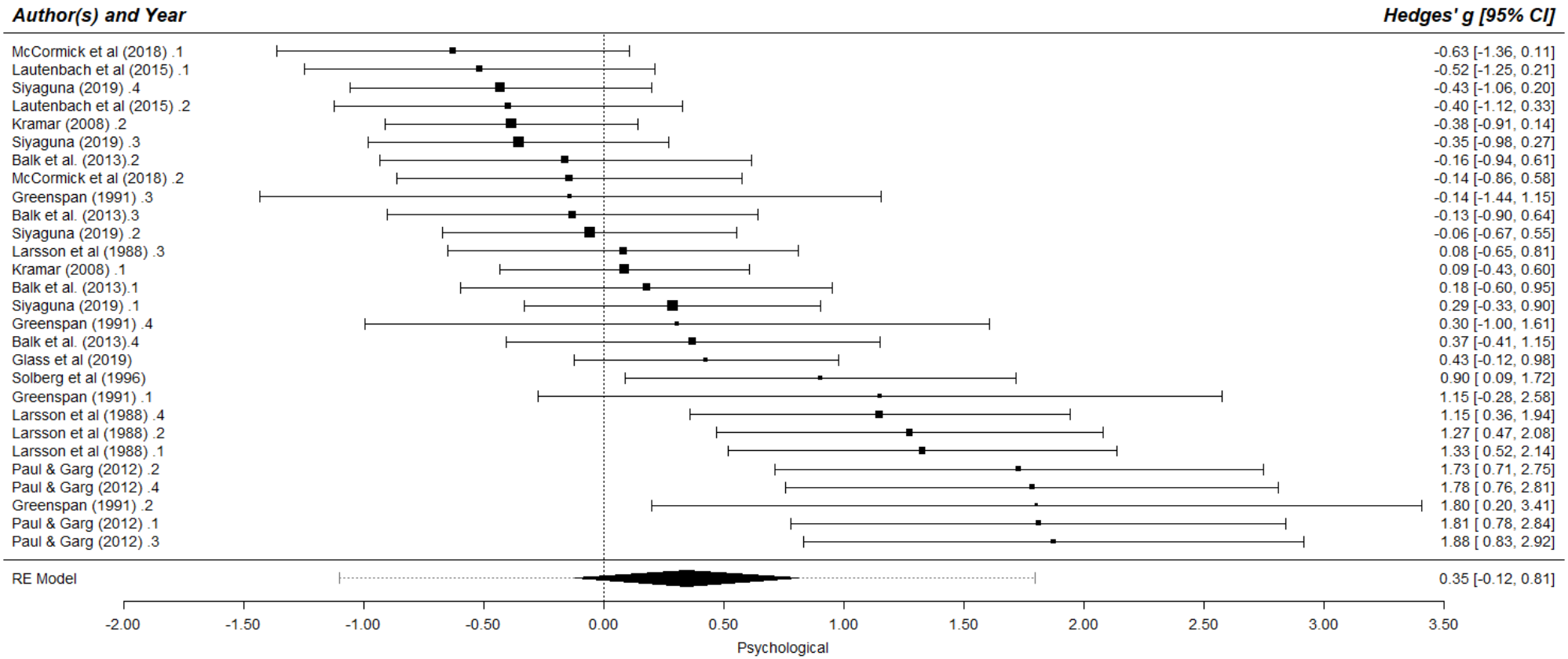
5 CONCLUSION

We revealed a small-to-moderate advantage of self-distanced relative to self-immersed reflections on autobiographical experiences among apparently healthy adults. Although small effects in the

psychological sciences are to be expected and often considered more 'believable' than large ones (Funder & Ozer, 2019), our assessment of the overall quality of evidence suggested uncertainty regarding the benefit of this pragmatic self-regulatory tactic. There remains an urgent need for high-powered, high-quality experiments on self-distanced reflections to reconcile some the methodological and substantive considerations identified via our review.

