Faculty of Business and Law

Examining the Curvilinear Effects of Autonomy at Work

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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made. This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007) – updated March 2014. The proposed research study received human research ethics approval from the Curtin University Human Research Ethics Committee (EC00262), Approval Numbers HRE2019-0053 and HRE2020-0101.

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We acknowledge that Curtin University works across hundreds of traditional lands and custodial groups in Australia, and with First Nations people around the globe. We wish to pay our deepest respects to their ancestors and members of their communities, past, present, and to their emerging leaders. Our passion and commitment to work with all Australians and peoples from across the world, including our First Nations peoples are at the core of the work we do, reflective of our institutions' values and commitment to our role as leaders in the Reconciliation space in Australia.

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Abstract

Major work design theories identify autonomy as an important characteristic of work, proposing linear positive effects of autonomy on key outcomes. However, theory and evidence suggest that there might be limits to the positive function of autonomy, that is, the relationship between autonomy and outcomes could be curvilinear, rather than linear. In this thesis, I seek to build upon research on the nonlinear effects of autonomy on performance, psychological well-being, and strain. I include three studies to investigate test the curvilinear effect of autonomy. The first study meta-analysed primary studies investigating the curvilinear relationships of autonomy on various outcomes, and found a small but significant overall curvilinear main effect of autonomy. Furthermore, this curvilinear effect was also found for behavioural, well-being and strain outcomes separately. In the second study, I utilised a longitudinal field study to establish the shape of the curve as well as identify the inflection point at which any additional autonomy is no longer beneficial, or even detrimental. Results of the longitudinal study suggests that autonomy displays a curvilinear effect on performance and psychological well-being (but not psychological ill-health) Participants reporting low and extremely high levels of autonomy indicated lowered levels of well-being, while participants with moderately high levels of autonomy reported the highest levels of well-being, after six months. Interestingly, the curvilinear effect of autonomy on performance was in the opposite direction to the hypothesised relationship, such that participants reporting extremely high autonomy also reported the highest levels of performance. As the field study was based on self-reports, I was prompted to utilise an experimental design in the third study to investigate the causal relationship and the mechanisms through which autonomy exerts curvilinear effect on outcomes. Results of the experiment showed

that participants with moderately high levels of autonomy performed significantly better than participants in the low or extremely high autonomy conditions. Interestingly, while participants in the moderately high and extremely high autonomy conditions reported more psychological well-being and lowered strain compared to participants in the low autonomy conditions, there were no significant differences in well-being or strain between the two conditions. The curvilinear effect of autonomy on well-being and strain, but not performance, appeared to occur through the mechanisms of perceived responsibility and goal setting. In sum, findings from this thesis indicate that the effect of autonomy on various outcomes is likely to be more nuanced than traditionally theorised.

Author's note

This current thesis is intended to be presented in a hybrid format, and consists of one paper with two additional chapters. As the paper (Chapter 3) is considered a standalone piece of work, some repetition, especially in theory-building, may be inevitable. In contrast, Chapters 4 and 5 are presented in a traditional thesis format. That is, the background and rationale presented in these two chapters build on the theoretical models presented in the introductory chapters. To increase cohesiveness, a short introductory preamble is presented to link the chapters where applicable. Additionally, reference lists have been combined and presented at the end of the thesis.

Chapter 1: Introduction and Overview of Studies

> "…when employees know they can work on whatever they want, they're more likely to neglect the boring, everyday stuff… infrastructure projects and unglamorous projects went wanting for people to work on them. After all, if you have the chance to work on longevity research or self-driving cars, who's going to opt to fix search-engine bugs?" (Todd, 2018).

This quote from a web article is based on an anonymous email sent by an ex-employee at Google, an organisation which is consistently included in superlative lists, such as "World's Most Valuable Brands" and "Best Companies to Work For". These accolades are attributed in part to Google's policies on providing employees with extremely high levels of autonomy (Todd, 2018), that is, unlimited freedom, independence and discretion (Hackman & Oldham, 1976).

The benefits of autonomy are typically lauded. Classical work design theories link autonomy, one of the most prominent job characteristics, to improved outcomes in a linear fashion (e.g., job characteristics model; Hackman & Oldham, 1976; job demands-resources model; Demerouti et al., 2001; self-determination theory; Ryan & Deci, 2001). Autonomy is theorised to operate through mechanisms such as motivation, quick response, and management of demands to improve desirable outcomes such as performance, psychological well-being and strain (Hackman & Oldham, 1976; Demerouti et al., 2001). However, alternative views of some work design characteristics such as autonomy suggest that the associations between autonomy and outcomes may not be as straightforward as originally thought (Pierce & Aguinis, 2013; Warr, 1987, 2002). These alternate views contend that although *some* autonomy is better than *none*, past a certain point, any additional autonomy may result in paradoxically unintended effects such as an increased amount of mental

load required to evaluate all available choices (Trujillo, 2019), leading to stress (Gardner, 1986), burnout (Warr, 2016), or settling on the first acceptable, rather than the best, choice available. (Schwartz, 2005).

The anecdote from Google presented at the beginning of this chapter illustrates the paradox of autonomy in which autonomy, an ordinarily beneficial antecedent of performance, psychological well-being and strain, might not lead to only positive outcomes, but may actually cause employees to lose focus on core task requirements, and can even cause unintended harm if taken too far. As the quote above alludes to, excessive autonomy potentially manifests in lowered core task performance. As I will discuss in the chapters that follow, excessive autonomy might further lead employees to feel overwhelmed, experience reduced meaningfulness at work, have a blurring of work-home boundaries, or experience increased job-related stress.

The current labour norms, especially within knowledge-based work, are shifting towards working-from-home or blended arrangements (Mazmanian et al., 2013; Stiglbauer & Kovacs, 2018), and this has been intensified by the impacts of the COVID-19 pandemic. Paired with the advent of the gig economy – where individuals interact with apps or online platforms to sell their labour, thereby deciding how much and when they want to work – autonomy is likely to become an even more central work characteristic in the near and sustained future. All these developments highlight the importance of understanding the implications of having too much autonomy for workers.

In this thesis, I examine this paradox of autonomy, focusing on investigating a possible curvilinear relationship between job autonomy and the outcomes of performance, psychological well-being and strain. I further investigate the ‘why’ of

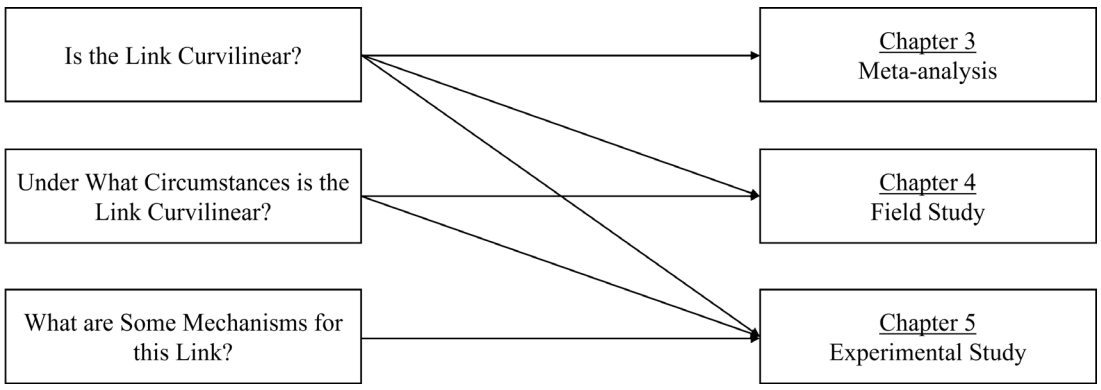
these curvilinear relationships, specifically examining the mechanisms by which autonomy exerts a curvilinear effect on outcomes.

Overview of Chapters

This thesis brings together a group of three studies designed to address the overall research question. The studies include a meta-analysis, a longitudinal survey study and an experimental study. In combining the various studies outlined in what follows, a holistic view of the curvilinear effects of autonomy, its mechanisms and moderators is established. Figure 1.1 outlines the three studies in relation to the overarching goals of understanding whether the curvilinear effect exists, the circumstances under which it may exist, and the mechanisms by which the curvilinear effect of autonomy occurs. The studies complement each other in the research methods adopted and the specific aspects that are addressed around the curvilinear effects of autonomy on workers.

Figure 1.1

Overview of Empirical Studies



This thesis is structured as follows: after this introductory chapter, in Chapter 2, I briefly summarise the traditional theories outlining the linear relations of autonomy with outcomes, such as the job characteristics model (Hackman & Oldham, 1976), the demand-resources model (Demerouti et al., 2001), and self-determination theory (Ryan & Deci, 2001). Next, I draw upon the too-much-of-a-

good-thing framing perspective (Pierce & Aguinis, 2013) as well as theories such as the vitamin model (Warr, 1987, 2002) and conservation of resources theory (Hobfoll, 1989) to present the argument for the non-linear effect of autonomy on various outcomes.

In Chapter 3, I present the first of three studies conducted for this thesis, which is a meta-analytic investigation into the curvilinear relations of autonomy with outcomes. Specifically, I investigate if associations between autonomy and outcomes are curvilinear, and if the curvilinear nature varies for different outcomes, such as behavioural, psychological well-being, psychological strain, or physical health outcomes.

To extend the findings from the meta-analysis, in Chapter 4, I investigate the curvilinear effect of autonomy on performance, psychological well-being and strain using a two-wave longitudinal field study design with a time lag of six months. I investigate the curvilinear effects of autonomy both cross-sectionally and longitudinally, noting that longitudinal analyses represent a more robust inference of the curvilinear effects of autonomy on outcomes. With the data gathered in this study, I seek to extend the findings from the meta-analysis in two ways. Firstly, I investigate the shape of the curve between autonomy and outcomes. Secondly, I identify the point of inflection after which any additional autonomy may no longer have incremental benefits, or even becomes detrimental. This study utilises data that is part of a larger ongoing research project investigating mature workers in the context of the COVID-19 pandemic due to the unique challenges faced by this group of workers (e.g., higher levels of autonomy due to working from home arrangements).

In Chapter 5, I present an experimental study to establish the causal curvilinear effect of autonomy on performance, psychological well-being and strain. This study builds on the preceding chapters in several ways. First, I seek to establish causality using an experimental design. Second, I investigate the mechanisms by which autonomy impacts on various outcomes. In this study, adapting an experimental paradigm from previous work design studies, I include a content validation step to ensure that the experimental manipulations present participants with varying levels of autonomy (i.e., extremely low, moderately high and extremely high levels of autonomy). In order to address the limitations of single-source data, I use an objective rating scheme of performance on the task and measure the mechanisms via self-report. To identify potential mechanisms involved in the curvilinear relationship, I consider perceived responsibility, goal setting, and choice overload.

Chapter 6 forms the general discussion and conclusion of this thesis. In this final chapter, I consolidate findings across the three empirical studies, discuss their limitations, theoretical and practical implications, and propose avenues for future research.

Chapter 2: Theoretical Development

Autonomy

Autonomy is defined as "the degree to which the job provides substantial freedom, independence, and discretion to the individual in scheduling the work and in determining the procedures to be used in carrying it out" (Hackman & Oldham, 1976, p. 162). This definition is closely echoed by other researchers such as Breaugh (1985) and Morgeson and Humphrey (2006). One similarity across these definitions is that autonomy is multi-faceted, encompassing multiple aspects of one's job, such as control over decisions, determining how and when tasks are completed, and the ability to define boundaries of work (Evans & Fischer, 1992).

Autonomy is one of the most prominent concepts included in well-established work design theories such as the job characteristics model (Hackman & Oldham, 1976) and the job demands-resources model (Demerouti et al., 2001). According to Hackman and Oldham (1976), job autonomy is positively linked to outcomes because it leads workers to experience responsibility for their work outcomes and believe that their work is meaningful, both of which are critical psychological states, which in turn lead to positive outcomes such as psychological well-being and increased performance. Beyond this motivational perspective, Demerouti et al. (2001) theorised that job autonomy is positively linked to outcomes because it helps individuals to cope with and meet the unique demands of their jobs. Autonomy is further argued to be a basic human need that is desired by all individuals across all jobs, because autonomy allows individuals to assert their identities, in turn allowing them to express their true selves (Keller, 2016). In the following section, I outline notable work design theories with a specific focus on autonomy. These theories focus on the positive, albeit linear, effect of work characteristics. They are essential in

reflecting on the concept of autonomy and provide a basis for my subsequent consideration of theoretical views that would suggest the effects of autonomy to be curvilinear.

The Linear Effect of Autonomy

Perhaps the most influential theory for understanding how autonomy relates to desirable outcomes is the job characteristics model (Hackman & Oldham, 1976). This model posits that jobs high in characteristics such as autonomy lead to improved performance because autonomy promotes intrinsic motivation. From this perspective, autonomy engenders internalised feelings of responsibility and meaningfulness, which in turn positively affect outcomes such as performance, psychological well-being and strain (Humphrey et al., 2007; Karasek, 1979).

Similarly, the job demands-resources model (Demerouti et al., 2001), based on an earlier job demands-control model (Karasek, 1979), suggests that job characteristic can be grouped into demands and resources that interact to impact individual, team and organisational outcomes. In this model, job demands are defined as a perception of elevated requirements from the job, such as time pressure and inflexible work methods (Bakker & Demerouti, 2007). These demands require employees to exert more effort in order to successfully achieve their work goals. On the other hand, job resources, such as autonomy, are aspects of the job that can help employees to meet the demands of their job (Bakker & Demerouti, 2007). In instances where autonomy (a job resource) is high, employees are well supported to cope with the strain arising from the demands of their jobs. For example, providing employees with autonomy can enable individuals to cope with job demands by determining *when* to complete tasks and *how* to meet the requirements of their jobs.

The job demands-resources model proposes that while autonomy impacts on strain-type outcomes, it can also work to buffer the negative effects of high job demands.

A third perspective comes from self-determination theory (Deci & Ryan, 1985). This theory proposes that autonomy is related to desirable job outcomes such as performance and well-being in a linear fashion because autonomy gives a sense of being in control of one's own behaviours and goals (or self-determination), and provides scope to take direct action that results in real change (Deci & Ryan, 1985). From this perspective, autonomy fulfils a basic psychological need for control, which when met, motivates employees to achieve organisational goals such as enhanced performance and well-being, because employees are empowered to partake in behaviours that are congruent with their personal goals and identities (Gagné & Deci, 2005). Conversely, the absence of autonomy manifests in the form of diminished motivation and symptoms of ill-being.

Among the various theoretical views and conceptualisations of autonomy, the definition of autonomy is similarly varied. It is therefore important to note that the definition of autonomy within the self-determination theory framework refers to an internalised sense of choice, rather than the actual freedom of discretion within one's job, as defined in the job demands-resources and job characteristics models outlined above (Parker, 2014). To elaborate, some researchers have argued that employees can be motivated by a sense of choice (i.e., "autonomy" within the self-determination theory framework) even if they lack actual freedom of discretion (i.e., "autonomy" from the job demands-resources and job characteristics perspectives; see for example Adler & Borys, 1996; Treville & Antonakis, 2006). For the purpose of this thesis, I align my definition of autonomy with the definitions from the job demands-resources

and job characteristics models – that is, the freedom of discretion present within one's job.

Regardless of the theoretical differences, a plethora of empirical studies have found support for the positive effects of autonomy on various outcomes, such as performance (Cordery et al., 2010; Dodd & Ganster, 1996), psychological well-being (Wheatley, 2017), and strain (Nauta et al., 2010). Multiple meta-analyses have also established a positive linear relationship between autonomy and various outcomes (e.g., Fischer & Boer, 2011; Fried, 1991; Humphrey et al., 2007). These findings provide support for the theoretical perspectives summarised above.

While the theories outlined above are undoubtedly influential in guiding modern-day work design research and practice, these theories demonstrate that scholars typically hypothesise and test the linear relations between an antecedental resource (e.g., autonomy) and outcomes, in turn reinforcing this approach. To illustrate, Pierce and Aguinis (2013) argued that in an implicit quest to maximise outcomes such as performance, when empirical support is found for monotonically linear relationships, assumptions that "if some is good, more must be better" are reinforced. In turn, scholars conclude that relationships between antecedents and important organisational outcomes are best characterised by linear relations. While model simplification may improve practical utility and hence support from practitioners (Einhorn & Hogarth, 1975), this conclusion undermines the necessity to consider the possibility of non-linear relations. On a similar note, Crawford et al. (2010) notes that linear perspectives are widely accepted due to their parsimonious nature. As this paragraph alludes to, the predominant view of autonomy considers it as a resource that has linear links with outcomes. However, as I establish next, a number of theoretical perspectives suggest that more autonomy may not always be

better. In the next section, I present the theoretical arguments for the possibility that the relationship between autonomy and outcomes may in fact be curvilinear.

The Curvilinear Effect of Autonomy

> "Theoretical progress occurs when scholars identify faulty logical or empirical inferences and update or develop new theories to address them." (Pierce & Aguinis, 2013, p. 315).

With the consideration of job autonomy being one of the most prominent work design characteristics, Langfred and Moye (2004) noted that the meta-analytic relationships found between autonomy and outcomes within studies grounded in traditional linear perspectives remain modest (e.g., $r = .26$; Spector, 1986), and effect sizes from empirical studies are not as strong as theoretical models imply. A number of non-linear theories provide alternative perspectives which speak to the presence of non-linear effects of autonomy. I outline three notable non-linear perspectives in turn.

As a framing perspective, the too-much-of-a-good-thing argument by Pierce and Aguinis (2013) provides a generic view of the reasons for curvilinear effects of autonomy and other variables. This perspective posits that antecedents, generally viewed as beneficial, can reach an inflection point, after which their relationships with desirable outcomes either become asymptotic or lead to a reversal in relational direction, such that additional amounts of the resource result in a detrimental effect on outcomes. Other more specific theoretical perspectives on work design characteristics align with this argument, and provide further insights into why such a curvilinear relationship might exist. In what follows, I illustrate these theories from the focal point of autonomy.

In contrast to traditional theories suggesting the linear effects of autonomy, the vitamin model (Warr, 1987) proposes a curvilinear effect for some job characteristics. The model suggests that, like vitamins, the effects of the job characteristics' availabilities are contingent on their overall levels. At extremely low levels, any increment of a characteristic would lead to a positive result. However, for some characteristics, beyond a certain level, no benefit can be derived from additional quantities, either tapering in a plateau (i.e., "constant effect"), or even becoming detrimental (i.e., "additional decrement"), leading to negative effects (Warr, 1987). In relation to autonomy, Warr (1987) suggested that extremely low levels of autonomy might be unstimulating and monotonous, which could create feelings of frustration and boredom. At these low levels of autonomy, any increment in autonomy is likely to be positively linked to desirable work outcomes, consistent with a linear positive effect discussed in the theories above. However, at extremely high levels of autonomy, a 'paradox of autonomy' can emerge, where autonomy actually adds to the workload, rather than reduces it. This is paradoxical because according to traditional linear theories, autonomy is a resource, and therefore should help employees to meet their work demands. Warr (2002) put forth that extremely high levels of autonomy require individuals to address all options (e.g., when in the day or week to complete a task vis-à-vis all other tasks). This process of evaluating each option of a seemingly unlimited number of options is tedious and can be overwhelming to the extent that individuals may not fully psychologically commit to their chosen option (Schwartz, 2005). As a result of insufficient psychological commitment, individuals may settle for a suboptimal choice (e.g., working after hours), or worse, not make a choice at all (e.g., putting a task off until it becomes overdue). It is clear that this lack of commitment can impact on performance, well-

being and strain (Schwartz et al., 2002). Further, when employees have seemingly been afforded all the autonomy to support them in meeting work demands, they may feel an unhealthy degree of sole accountability for all the outcomes of their work (Warr, 2016). This in turn may increase the amount of stress experienced (Gardner, 1986; Gardner & Cummings, 1988; Yerkes & Dodson, 1908).