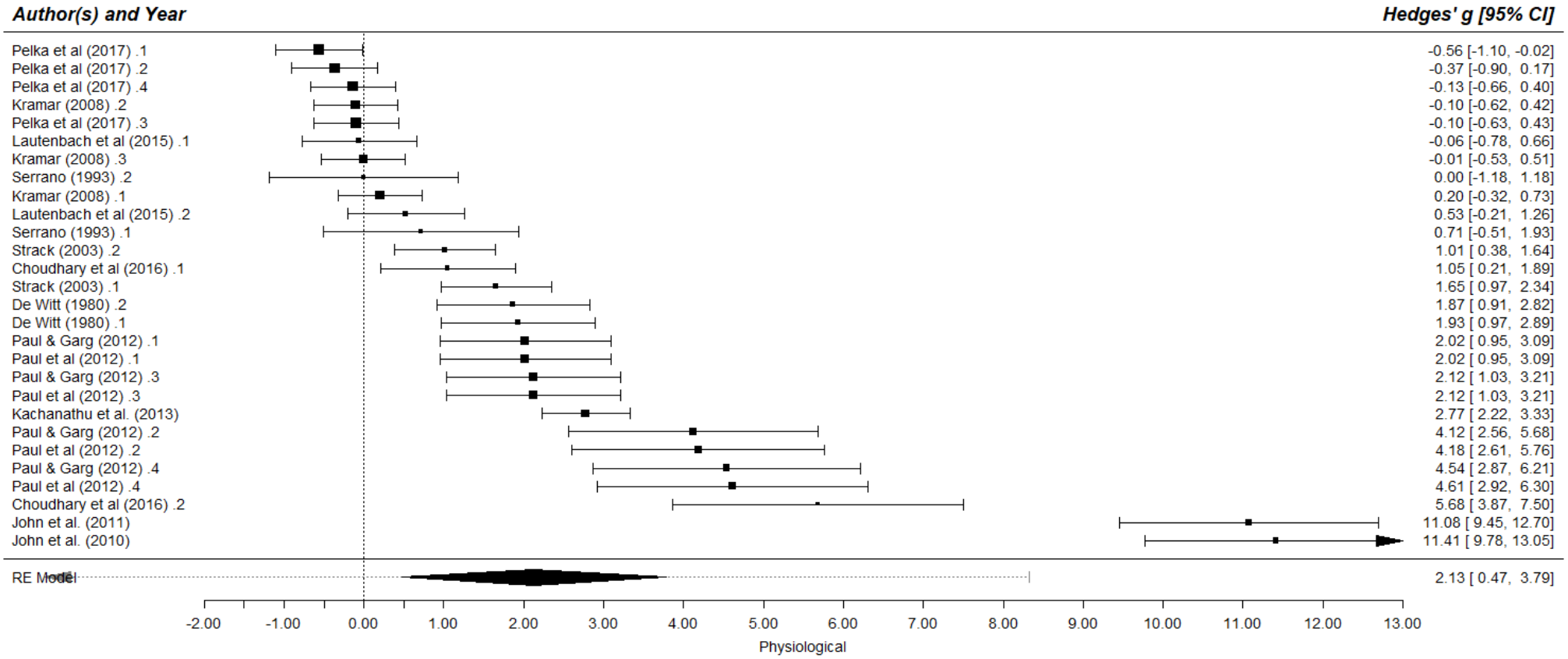
Appendix E. Stress Regulation Systematic Review and Meta-analysis - Supplementary Material