The non-linear effects of autonomy may also be explained by the conservation of resources theory (Hobfoll, 1989). According to this theory, when faced with resource losses in the workplace, individuals seek to protect their pool of limited resources. Despite these attempts to defend against resource loss, when resources are depleted, individuals experience stress. As a result of this stress, individuals have even fewer resources to offset further resource loss, resulting in a loss spiral (Hobfoll et al., 2018). To illustrate, while autonomy is typically viewed as a resource, extremely high levels of autonomy may cause individuals to dedicate often scarce psychological resources to manage that autonomy, rather than dedicating these psychological resources to meeting task requirements. This increases psychological strain, which in turn further reduces the individual's capacity to manage these extreme levels of autonomy, and may set off a "loss spiral" over time, where individuals are preoccupied with managing this autonomy at the cost of performance or psychological well-being.

An increasing number of researchers argue that the categorisation of an antecedent as a "resource" or "demand" based on its effect is flawed (Van den Broeck et al., 2010), with a growing debate about whether demands may have beneficial effects (e.g., challenge stressors; Crawford et al., 2010; Podsakoff et al., 2007), but also – and perhaps less researched – whether resources may have detrimental effects on outcomes. The curvilinear perspectives outlined above serve to

guide my investigation into extending the argument that resources, when taken too far, may also have detrimental effects on outcomes.

Outcomes Investigated in this Thesis

In this thesis, I investigate three main outcome types across the three studies, namely performance, psychological well-being and ill-health. These three concepts are outcomes that are typically of interest to both scholars and practitioners. First, performance is defined as the extent to which an individual meets their role requirements (Griffin et al., 2007). Psychological well-being refers to a positive assessment of one's life and emotional experiences (Diener et al., 2017), and distinguishes between hedonic (i.e., related to happiness, such as pleasure attainment and pain avoidance; Warr & Clapperton, 2010; Kahneman et al., 1999) and eudaimonic (i.e., related to self-realisation, that is, the full functioning of the person; Ryan & Deci, 2001) well-being. Lastly, psychological ill-health is typically characterised by experiences of anxiety, depression, and other mood disorders (Keyes, 2005), which may manifest as burnout (e.g., emotional exhaustion, cynicism, depersonalisation) or chronic stress in the workplace. Throughout the discussion of psychological well-being and ill-health in this thesis, I subscribe to the dual axiom model of psychological health by Keyes (2005), that is, that psychological well-being is not defined by the absence of ill-health, but rather should be viewed as two distinct concepts. For example, an individual may not experience depression or anxiety, typical markers of psychological ill-health, but this does not mean that they are happy and flourishing (i.e., psychological well-being; Keyes, 2007). Parker (2014) proposed that work design characteristics such as autonomy directly impact outcome categories such as performance, well-being and ill-health through different pathways, providing support for considering these three outcomes separately.

Due to the different nature of the following three studies, performance, psychological well-being and ill-health are operationalised using different measures across the three studies. I will elaborate on each operationalisation in the respective chapters that follow.

Summary

While traditional theories propose a positive effect of autonomy on outcomes and studies predominantly have focused on linear effects, there are some alternative theories and studies that demonstrate that it may in fact not be linear. However, there is not a broad base of empirical research into the curvilinear effects of autonomy compared to studies investigating linear effects. Most are based on cross-sectional self-reports which are less robust compared to multi-source or longitudinal designs, and even fewer are experiments. Therefore, a causal curvilinear effect cannot be established.

With the current trends in work environments shifting towards working-from-home or blended arrangements, as well as an increase in highly autonomous working conditions such as the gig economy, autonomy is likely to become an even more central work characteristic in the future (Stiglbauer & Kovacs, 2018). Therefore, it is particularly relevant, and indeed important, to investigate the potential limits or even drawbacks of job autonomy. Understanding how extremely high autonomy affects individuals' performance, well-being and strain is imperative to advancing work design theory and supporting employees and organisations in a practical manner.

It is important to note that the proposition of non-linear relationships do not dispute the validity of well-established linear theories. However, it challenges researchers to continue to refine and re-examine important nuances of work design theories. It is with this view that I discuss the following empirical studies.

Chapter 3: Too Much of a Good Thing? A Meta-Analysis of Curvilinear Effects of Autonomy in the Workplace

Introduction to Chapter 3

In this chapter, I review the literature on the curvilinear relationships between autonomy and various outcomes. To this end, I conducted a meta-analysis to assess and evaluate *if* a curvilinear relationship between autonomy and outcomes do indeed exist. This chapter has been submitted to a journal for peer-review, and is formatted accordingly. As this chapter is a standalone manuscript, some repetition is unavoidable, particularly in describing the theory, background and rationale of the paper.

Co-author Attribution

Author	Contribution	I acknowledge that these represent my contribution to the research output Signed:
Cheryl Yam	Development of research question, data collection, data management, data coding, data analysis, interpretation and discussion, manuscript preparation, review and editing of drafts	
Dr. Laura Fruhen	Development of research question, data coding, interpretation and discussion, review and editing of drafts	
Professor Sharon Parker	Development of research question, interpretation and discussion, review and editing of drafts	

Too Much of a Good Thing? A Meta-Analysis of Curvilinear Effects of Autonomy in the Workplace

Work constitutes one of the most important domains of life and has consistently been demonstrated to affect people and their well-being (Bianchi et al., 2005). Theories of work design have been critical in understanding the processes through which work affects people and their well-being (Fried & Ferris, 1987; Hackman & Oldham, 1976; Morgeson & Humphrey, 2006). Work design refers to the "content and organization of one's work tasks, activities, relationships, and responsibilities" (Parker, 2014, p. 662). It is typically described in terms of the characteristics of an individual's work that can affect how people perform, feel, and view themselves and their jobs, and has been linked to many outcomes that are of interest to organizations, such as safety, well-being, performance, and innovation (Parker, 2014).

A key component of work design is autonomy, defined as "the extent to which a job allows freedom, independence, and discretion to schedule work, make decisions, and choose the methods used to perform tasks" (Breaugh, 1985; Morgeson & Humphrey, 2006). Autonomy in a job encompasses multiple aspects, such as control over one's own work decisions, the ability to determine or influence how and when tasks are accomplished, and the authority to define one's boundaries of work (Evans & Fischer, 1992). As such, autonomy is not just the number of decisions a person can make, but also the extent of the decision. Autonomy is a central element in all major theories of work design (e.g., job demands-resources model, Demerouti et al., 2001; job characteristics model, Hackman & Oldham, 1976, etc.), and is commonly theorized to improve desirable work outcomes such as well-being (e.g., job satisfaction, engagement) and behavioral outcomes (e.g., performance, turnover

intentions), and further impair negative work outcomes such as psychological strain (e.g., stress) and physical health (e.g., obesity). These effects are reasoned to occur because autonomy provides individuals with discretion over how best to meet their unique work demands (Bakker & Demerouti, 2007), as well as motivate individuals through meeting their psychological needs at work (Hackman & Oldham, 1976). Viewed from a more general perspective, autonomy in life, or freedom of choice, enables individuals to express their identities through their motives and interests that they chose of their own volition, which in turn allows them to realize their authentic selves (Kühler & Jelinek, 2013). A desire for autonomy is argued to be a basic human need – existing in a self-reflective manner, centered on the exploration and awareness of one's personal desires, wishes and intentions (Keller, 2016).

The importance of autonomy is supported by studies that show its positive impact on a range of desirable work outcomes. Indeed, research has consistently identified autonomy as a key aspect of work that supports an employee's effectiveness (Farh & Scott, 1983), physical well-being (Landeweerd & Boumans, 1994), and psychological well-being (Häusser et al., 2010). These effects have also been consistently demonstrated in various meta-analyses (Fried & Ferris, 1987; Humphrey et al., 2007; Nixon et al., 2011). All these studies suggest that more autonomy is better for employees.

Theoretically, while autonomy has been widely accepted as a job resource which helps people to navigate work demands, there is a strong rationale for proposing that there are limits to its benefits. Evidence from other researchers suggests that autonomy may not always be as beneficial as traditional theories and studies propose (Stiglbauer & Kovacs, 2018). Grounded in theories such as the vitamin model and activation theory, there is good reason to believe that a curvilinear

relationship might best characterize the effects of autonomy at work, as we elaborate later. In line with these theories, there is some evidence that both insufficient and excessive autonomy are associated with lower levels of well-being (e.g., Daniels et al., 2013; Stiglbauer & Kovacs, 2018), job satisfaction (e.g., Baltes et al., 2002), and performance (e.g., Daniels et al., 2013). However, this evidence is also countered by studies that have tested, yet failed to demonstrate the curvilinear effects of autonomy (e.g., Toker et al., 2012), or found the curvilinear effects only at boundary conditions such as high levels of feedback (Preston, 2013) or high job complexity (e.g., Chung-Yan, 2010). From a theoretical and empirical perspective, it is crucial to gain more resolution into the relationship between autonomy and key outcomes to better understand how the relationships between autonomy and work outcomes change at varying levels of autonomy.

Understanding the true nature of the link of autonomy with outcomes has relevance for work design implementation in organizations. Investigating the possibility of curvilinear effects is important in the context of the key positive impact that autonomy is assumed to have on employees, particularly on their mental health (Parker, 2014). In policy guidance across various countries such as Australia (Comcare, n.d.; Safe Work Australia, 2014), the United States of America (e.g., National Institute for Occupational Safety and Health; Streit et al., 2019), and Europe (e.g., Eurofund; Ardito et al., 2012), low autonomy is described as a "psychosocial hazard", and is typically included as an area for improvement in most frameworks. Given this guidance provided to practitioners, it is important to know whether excess autonomy might potentially cause detrimental effects to well-being and performance, and to ensure that well-meaning organizations do not unknowingly worsen work design by increasing the 'resource' of job autonomy to excess.

The aim of this study, therefore, is to synthesize this existing research using meta-analytical techniques. We seek to consolidate the findings from studies that have tested for a curvilinear relationship between autonomy and outcomes. While meta-analyses exist that investigate linear effects of work design attributes on various outcomes (e.g., Fried & Ferris, 1987; Humphrey et al., 2007; Nixon et al., 2011), to our knowledge, a meta-analysis testing curvilinear effects of autonomy on various outcomes does not yet exist. Guided by these previous meta-analyses on linear effects of work design, we include outcomes that are central to work design theory (e.g., Chung-Yan, 2010; Fried et al., 2013; Stiglbauer & Kovacs, 2018) and that have been considered in previous meta-analyses. These outcomes include psychological strain (e.g., anxiety, burnout), well-being (e.g., job satisfaction, engagement), physical health (e.g., somatic complaints, obesity) and behavioral outcomes (e.g., performance). The distinction between strain and well-being as two distinct unipolar dimensions in our study is based on the dual axiom model of psychological health (Keyes, 2005), which together allows us to capture a more complete image of mental health, as opposed to the traditional bipolar continuum of the absence-presence of psychological ill-health.