Supplementary Figure 1. Forest Plot of Effect Sizes for Psychological Outcomes



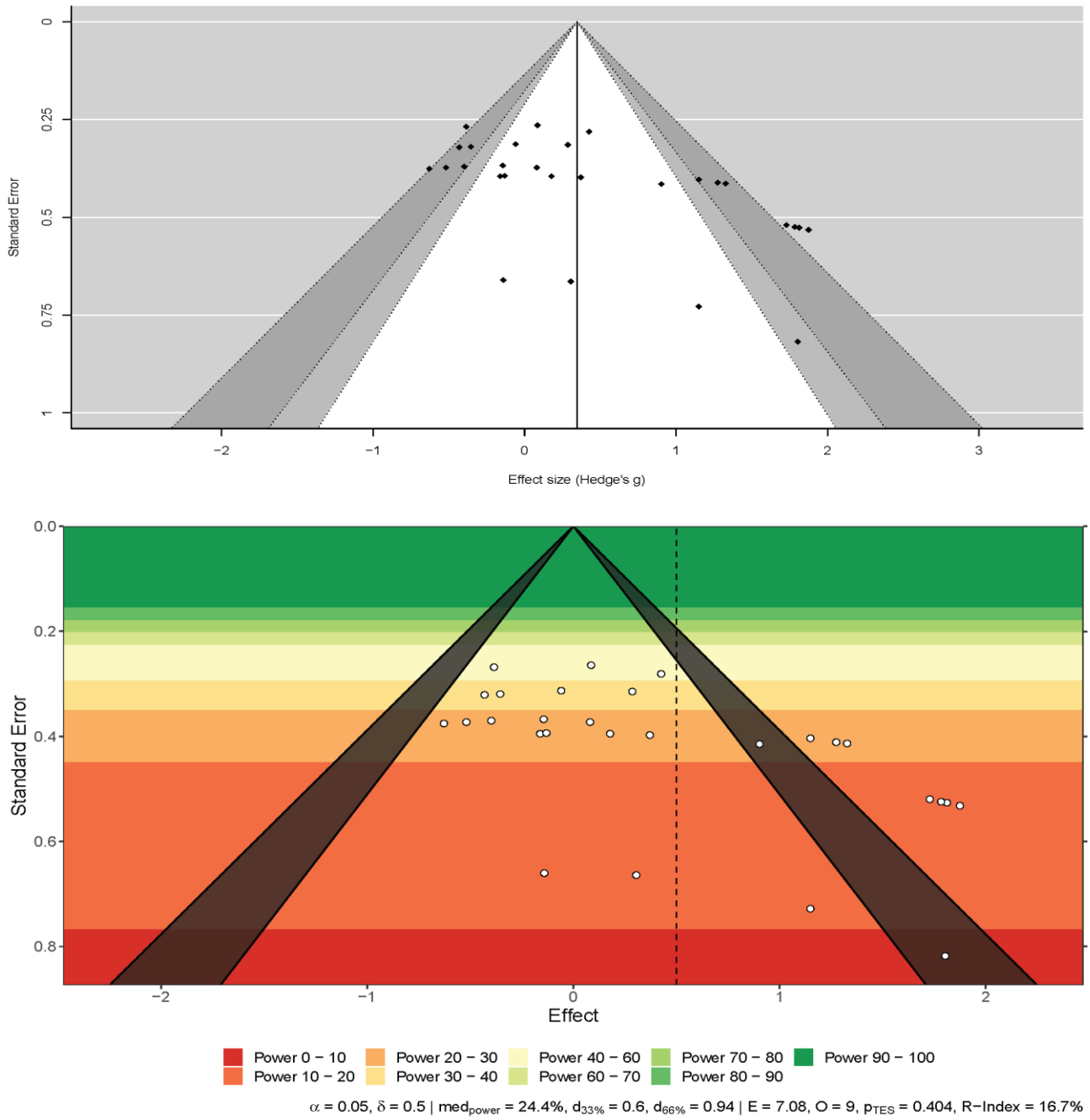
Note: The sizes of the squares represent relative sample sizes. The diamond at the bottom represents the overall effect; the dotted line around the diamond reflects the 95% prediction interval. The dotted vertical line represents an effect size (*g*) of zero. CI = confidence interval; RE = random effects.

Supplementary Figure 2. Forest Plot of Effect Sizes for Physiological Outcomes



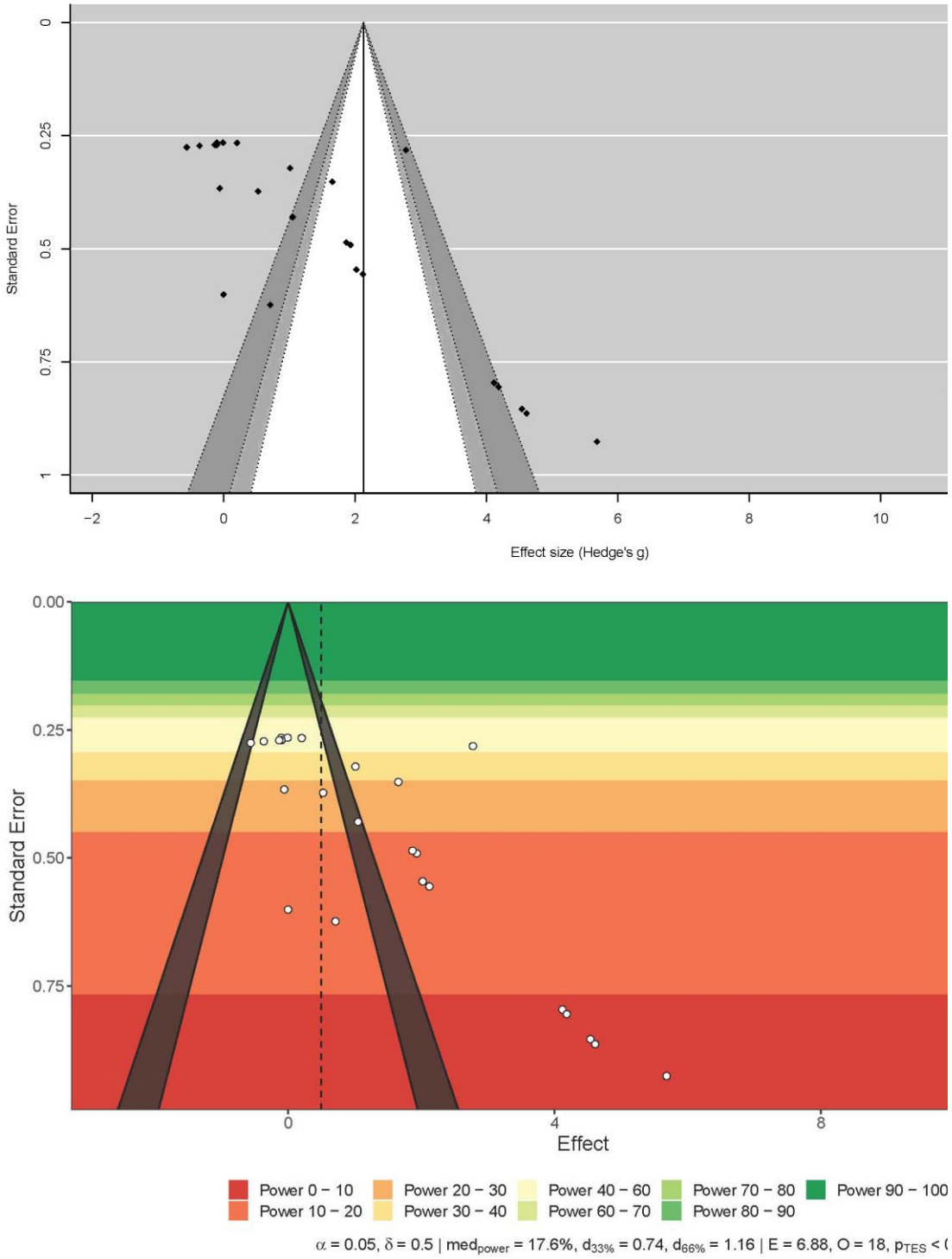
Note: The sizes of the squares represent relative sample sizes. The diamond at the bottom represents the overall effect; the dotted line around the diamond reflects the 95% prediction interval. The dotted vertical line represents an effect size (*g*) of zero. CI = confidence interval; RE = random effects.