Theoretical Background and Hypotheses

Several work design theories identify the importance of autonomy for individual-level outcomes such as strain, well-being and behavior, and these perspectives are backed up by research, as we discuss next. However, as we elaborate, there is also considerable theory and evidence suggesting the possibility of a curvilinear relationship of autonomy with these outcomes.

Theory and Evidence for Positive Linear Effects of Autonomy on Outcomes

One of the most influential theories for understanding how and why autonomy relates to key employee outcomes is the job characteristics model (Hackman & Oldham, 1976), which theorized that autonomy is related to desirable job outcomes such as performance and well-being because of the motivating potential of this job attribute. Specifically, autonomy is thought to motivate individuals through engendering feelings of responsibility for outcomes, meaningfulness, and understanding the results of investing effort. This in turn increases psychological well-being and behavioral outcomes such as motivation, job satisfaction, and performance (Hackman & Oldham, 1976; Humphrey et al., 2007). This relationship was demonstrated in a meta-analysis which found that autonomy affects various outcomes through arousing a sense of meaningfulness as well as responsibility for work outcomes (Humphrey et al., 2007).

The job demands-resources model (Demerouti et al., 2001), which builds on an earlier job demands-control model (Karasek, 1979), also features job autonomy. This theory proposes that demands and resources are key work characteristics that predict positive outcomes (e.g., learning, motivation, efficiency) and negative outcomes (e.g., strain, work-related illnesses). Job demands have been described as a perception of increased requirements to navigate the work environment successfully (Hobfoll & Shirom, 2001), such as time pressure, difficult customers, and inflexible work schedules. These demands require an employee to expand more effort to deal with them. On the other hand, job resources such as autonomy have been theorized as aspects of the work environment that not only help employees to achieve their goals, but also enable them to better handle job demands (Bakker & Demerouti, 2007). Thus, autonomy can enable employees to cope with job demands by allowing them to determine when and how to meet the demands of their job, and this is

especially effective when demands are time critical. For example, autonomy allows individuals to use their own discretion to deal with problems as they arise, rather than deferring to higher management, which may result in delayed decision making (Wall et al., 1992). The job demands-resources model predicts that autonomy will be positively linked with psychological well-being (such as engagement and job satisfaction) and behavioral outcomes (such as performance), while also reducing strain (such as anxiety and burnout) in a linear fashion.

Consistent with the theoretical arguments regarding the linear effects of autonomy on outcomes outlined above, linear effects of autonomy at work have been consistently documented in meta-analyses. These meta-analyses link job autonomy with a range of psychological outcomes, including well-being at work (e.g., γ_{health} = -.19, $p < .10$, Fischer & Boer, 2011; $\hat{\rho}_{jobsatisfaction}$ = .48, $CI^{95\%LL}$ .45, $CI^{95\%UL}$ .50, Humphrey et al., 2007), psychological strain ($\gamma_{anxiety}$ = -.33, $p < .001$, $\gamma_{emotionalexhaustion}$ = -4.57, $p < .001$, Fischer & Boer, 2011) and behavioral outcomes such as job performance ($\bar{r}$ = .18 - .21, $CI^{95\%LL}$ .08 - .30, $CI^{95\%UL}$ .07 - .35, Fried, 1991). Nevertheless, it is important to note that these meta-analyses investigated only the linear effects of autonomy on various outcomes and did not explore the possibility of curvilinear relationships. The empirical support for linear relationships by these meta-analyses may further reinforce assumptions that monotonical relationships between autonomy and important organisational outcomes are best characterised by linear relations. This success may have indeed led scholars to largely overlook other possibilities, such as non-linear effects.

While the theories outlined above have been highly influential in explaining the theoretical mechanisms of job demands and resources on work outcomes, critics argue that the categorization of a work design factor as a resource or demand based

on its effect is flawed (e.g., Van den Broeck et al., 2010). In other words, when a variable on some level contributes positively to an outcome, it is deemed a job resource. On the other hand, when a variable on some level is negatively related to outcomes, it is deemed a job demand. This approach towards work design factors rooted in their effect may have further driven a focus on linear effects of autonomy and other factors, even if curvilinear effects may more accurately represent the impact of autonomy on outcomes. The curvilinear perspective questions the utility of approaching work design characteristics as linear constructs and, as such, the categorization of work design factors based on their effects as positive or negative per se. Indeed, some studies suggest that curvilinear main effects exist, but these are typically overlooked in psychological research (Cortina, 1993; Matuschek & Kliegl, 2018). As we will elaborate next, there are strong theoretical reasons to suggest the possibility of curvilinear effects of autonomy on key outcomes.

Theory and Evidence for Curvilinear Effects of Autonomy on Outcomes

Despite the pervasiveness of the linear theories outlined above, alternative theoretical perspectives on autonomy exist that suggest a curvilinear effect of autonomy. A generic view of the reasons why such curvilinear effects may occur is provided by the framing perspective put forth by Pierce and Aguinis (2013), which outlines that antecedents, generally seen as beneficial, can reach an inflection point, after which their relationships with desirable outcomes leads either to a waste of resources (e.g., no additional benefit to performance), or worse, a detrimental outcome (e.g., decreased performance).

A range of specific theoretical perspectives align with this argument and provide further theoretical rationale why such a curvilinear link between autonomy and outcomes may exist. Each of these theories identify various reasons for a

curvilinear effect of autonomy. First, according to Warr's (1987) vitamin model, a 'paradox of autonomy' (Warr, 2002) can emerge in which autonomy adds to workload rather than reduces it. From this point of view, individuals with excess autonomy have to dedicate limited resources to evaluating and prioritizing each option of many decisions and choices, then have to manage the additional responsibilities deriving from these options. Second, at particularly high levels of autonomy, the sheer amount of information, depth, and number of options to process (e.g., method used to perform a task) may overwhelm an individual, leading them to not fully psychologically commit to a chosen option (Iyengar & Lepper, 2000; Schwartz, 2005). In turn, individuals are more likely to make a suboptimal choice, or in some cases, not make a choice at all, thereby negatively impacting on their performance (Schwartz et al., 2002). Third, excessive autonomy may be perceived as unpleasantly coercive, rather than beneficial (Warr, 2002). This sense of coercion may result from individuals perceiving an intense level of personal responsibility to perform under conditions of extreme autonomy (Warr, 2002, 2016). Because they have seemingly been afforded all the resources to support them in their work, individuals may feel an unhealthy degree of accountability for the outcomes of their work (Warr, 2016), thereby increasing stress (Gardner, 1986; Gardner & Cummings, 1988; Yerkes & Dodson, 1908) which in turn negatively impacts on psychological well-being. It is important to note that this effect is likely to be even more pronounced in knowledge-based work, typically characterized by high uncertainty and ambiguity. In this type of work, high levels of job resources require much more mental effort to process (Baumeister et al., 2007), which over a long period can turn into a chronic stressor (Gardner & Cummings, 1988). For example, all alternative

options (e.g., how to complete a task) need to be assessed in consideration of the uncertainty and ambiguity of the environment (Sørensen & Holman, 2014).

The Current Study and Hypotheses

Despite the theoretical arguments for the existence of curvilinear effects of autonomy, the possibility of curvilinearity continues to go relatively unexplored. For example, within the last decade in the SCOPUS database, 2,504 studies investigated interaction effects between autonomy and other variables, but only 39 investigated the possibility of a non-linear trend[1]. In the wider context of the overall autonomy literature, the small number of studies investigating non-linear effects represent an emerging trend. This trend adds a more refined understanding of autonomy that warrants further attention. When scholars search for curvilinear trends, these studies are divided in their conclusions regarding the existence of a curvilinear effect of autonomy, with different researchers finding conflicting results. For example, some studies demonstrate a clear curvilinear effect (e.g., De Jonge et al., 2000), others find it only under particular conditions (e.g., Chung-Yan, 2010; Preston, 2013), and still others search for, but do not find a curvilinear effect (e.g., Toker et al., 2012). In order to understand if a curvilinear effect of autonomy indeed exists, these differences must be reconciled.

The incongruence of the current literature on the link between autonomy with outcomes suggests that a review assessing the existence and nature of curvilinear effects of autonomy is needed. Such a review will help to direct and justify future research towards searching for a curvilinear relationship if it indeed exists. The

[1] All research articles indexed in the SCOPUS database from 2008-2019 was searched, using the words “interact*”, “moderat*”, in the results section in the first instance. In the second search, additional terms “curvilinear”, “non-linear”, “inverted-U”, and “U-shaped” were also included. Given the potential mismatch between search terms and actual tests of interaction and curvilinear effects, these figures are only an approximation.

current study assesses the prevalence of curvilinear effects of autonomy on work outcomes by conducting a systematic search of the literature to identify studies that have tested for curvilinearity, examining the curvilinear association of autonomy with outcomes such as performance, strain and well-being at work, and statistically meta-analyzing the results of those studies.

Based on the theoretical arguments referred to above, we expect to see a curvilinear link between autonomy and outcomes such that – consistent with the job characteristics model and other theories – there is a positive effect of job autonomy from low to high job autonomy. However, consistent with the vitamin model (Warr, 1987), we expect that the positive relationship between autonomy and outcomes will no longer hold at very high levels of autonomy, instead becoming negative.

In this meta-analysis, we focus on four broad types of outcomes, namely outcomes related to well-being (e.g., psychological well-being, affective well-being, engagement, job satisfaction), strain (e.g., anxiety, burnout), physical health (e.g., obesity), and behavior (e.g., performance, turnover intentions). These concepts are identified as core outcomes of autonomy in the literature (Humphrey et al., 2007), and are conceptually different in nature, such that considering them separately will contribute to a refined understanding of the ways in which curvilinear effects of autonomy operate. In particular, we propose that psychological outcomes (i.e., well-being and strain) and behavioral outcomes are more susceptible to pronounced curvilinear effects of autonomy compared to other outcomes, due to them being more proximate outcomes of autonomy. In contrast, physical health outcomes are more distal to autonomy (Bambra et al., 2007), such that the possible effects of extremely high autonomy on these outcomes are more likely to be buffered by contextual

factors. We consider the four outcomes types separately in our investigation of curvilinear effects of autonomy based on the following rationale.

First, we consider the psychological outcomes of autonomy. Within psychological outcomes, the dual axiom model of well-being and strain by Keyes (2005) puts forth that well-being is not the absence of strain, but rather should be viewed as a complementary concept which provides a more complete state of mental health. Specific to work design theory, Parker (2014) proposed that work design characteristics such as autonomy directly impact outcome categories such as well-being and strain through different pathways. For example, autonomy might promote "active coping", which leads to reduced strain (e.g., anxiety) due to the increase in learning and mastery in the face of job demands (Karasek, 1979). Based on the conservation of resources theory (Hobfoll, 1989), extreme levels of autonomy may however cause individuals to dedicate too much resources to "active coping". Autonomy might also motivate individuals through engendering feelings of meaningfulness and responsibility, thus improving feelings of well-being (e.g., positive affect, satisfaction; Hackman & Oldham, 1976). However, extremely high levels of autonomy may result in perceptions of excessive accountability in employees (Warr, 2016). In line with Keyes (2005) and Parker (2014), we include well-being and strain as distinct outcome types in the study of the curvilinear effects of autonomy.

Second, scholars have also suggested a similarly direct relationship between autonomy and behavioral outcomes (Humphrey et al., 2007; Johns et al., 1992), suggesting it to be a more proximal outcome of autonomy. These relationships are likely to occur through processes such as goal setting and information processing (Locke & Latham, 2013; Schwartz et al., 2002). To elaborate, employees provided

with extreme levels of autonomy may engage in poorer goal setting behaviors (i.e., setting vague goals), which in turn negatively affects performance (Latham & Locke, 2006). Therefore, we also expect that the detrimental effects of excessive autonomy on behavioral outcomes occurs on a proximal level.

Third, we consider physical health as a more distal outcome of autonomy. While Parker (2014) proposed that work design characteristics also affect physical outcomes, researchers argue that the specific effects of job design characteristics on physical health follows an indirect path (Fried et al., 2013). These effects are likely to occur through various processes leading to psychological outcomes (e.g., psychological well-being and strain) as outlined above. In turn, psychological well-being and strain represent the first step towards compromised physical health by operating through "brain-body pathways" to affect physical health (Gianaros & Wager, 2015; Rosengren & Manhem, 2015). For example, psychological strain has been found to result in elevated levels of involuntary physiological responses such as an increase in cortisol, which in turn is linked to cardiovascular disease (Pahuja & Kotchen, 2011). Other scholars also point to health behaviors as an alternate mechanism through which job control may affect physical health (e.g., Weidner et al., 1997). For example, poorly designed jobs may increase peoples' risk of smoking and alcohol consumption as a coping mechanism, while at the same time having a poorer diet and failing to exercise, all of which lead to ill health (Jones & Fletcher, 2002). While the exact mechanism by which autonomy impacts of physical health may not be as straightforward, the consensus is that the impact of autonomy on physical health may be less direct, working through psychological well-being, or short-term physical behaviors (Payne et al., 2002). These additional sequential pathways may have a buffering function such that they may obscure the existence of

any curvilinear effects and in doing so make these effects less pronounced (Landsbergis et al., 1998). Due to this relatively distal association between physical outcomes and autonomy, we expect that the curvilinear effects of autonomy on physical outcomes may be less pronounced than on more proximate outcomes such as psychological well-being, strain and behavioral outcomes.

> *Hypothesis 1:* Autonomy demonstrates a significant curvilinear relationship with all outcomes, such that at low levels of autonomy, any increment in autonomy results in a positive relationship with outcomes, but at extremely high levels of autonomy, any additional autonomy will have a negative relationship with outcomes.

Moderators of the Curvilinear Effect of Autonomy

Although we expect a curvilinear effect of autonomy on outcomes such as strain, well-being and performance, we also expect that these effects are more or less pronounced in certain circumstances. Work design variables, such as autonomy, do not operate in isolation and the extent to which work design variables affect employees may be contingent on other factors such as gender and culture, as well as attributes of the primary studies, namely the way that autonomy is operationalized. We discuss the moderating role of each of these three factors in the following sections.

Gender. Autonomy has been found to affect both genders differently (Doherty, 2004) and this is also likely to be the case for its curvilinear effects. Autonomy, specifically the facet of scheduling autonomy, has been argued to be important when analyzing gender differences at work, because societal expectations and norms around familial responsibilities may require women to have more flexibility in arranging their work schedules to suit the needs of the family and home

(Adler, 2005). Thus, women may benefit more from extreme levels of autonomy than men. For example, having more flexibility in their schedules and location of work might allow women to attend to their children's schedules at specific times of the day, and returning to their work tasks after they have completed their family and childcare commitments, thus allowing them to balance their dual responsibilities of work and home. As men are less likely to juggle home and work responsibilities to the same extent (Adler, 2005), they are also less likely to benefit to the same extent from extreme levels of autonomy. The differing effects of autonomy on men and women were demonstrated by Wheatley (2017), who found a positive relationship between autonomy related to working hours and various indicators of satisfaction across job, life and leisure in women, but only relating to job satisfaction in men. Further, and more central to the relationships under examination in this meta-analysis, Fletcher and Jones (1993) demonstrated a curvilinear effect of autonomy on job and life satisfaction amongst men, but not women, suggesting that women may be less susceptible to the detrimental effects of excessive autonomy. Following the theoretical arguments and empirical evidence presented above, we predict:

> *Hypothesis 2:* The curvilinear relationship between autonomy and outcomes is less pronounced in women, compared to men, such that the negative relationships of extreme autonomy with outcomes are weaker in women.

National Culture. Scholars conducting multi-national studies have noted that national institutional environments and cultural specifications may impact the effects of work characteristics such as autonomy on outcomes (e.g., Lopes et al., 2014). Scholars have theorized that these cultural specifications may shape preferences for particular working environments (Aycan, 2005; Erez, 2010) and managerial practices around managing autonomy (Snitker, 2010). Specifically, Hofstede's (2001) concept

of power distance refers to the extent to which cultures expect and accept egalitarian or hierarchical managing styles (Hofstede, 1980), and may be a relevant moderator of autonomy's link with outcomes. Individuals in high power distance cultures tend to perceive figures of authority (e.g., managers) as legitimate sources of "controlling support" (Chua et al., 2014), believe that subordinates should take instructions and orders from their supervisors, and may even feel uneasy or reluctant to accept and exercise discretionary power in performing their duties (Fock et al., 2004). Following, employees within cultures of higher power distance are more likely to be accepting of, and even value low autonomy conditions compared to employees in more egalitarian cultures (Chua et al., 2014). Empirical studies have found that in countries with higher power distance, the relationship between job autonomy and job satisfaction is attenuated, and the autonomy-job satisfaction relationship may not exist in countries of very high power distances (Fock et al., 2004). These cultural preferences may affect the extent to which autonomy displays curvilinear effects on outcomes as differing levels of autonomy within the workplace may fit better within high power distance cultures than low power distance cultures (Parker et al., 2017), and this fit may in turn result in more positive employee outcomes at high and very high levels of autonomy, making the curvilinear effects less pronounced. Thus, we hypothesize:

> *Hypothesis 3:* The curvilinear relationship between autonomy and outcomes are more pronounced in cultures with lower power distance such that the negative relationships between extreme autonomy and outcomes are stronger, compared to higher power distance cultures.

Operationalization of Autonomy. It has been argued that the study of autonomy has been hindered by the inconsistent way in which autonomy has been

conceptualized and operationalized (e.g., Breaugh, 1985, 1989; Sadler-Smith et al., 2003). Specifically, Breaugh (1985) demonstrated that a three-factor operationalization of work autonomy (via method, scheduling and decision-making autonomy) differentially related to work outcomes compared to a global autonomy factor. Adding to this finding in their meta-analysis, (Humphrey et al., 2007) found a larger correlation coefficient between job satisfaction and decision-making autonomy ($\hat{\rho}$ = .58, 95% CI [.52, .65]) compared to method ($\hat{\rho}$ = .34, 95% CI[.30, .38]) and scheduling ($\hat{\rho}$ = .11, 95% CI [.00, .21]) autonomy. These differences may be due to method and scheduling autonomy being more central to the design of the job itself, while decision-making autonomy may reflect issues more closely aligned with management philosophy rather than job design per se (Stiglbauer & Kovacs, 2018). An increase in decision-making autonomy may be related to better access to relevant information within the workplace, which may reflect less of a depletion or interference effect (Stiglbauer & Kovacs, 2018). Conversely, high autonomy in terms of method and scheduling autonomy could imply that a job is more unstructured (Barrick & Mount, 1993). Taken together, this suggests that method and scheduling autonomy may be more susceptible to curvilinear effects, whereby too much method and scheduling autonomy has detrimental effects on strain, well-being and performance. Therefore, studies which operationalize autonomy as having control over decisions (i.e., one factor; e.g., Kubicek et al., 2014; Rydstedt et al., 2006), may be less likely to find curvilinear effects compared to studies which separately take into account method and scheduling autonomy (i.e., three facets). Accordingly, we hypothesize:

> *Hypothesis 4:* The curvilinear relationships between autonomy and outcomes are more pronounced in studies which operationalize autonomy as having

three facets (i.e., method, scheduling and decision-making autonomy) such that the negative relationships between extreme autonomy and outcomes are stronger, compared to studies employing a global autonomy concept.