Supplementary Figure 3. Contour-Enhanced and Sunset Plots for Psychological Outcomes



Note: Each dot represents an individual effect size and is plotted as a function of standard error. The vertical line in the contour-enhanced plot represents the random-effects-model estimate (g = 0.35). Top panel: light and dark grey triangles denote 95% and 99% confidence intervals, respectively, for the effect sizes, given the absence of publication (or small-study) bias. Bottom panel: significance contours at .05 and .01 levels are noted by dark shaded areas, with discrete colour-coded power regions computed via a two-tailed test with significance at .05.

Supplementary Figure 4. Contour-Enhanced and Sunset Plots for Physiological Outcomes



Note: Each dot represents an individual effect size and is plotted as a function of standard error. The vertical line in the contour-enhanced plot represents the random-effects-model estimate (g = 2.13). Top panel: light and dark grey triangles denote 95% and 99% confidence intervals, respectively, for the effect sizes, given the absence of publication (or small-study) bias. Bottom panel: significance contours at .05 and .01 levels are noted by dark shaded areas, with discrete colour-coded power regions computed via a two-tailed test with significance at .05.

Appendix F. Self-distanced vs. Self-immersed reflection Systematic Review and Meta-analysis

Readers might be interested in the distinctions and therefore extensions of our work beyond the meta-analysis published by Moral and Eyal (2022). For context, Moran and Eyal's paper was first published online as an 'accepted article' and therefore publicly available on 1st Feb 2022 (https://journals.sagepub.com/doi/abs/10.1177/10888683211069025); we registered our protocol on 2nd August 2021 (https://bit.ly/self-immersed-meta-registration) so we had no knowledge of their work until we were engaged in the writing phase of our project. Nevertheless, our meta-analysis differs from Moral and Eyal in several important ways:

1. ***Objectives***: Moran and Eyal aimed to examine the effects of psychological distancing strategies broadly, whereas we focused specifically on self-distanced reflections relative to self-immersed reflections.
2. ***Comparator***: We considered self-distanced reflections primarily from the 'objective' view rather than all 4 forms captured in construal level theory (see the Intervention sub-section of our PICO statement in the Eligibility Criteria section of the methods); Moran and Eyal examined all 4 forms of distancing.
3. ***Outcomes***: We considered all types of outcomes, whereas Moran and Eyal focused specifically on emotional experiences.
4. ***Target event for reflection***: We focused on autobiographical events directly experienced by participants to maximise ecological validity, whereas Moran and Eyal also considered 'artificial' events (e.g., in the lab or some type of stimuli) or those which were imagined.
5. ***Inclusion and exclusion criteria:*** There are several important differences between the primary studies we considered eligible for inclusion in our systematic review and those

of interest to Moran and Eyal, namely (i) the comparator group, (ii) apparently healthy adults only (see our response to Reviewer 1, comment #1), (iii) between-subject designs only to avoid contamination of distancing strategies across experimental conditions, (iv) databases utilised for the search [Moran and Eyal searched PubMed and PsycINFO, whereas we searched Scopus, Medline, Web of Science (core collection), PsycInfo, CINAHL Plus, Embase, and ProQuest Dissertations and Theses Global], and (v) we executed a forward and backward search of papers identified as eligible for inclusion in our systematic review and meta-analysis. In so doing, we identified several papers via our systematic review of the literature that are absent from Moran and Eyal's review and which would have met their eligibility criteria (Andersson & Conley, 2012; Dorfman et al., 2021; Ferguson, 1993; Fuentes et al., 2021; Giovanetti et al., 2019; Grossman et al., 2021; Levy, 2016; Yasinski et al., 2016).