Method

Search Strategy for Primary and Secondary Data

A multi-stage literature search was conducted in accordance with current standards outlined in The Cochrane Collaboration's (Higgins & Green, 2008) guidelines for systematic reviews. Published studies were identified through searching the databases SCOPUS, Business Source Complete, PsycINFO and Emerald which index most journals relevant to the fields of organizational psychology and organizational behavior. To our knowledge, this is the first attempt at conducting a meta-analysis with this focus, therefore we did not restrict the date range and included all studies available. This revealed 1,353 records overall. Search terms followed the PICO framework as closely as possible (Petticrew & Roberts, 2006). This included defining the organization or work environment as the population of interest, alternate terms for the autonomy[2] concept (e.g., control, discretion, etc.), typical terms for outcomes related to studies within organizational settings (e.g., performance, engagement, well-being, etc.), and specifying a curvilinear relationship. Search strategies were modified for each database in accordance to the variation in search methodology employed by each database. See Appendix A for the full search strategy and search terms.

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[2] Studies (e.g., Häusser et al., 2010) have suggested that job control is a similar concept to job autonomy. Due to its theoretical overlap with autonomy, we included job control as a search term in order to capture any studies which might have used job control interchangeably with job autonomy. We then manually filtered these studies based on their operational definitions and measurements of "job control".

Additional studies were also found using references cited within the studies obtained from the database search. This resulted in an additional 87 records. We also emailed prominent work design scholars requesting unpublished studies and/or datasets that investigated the curvilinear effects of autonomy and received two unpublished datasets representing 15 main effects.

Criteria for Inclusion

All studies were required to meet the following criteria to be included in the meta-analysis: 1) written in the English language, 2) includes autonomy as an independent variable, 3) includes work-related outcomes, and 4) investigates the curvilinear relationship between autonomy and outcomes. Following the systematic search, duplicates (k = 45) were removed and the remaining titles and abstracts were screened for exclusion (k = 1,400). The vast majority of excluded studies in the next stage (k = 68) did not investigate the curvilinear relationship of autonomy with outcomes. From the initial 1,353 records identified, 43 records remained for inclusion in the meta-analysis. Of the initial 43 studies obtained via the primary search, only twelve studies provided the required effect sizes directly. To obtain additional data points from studies which did not provide the required effect sizes, we emailed the corresponding authors of all 31 remaining studies (relating to 26 corresponding authors due to multiple publications), requesting for the correlation coefficients between the linear and curvilinear autonomy terms and outcomes. Of the 26 authors contacted, seven responded with the required effect sizes. To expand our search, we also contacted authors of eligible studies from the last stage of the data screening process (k = 68). These studies investigated curvilinear effects of non-autonomy variables but included autonomy as a moderator of those curvilinear effects. Authors were provided with personalized syntax to calculate the correlations

of the autonomy term, the centred squared autonomy term, as well as outcomes. Of these, four authors replied with the required effect sizes. Consequently, 93 effect sizes from 27 studies, represented by 24 records, were included in the meta-analysis. See Appendix B for an outline of the steps in the literature search and meta-analysis.

In order to investigate the curvilinear effects of autonomy on outcomes in this meta-analysis, the effect sizes for each study had to be calculated from the semi-partial correlation coefficient, computed directly from the correlation coefficients of the linear (autonomy) and curvilinear (autonomy^2) terms with outcomes (see equation 1; Abdi, 2007), as well as the sample size. According to Cohen and Cohen (2003), this effect represents the incremental variance of the curvilinear term above and beyond the linear term and can also be isolated from hierarchical regressions in which the linear term is entered first, followed by only the quadratic term in the next step[3].

$$r_{Y.X|T} = \sqrt{\frac{(r_{X.Y} - r_{Y.T} * r_{X.T})^2}{1 - {r_{X.T}}^2}} \quad (1)$$

where X: autonomy^2

Y: outcome

T: autonomy

It is important to note that the values generated using this formula is based on the incremental variance of the curvilinear effect, that is, the incremental variance of the curvilinear term above and beyond the linear term (rather than the beta values).

[3] Since the increment in additional variance in the second step of a hierarchical regression model is a squared semi-partial correlation, its square root – the semi-partial correlation between the curvilinear component and the outcome variable – can be used in a meta-analysis in the same way as an ordinary correlation coefficient between the quadratic term and outcome variables (Williams & Livingstone, 1994).

Therefore, these values do not indicate the specific pattern or direction of the curve, but only if there is an overall curvilinear relationship

Coding of Studies

The authors developed a coding protocol to record data from all primary studies to ensure that coders were consistent in their independent assessments of each study. Characteristics recorded included the author details, type of record (e.g., journal article, conference proceedings, etc.), country of data collection, response rate, study design, and industry setting. Other information such as the operationalization and measure of autonomy (uni- or multi-dimensional, i.e., scheduling, method and decision-making autonomy) used, as well as any moderators relevant to this study, were also noted. The coders further recorded the type of outcomes which were relevant from a theoretical perspective, and aligned with notable meta-analytic studies in this field (e.g., Humphrey et al., 2007; see Table 3.1 for categories included). Lastly, where available, the authors also coded for the shape of the curve – that is, whether the curvilinear relationship resembled a plateau ("constant effect"; CE) or reversed in direction, thus following a U- or inverted U-shaped curve ("additional decrement"; AD). These categorizations were then independently coded by the first and second authors. The agreement between the two raters was assessed using Krippendorff's alpha (Hayes & Krippendorff, 2007) which indicated that the raters were highly consistent in their coding of the outcomes (α_{Kripp} = .85, 95%CI [.74, .97]; Krippendorff, 2013). Following this assessment, any discrepancies were resolved by discussion and agreement.

Table 3.1

Categories of Outcomes Based on Previous Research and Meta-analyses

Outcome type	Examples
Psychological well-being outcomes	Job satisfaction
	Internal work motivation
	Engagement
	Psychological well-being
	Positive affect
Strain outcomes	Anxiety
	Burnout
	Emotional exhaustion
	Negative affect
Physical outcomes	Obesity
	Somatic complaints
Behavioral outcomes	Performance
	Turnover intentions
	Sickness presenteeism
	Sickness absenteeism

Statistical Procedure

There are various statistical methods to conduct a meta-analysis of curvilinear effects. For example, Sturman (2003) recommends gathering data from all studies that investigate the relationships of interest in a linear fashion, and test for curvilinear relationships using a meta-regression procedure. This allows for the comparison between linear and non-linear effects of autonomy. For the purpose of this paper, we

were specifically interested in studies that have actively searched for the curvilinear relationship between autonomy and various outcomes in order to summarise whether a curvilinear relationship exist when researchers specifically search for it, in line with suggestions made by Cortina (1993). This method, outlined by Williams & Livingstone (1994), allows us to conduct a direct meta-analytic test of curvilinear relationships.

The meta-analysis was conducted using the statistical package Comprehensive Meta-Analysis (Borenstein et al., 2011). The semi-partial correlation coefficient for the quadratic term (i.e., autonomy^2) with all outcome variables along with the sample size were computed and entered for each study. Effect sizes (Pearson's *r*) and their 95% confidence intervals were computed. The software then standardized the effect sizes, and all analyses were performed using these transformed values. This was then converted back into Pearson's *r* for presentation (Borenstein et al., 2009). The mean effect size for studies with multiple outcome variables was calculated by pooling the individual effect sizes using a random-effects approach. A random-effects model was used as we assumed variability due to the various contexts of data collection in the individual studies. In addition, our intent to generalize findings from this meta-analysis beyond the included sample of studies makes a random-effects, rather than fixed-effects model, the more appropriate approach (Borenstein, 2019). Heterogeneity of results were then assessed using Cochran's Q, and I^2. These statistics indicate the likelihood that variation across studies is due to chance, with a high heterogeneity (i.e., a I^2 value above 75%) indicating the presence of moderator effects in the primary studies (Higgins et al., 2003; Higgins & Thompson, 2002). Rosenthal's (1979) fail-safe *N* and Duval and Tweedie's (2000) trim and fill method were used to assess results for common issues in meta-analyses such as systematic

sampling error, sensitivity and publication biases. Following, the quality of studies was evaluated using Cochrane's risk of bias tool. This tool categorizes studies as 'low risk', 'unclear risk' or 'high risk', according to five criteria: selection bias, allocation concealment, performance bias, detection bias, and attrition bias (Higgins et al., 2011). A study is generally considered at 'high risk' if there is evidence of bias which is likely to substantially affect the results or conclusions (Higgins et al., 2011).

Results

Study Characteristics

Three of the 27 studies were longitudinal (i.e., constructs were measured multiple times over different time points), four were multi-phasic (i.e., different constructs were measured once at each time point) while 20 studies were based on cross-sectional data. All studies measured autonomy through self-report Likert scales (see Table 3.2 for an overview of characteristics of each of the studies; see Appendix C for linear correlation coefficients between autonomy and each outcome). Ten of the 27 studies included defined autonomy as a single-factor construct (i.e., decision making autonomy), and 11 defined autonomy by three factors (i.e., scheduling, method and decision making autonomy). Four did not provide an explicit definition of autonomy, while two used a different definition of autonomy (i.e., combination of scheduling and method, but not decision-making, autonomy).

Table 3.2

Overview of Characteristics of Each of the Included Studies

Reference	Sample size	Sample job type	Definition of autonomy	Study design	Measure of autonomy	Outcomes	Outcome type	General shape of curve
Baltes et al., 2002	501	Blue-collar	N/A	Cross-section	Other	Job satisfaction	WB	AD
Chung-Yan, 2010	259	Various	3-factor	Cross-section	WDQ	Job satisfaction	WB	NS
						Turnover intentions	Behavioral	NS
Daniels et al., 2013	191	Knowledge	3-factor	Cross-section	Other	Psychological well-being	WB	NS
						Positive affect	WB	NS
						Negative affect	Strain	AD
						Fatigue	Strain	AD
						Cognitive failure	Behavioral	AD
de Jonge & Schaufeli, 1998 (a)	665	Knowledge	N/A	Cross-section	MAQ	Job satisfaction	WB	NS
						Anxiety	Strain	NS
						Emotional exhaustion	Strain	AD (inverted)
de Jonge & Schaufeli, 1998 (b)	667	Knowledge	N/A	Cross-section	MAQ	Job satisfaction	WB	NS
						Anxiety	Strain	NS
						Emotional exhaustion	Strain	AD (inverted)
Dierdorff & Jensen, 2018	295	Knowledge	3-factor	Longitudinal	WDQ	Affective Commitment	WB	N/A
						Job proficiency	Behavioral	N/A
						Job Satisfaction	WB	N/A
						OCB	Behavioral	N/A
Fried et al., 2013	616	Various	3-factor	Multi-phase	JCQ*	Waist circumference	Physical	AD
						Waist-hip ratio	Physical	AD
						BMI	Physical	NS

Reference	Sample size	Sample job type	Definition of autonomy	Study design	Measure of autonomy	Outcomes	Outcome type	General shape of curve
Fruhen & Parker, 2020	3,108	Blue-collar	3-factor	Cross-section	WDQ	Emotional well-being	WB	N/A
						Engagement (absorption)	WB	N/A
						Engagement (dedication)	WB	N/A
						Job Satisfaction	WB	N/A
						Performance	Behavioral	N/A
						Psychological well-being	WB	N/A
						Social well-being	WB	N/A
Gerich, 2019	532	Various	3-factor	Cross-section	KFZA	Sickness absenteeism	Behavioral	N/A
						Sickness presenteeism		
						- Days	Behavioral	AD
						- Propensity	Behavioral	NS
Heinrichs et al., 2020	333	Knowledge	1-factor	Longitudinal	TAA-KH-S	Engagement T1	WB	NS
						Engagement T2	WB	NS
						Engagement T3	WB	NS
						Engagement T4	WB	AD
Kubicek et al., 2014 (a)	606	Knowledge	1-factor	Cross-section	ISTA	Irritation	Strain	AD
Kubicek et al., 2014 (b)	591	Knowledge	1-factor	Multi-phase	TAA-KH-S	Depersonalization	Strain	AD
						Emotional exhaustion	Strain	NS
						Reduced professional efficacy	Strain	NS
						Absorption	WB	AD
						Dedication	WB	AD
						Vigor	WB	AD
Li et al., 2018	295	Knowledge	1-factor	Cross-section	Other	Team creativity	Behavioral	N/A
						Team efficiency	Behavioral	N/A
Mansell & Brough, 2005	814	Knowledge	1-factor	Cross-section	JCQ, Other	Job satisfaction	WB	AD
						Work well-being	WB	NS

Reference	Sample size	Sample job type	Definition of autonomy	Study design	Measure of autonomy	Outcomes	Outcome type	General shape of curve
Muldoon et al., 2017	190	Various	1-factor	Cross-section	Other	OCB	Behavioral	N/A
Parker, 2003	448	Blue-collar	Other	Longitudinal	Other	Burnout	Strain	N/A
						General health	WB	N/A
						Job Satisfaction	WB	N/A
						Negative well-being	Strain	N/A
						Organisational Commitment	WB	N/A
						Positive well-being	WB	N/A
						Substance use	Behavioral	N/A
						Turnover Intentions	Strain	N/A
Pisanti et al., 2003	169	Knowledge	1-factor	Cross-section	LAKS-DOC	Depersonalization	Strain	N/A
						Emotional Exhaustion	Strain	N/A
						Job satisfaction	WB	N/A
						Personal accomplishment	WB	N/A
						Somatic complaints	Strain	N/A
Preston, 2013	349	Knowledge	3-factor	Cross-section	Other	Motivation	WB	NS
Rubin et al., 2013	352	Knowledge	3-factor	Cross-section	WDQ	OCB	Behavioral	N/A
						Task performance	Behavioral	N/A
Rydstedt et al., 2006	7,319	Knowledge	1-factor	Multi-phase	JCQ	Job satisfaction	WB	AD
						Psychological well-being	WB	NS
Stiglbauer & Kovacs, 2018 (a)	258	Blue-collar	3-factor	Cross-section	WDQ			
						Affective well-being	WB	CE
Stiglbauer & Kovacs, 2018 (b)	324	Various	3-factor	Cross-section	WDQ	Flourishing	WB	AD
						Affective well-being	WB	AD
Tanskanen et al., 2016	7,867	Various	1-factor	Cross-section	JCI*	Engagement	WB	CE

Reference	Sample size	Sample job type	Definition of autonomy	Study design	Measure of autonomy	Outcomes	Outcome type	General shape of curve
Vander Elst et al., 2017	1,478	Knowledge	N/A	Cross-section	Other	Cognitive stress complaints	Strain	N/A
						Cynicism	Strain	N/A
						Emotional Exhaustion	Strain	N/A
						Engagement	WB	N/A
Verhoeven et al., 2003	304	Knowledge	1-factor	Cross-section	LAKS-DOC	Burnout	Strain	N/A
Wood et al., 2011	2,258	Knowledge	3-factor	Cross-section	Other	Job satisfaction	WB	NS
						Depression	Strain	NS
						Anxiety	Strain	NS
						Emotional Exhaustion	Strain	NS
						Personal accomplishment	WB	CE
						Depersonalization	Strain	NS
Zhang & Liu, 2009	93	Knowledge	Other	Cross-section	Other	Knowledge sharing behavior	Behavioral	AD

Note. WDQ = Work Design Questionnaire (Morgeson & Humphrey, 2006); JCQ = Job Content Questionnaire (Karasek et al., 1998); JCI = Job Characteristics Inventory (Sims et al., 1976); MAQ = Maastricht Autonomy Questionnaire (De Jonge, 1995); ISTA = Instrument for Stress-related Job Analysis (Semmer et al., 1995); TAA-KH-S = Tätigkeits-und Arbeitsanalyseverfahren für das Krankenhaus-Selbstbeobachtungsversion (Büssing & Glaser, 2002); KFZA = Kurz-Fragebogen zur Arbeitsanalyse (Prümper et al., 1995). Measures indicated with an asterisk (*) indicates that the actual measure used was adapted.
SD = Strongly Disagree; SA = Strongly Agree
WB = Well-being
N/A = information not explicitly provided
NS = no significant curvilinear effect
AD = Additional decrement; CE = Constant effect

Overall Curvilinear Main Effect of Studies

The meta-analysis revealed a small but reliable curvilinear main effect across all studies and outcomes (k = 27; r = .07, p < .001, 95%CI [.05, .09]). This effect provides support for the existence of curvilinear effects of autonomy on outcomes. However, it was not possible to statistically investigate the differences in slope or shape of the curve to determine the mean curvilinearity of autonomy as this requires the unstandardized coefficients and the corresponding standard errors, which we were unable to obtain. The semi-partial correlations derived from the incremental variance does not indicate the shape of the curve. However, where available, the shape of the curve was noted and considered (see Table 3.2). Of the 93 effects investigated, 21 effects included descriptions of the shape of the curve. Of these, 14 effects displayed an additional decrement, where additional autonomy beyond a certain level results in negative effects (Warr, 1987). Another four effects also displayed an additional decrement. However in these four effects, this additional decrement occurred in a direction opposite to the hypothesised curve – that is, moderate levels of autonomy were associated with worse outcomes. The remaining three displayed a constant effect, where no additional benefit can be derived from any additional autonomy beyond a certain level, with the relationship tapering in a plateau (Warr, 1987). In other words, most curvilinear effects were consistent with the idea that any additional autonomy beyond a certain level results in detrimental effects. These differences are summarized in Table 3.2. Analyses based on the four outcome types showed a statistically significant difference between subgroups, with a small effect size supporting the curvilinear effects of autonomy on well-being (r = .09, p < .001, 95%CI [.07, .11]), strain (r = .13, p < .001, 95%CI [.07, .19]) and behavioral (r = .07, p = .01, 95%CI [.01, .13]) outcomes, but not physical health (r =

.05, p = .21, 95%CI [-.03, .13]) outcomes (see Table 3.3 for an overview). Therefore, Hypothesis 1 was supported for all outcome types except for physical outcomes. However, based on the limited sample sizes in subgroups (in particular strain and physical outcomes), the results from these subgroup analyses should still be interpreted with care, as low power may decrease the likelihood of detecting an effect, thus decreasing the robustness of the results (Schmidt & Hunter, 2015).

Table 3.3

Meta-analytic Results for Analysis Based on Outcome Type

			Effect size			Heterogeneity		
Outcome type	*k*	*n*	*r*	95% CI	*p*	Q	*df*	*p*	I^2
Well-being	8	17,765	.09	.07-.11	< .001	8.86	7	.26	20.95
Strain	2	910	.13	.07-.19	< .001	0.03	1	.86	-
Behavioral	5	1,462	.07	.01-.13	.22	5.32	4	.26	24.78

Note. Twelve of the 27 studies included in the primary analysis included multiple outcomes that spanned multiple outcome types, as defined in this paper. Because the multiple outcomes in each of those studies were based on the same sample, including them in an analysis comparing various outcomes would violate the assumption of sample independence. Therefore, only 15 of the 27 studies that included single outcomes, or multiple outcomes of the same type, were included in the analysis based on outcome type.

Moderators of the Curvilinear Effect of Autonomy

The Cochran's Q and I^2 statistics indicate if a variation across studies are due to heterogeneity rather than chance, specifically the proportion of observed variance that reflects variation due to true effects (Borenstein, 2019). While power of the Cochran's Q is low when the sample size is small, the I^2 statistic is not inherently dependent upon the number of studies considered, and is a more appropriate measure of heterogeneity (Higgins et al., 2003). Results indicated low heterogeneity amongst the studies (Q = 37.88, p = .06; I^2 = 31.37%; Higgins et al., 2003), suggesting that heterogeneity cannot be established, and dispersion is at a level that would occur by

chance, so that the presence of moderators is reasonably unlikely (Borenstein, 2019; Borenstein et al., 2009). Therefore, no support was found for Hypotheses 2-4, and no further analyses will be reported[4]. Further, Rosenthal's fail-safe *N* did not detect the presence of publication bias (fail-safe $N = 782$), and Duval and Tweedie's trim and fill method revealed that the funnel plot was symmetric, suggesting that the observed effect sizes are reflective of the true mean and variance. These results provide support that the effect size estimates from the included primary studies were unbiased and robust. However, The Cochrane Collaboration's Risk of Bias tool (Higgins et al., 2011) revealed that all studies were at high risk of bias. These indicators should be taken into account when interpreting the results.