6. We considered a broad range of moderator variables to characterise the content and nature of reflection strategies alongside features of the individuals and contexts in which they were evaluated, whereas Moran and Eyal targeted as the primary moderator the type of emotion (low- versus high-level construal) alongside characteristics of the participants, manipulation, and outcome variable. Thus, our contribution reflections a 'deep dive' into the characteristics of reflection strategies that offer the greatest insight for practical recommendations.
7. We assessed the quality of evidence locally for each individual study and collectively for the body of evidence included in our meta-analysis using widely accepted protocols; Moran and Eyal considered publication bias only.

Appendix G. Copyright Permission for Stress Regulation Meta-analysis and Systematic Review

Appendix H. Print Screen of Stress Regulation Meta-analysis and Systematic Review Open Access

Received: 27 March 2022 | Revised: 19 August 2022 | Accepted: 8 September 2022

DOI: 10.1002/smi.3199

REVIEW ARTICLE

WILEY

The effectiveness of self-distanced versus self-immersed reflections among adults: Systematic review and meta-analysis of experimental studies

Elizabeth M. Murdoch[1,2] | Michael T. Chapman[1] | Monique Crane[3] | Daniel F. Gucciardi[1,4]

[1]Curtin School of Allied Health, Curtin University, Perth, Western Australia, Australia

[2]Western Australian Institute of Sport, Claremont, Western Australia, Australia

[3]School of Psychological Sciences, Macquarie University, Sydney, New South Wales, Australia

[4]Curtin enAble Institute, Faculty of Health Sciences, Curtin University, Perth, Western Australia, Australia

Correspondence
Daniel F. Gucciardi, Curtin School of Allied Health, Curtin University, GPO Box U1987, Perth, WA 6845, Australia.
Email: daniel.f.gucciardi@gmail.com

Funding information
Open access publishing facilitated by Curtin University, as part of the Wiley - Curtin University agreement via the Council of Australian University Librarians.

Abstract

Stressor events can be highly emotional and disruptive to our functioning, yet they also present opportunities for learning and growth via self-reflections. Self-distanced reflections in which one reasons about target events in ways that maximise their removal of the current self from the experiential reality are said to facilitate this reflective process. We tested the expectation that self-distanced reflections offer an advantage over self-immersed vistas via a pre-registered systematic review of seven electronic databases (Scopus, Medline, Web of Science, PsycInfo, CINAHL Plus, Embase, and ProQuest Dissertations and Theses Global) to identify experimental tests with adults aged 18–65 years where the focus of the reflection was a stressor or adverse event that participants had already experienced. A three-level, random effects meta-analysis of 25 experiments ($N = 2,397$, 68 effects) revealed a small-to-moderate advantage of self-distanced reflections ($g = 0.19$, SE = 0.07, 95% CI [0.05, 0.33]) and were most effective when they targeted a stressor experience that emphasised one's emotional state or lifetime. Nevertheless, our assessment of the overall quality of evidence including risk of bias suggested uncertainty regarding the benefit of this pragmatic self-regulatory tactic and therefore the need for future high-powered, high-quality experiments.

KEYWORDS
construal level theory, emotion regulation, perspective taking, resilience, vantage point

1 | INTRODUCTION

Stressor events are typically viewed as being negative in nature, yet in some instances can provide opportunities for self-insight and personal growth. Stressor events are characterised by high levels of novelty, disruption, and/or criticality (Morgeson et al., 2015). Depending on their intensity and frequency as well as emotional significance, stressor events typically pose heightened vulnerability to maladaptive outcomes and therefore demand the deployment of resources to minimise or mitigate their effects on one's functioning (Luhmann et al., 2021). Viewed from a transactional (Lazarus & Folkman, 1984; Obbarius et al., 2021) person-situation interactionist