Discussion

There are good theoretical reasons to expect that job autonomy at extremely high levels have negative implications for workers. However, evidence to date has been mixed. We synthesized the findings from studies that have examined curvilinear effects between autonomy and outcomes to ascertain whether autonomy demonstrates a curvilinear, rather than linear, trend with key outcomes. We also assessed whether this effect is more applicable to particular outcomes (e.g., physical vs. psychological, well-being vs. strain) or study attributes (e.g., country, gender, operationalization of autonomy). The initial systematic literature search resulted in 19 studies that met the inclusion criteria and were thus included in the meta-analysis. Efforts to contact authors for additional data resulted in an additional eight studies, for a total of 27 studies included in this meta-analysis. Results from the meta-analysis demonstrated a small but significant curvilinear main effect of autonomy on

[4] Exploratory analyses found non-statistically significant differences between subgroups for all moderators.

various outcomes, suggesting that – contrary to traditional theories like the job demands-resources model (Demerouti et al., 2001) – too much autonomy can be detrimental to work outcomes. In addition, these curvilinear effects were found in studies investigating well-being and strain, but not physical or behavioral outcomes. However, it is important to note that only one study investigated physical and five studies investigated behavioral outcomes, suggesting that the findings specific to physical and behavioral outcomes should be interpreted with care. In addition, the majority of the sample included knowledge-based workers, in which the curvilinear effects might be more likely to occur compared to that of more traditional blue-collar workers, because knowledge-based workers are more likely to have higher levels of job resources (Baumeister et al., 2007). Considering the relatively lower number of studies including blue-collar or various workers, no moderator effects were found across the different job types (knowledge-based, blue-collar or various). This suggests that it was just as likely for all job types to demonstrate a curvilinear effect of autonomy. However, these results should be interpreted with care as only four studies included blue-collar workers, while six studies used a sample of various job backgrounds. Despite these caveats, on the whole, findings from this meta-analysis raise questions over the traditional operationalization of autonomy as a linear construct and lends further support for the existence of curvilinear trends in the work design literature. Importantly, the findings reinforce that research identifies curvilinear effects of autonomy when researchers search for them, which reinforces the importance of considering curvilinear effects more broadly in the work design research literature

The curvilinear effects of autonomy on a range of outcomes identified in this meta-analysis supports theories postulating the curvilinear effects of autonomy, such

as the vitamin model (Warr, 1987), conservation of resources theory (Hobfoll, 1989), and activation theory (Gardner, 1986), amongst others. In particular, the findings suggest that autonomy is more likely to follow the "additional decrement" curvature, whereby beyond a certain level, any additional autonomy becomes detrimental in relation to outcomes, leading to negative effects. Notably, this finding is not aligned with the job demands-resources model's conceptualization of autonomy as a resource *because* it offsets demands and overall is thought to have a positive effect (Demerouti et al., 2001). This finding supports debate in the work design literature, which identifies that the job demands-resources model provides an overly simplified model fit due to its current conceptualization of "demands" and "resources" (Van den Broeck et al., 2010). Specifically, results from this meta-analysis lend support to Van den Broeck et al.'s (2010) conclusion that the operationalization of work design factors used in the job demands-resources model may be too broad, and the distinction between "demands" and "resources" may not be as straightforward as suggested by the model. Specifically, our results show that the provision of more job resources in the form of autonomy might not always help employees to deal with job demands effectively (Bakker & Demerouti, 2007), as it appears that there are limits to these benefits. The curvilinear effects of autonomy on employee outcomes illustrates that autonomy as a resource does not always result in better outcomes. In sum, these results indicate that a closer inspection of the concepts of job demands and resources is warranted.

Statistical Perspectives

In addition to the theoretical arguments for the curvilinear effects of autonomy, there are various statistical perspectives to explain why more studies are not reporting curvilinear effects of autonomy. First, our literature search suggests that

the majority of studies do not consider curvilinear trends in the first place, and thus do not search for such patterns. Importantly, our results show that when researchers do search for these effects, they find them. Second, nonlinear effects can be hidden by interaction effects (Cortina, 1993; Matuschek & Kliegl, 2018). It has been demonstrated that the higher the correlation between an independent variable and a moderator, the more likely a true curvilinear effect can be hidden by a false moderator effect. This results in an inflated Type I error rate with respect to the product term in a moderated hierarchical multiple regression (Cortina, 2003). For example, a plethora of studies investigating both autonomy and other moderators, such as role complexity (Jung et al., 2016), self-efficacy (Nauta et al., 2010) and personality (Barrick & Mount, 1993), have demonstrated an interaction between autonomy and these moderators. It needs to be considered that some of these moderation effects may in fact be masking the curvilinear effects of autonomy on outcomes. Third, it is possible that the linear effects identified in the literature themselves directly mask curvilinear effects. This applies when, as opposed to the inverted-U shape popularized by the Yerkes-Dodson law (Yerkes & Dodson, 1908), the linear effect of autonomy holds up until moderately high levels. Beyond this level, extremely high levels of autonomy are likely to be detrimental. This results in a curve that indicates a point of inflection at higher levels of autonomy. Fitting a line of best fit through this model results in a positive linear effect of autonomy on outcomes, while masking a true curvilinear effect. This masking effect might provide support for traditional studies of autonomy which deduce a positive linear effect of autonomy on work outcomes, even though this effect may plateau at high levels.

In line with various scholars who have called for researchers to include a quadratic term as an extra step in any moderated hierarchical multiple regressions

conducted (e.g., Cortina, 1993; Matuschek & Kliegl, 2018), results from this meta-analysis suggest that curvilinear trends of autonomy exist, if only researchers search for them. Unfortunately, in the past decade, less than 2% of studies which look for linear interaction terms involving autonomy also searched for the existence of curvilinear trends[1]. This lack of research on curvilinear effects not only limits the theoretical understanding of autonomy, but also perpetuates how autonomy is practically defined and managed in workplaces. Researchers suggest that a nonlinear term should be included, even if nonlinearity is not the goal of the study (Cortina, 1993; Pierce & Aguinis, 2013) and our results support this proposition. In studies hypothesizing moderated linear relationships, the inclusion, and associated non-significance, of a nonlinear term can help to strengthen the evidence of a linear moderated relationship, thus improving the robustness of any conclusions derived from the results.

While the low heterogeneity of included studies in our meta-analysis indicated the absence of moderators, research suggests that the curvilinear effects of autonomy might be more pronounced or exist only under certain conditions such as gender (e.g., Fletcher & Jones, 1993), or in the presence of other job resources such as feedback (e.g., Preston, 2013) or job complexity (e.g., Chung-Yan, 2010). The sub-group analyses conducted in this meta-analysis were limited by the low sample size ($k = 27$) as well as the fact that other study attributes (e.g., feedback, job complexity, etc.) were not common across all included studies. Taken together, these issues could explain the lower likelihood of sub-group analyses revealing significant differences.

With a view of differences in autonomy's effect for different outcomes, a small effect size was found supporting the curvilinear effects of autonomy on well-

being (e.g., positive affect, engagement) and strain (e.g., anxiety, depression) outcomes, but not physical (e.g., obesity) or behavioral (e.g., turnover intentions, sickness absenteeism). On the surface, this suggests that well-being and strain may be more vulnerable to extreme levels of autonomy. This is in line with the argument that work autonomy is a psychosocial characteristic of work, and as such is more likely to affect psychological health on a proximate level (Bambra et al., 2007). It also aligns with other studies centered on the job demands-resources model which typically include psychological (i.e., well-being and strain), rather than physical or behavioral, outcomes. However, due to the extremely small sample size of studies investigating physical (k = 1) and behavioral (k = 5) outcomes, future research investigating autonomy should in particular consider physical and behavioral outcomes to determine if the curvilinear trend of autonomy holds for these outcomes.

Limitations

There are limitations to this study. First, the small sample size of studies (k = 27) available reduced the power of the analyses and limited the extent to which conclusions can be drawn. While small, it should be noted that a 'meta' meta-analysis by Cafri et al. (2010) found that the median number of primary studies included in psychology research was k = 27, suggesting that this present paper includes the median k for meta-analysis in this field. Specific to organizational psychology research, small numbers are also not unusual in meta-analyses (e.g., Knight et al., 2016, k = 20; Richardson & Rothstein, 2008, k = 36). In addition, sensitivity analyses did not indicate biased results. However, we acknowledge that the detection of non-linear effects would be strengthened by having a larger k. For example, the small k limited the extent to which further analyses based on outcome type could be conducted. We note that only one study included physical outcomes,

and five studies included behavioral outcomes. This limits any conclusions that can be drawn based on analyzing these subgroups. Related to this issue, the heterogeneity statistics (i.e., Q and I^2 statistics) indicated that the presence of moderators was unlikely. However, there is empirical and statistical evidence that curvilinear trends of autonomy might change as a function of a moderator variable (de Jonge & Schaufeli, 1998; e.g., gender, Fletcher & Jones, 1993; feedback, Preston, 2013). Other non-linear studies on work design have demonstrated that work design characteristics tend to interact with each other (e.g., Dodd & Ganster, 1996; Sia & Appu, 2015) and this is also one of the key propositions of the job demands-resources model (Demerouti et al., 2001). Unfortunately, considering the curvilinear effects of autonomy in the context of other work design factors was not feasible in this study, as conducting such a moderator analysis would be severely limited by the number and type of predictor variables included in the primary studies. For example, only $k = 20$ primary studies measured any other job characteristics, with the most common other job characteristic measured being job demands ($k = 10$), followed by social support ($k = 7$). This would not have provided a large enough sample to conduct a moderator analysis on. Accordingly, a general increase of research into this area may contribute to a richer understanding of the boundary conditions at which the non-linear effects of autonomy operate. The present study may have been limited by the decision to directly meta-analyse the curvilinear effect of autonomy on outcomes. While this decision was made in order to summarise whether a curvilinear relationship exist when researchers specifically search for it, in line with suggestions made by Cortina (1993), it may have limited the extent to which further analyses could have been conducted.

An alternative meta-analytic procedure outlined by Sturman (2003) recommends including all studies examining the linear form of the autonomy-outcome relationship could also be utilised. The main advantage of the procedure outlined by Sturman (2003) is the number of primary studies that can be included, mainly due to the sheer number of studies that have investigated the autonomy-outcome relationship in a linear, rather than curvilinear, fashion. This procedure additionally allows a meta-regression to be conducted. A meta-regression allows for the employment of the full arsenal of procedures that fall under a standard multiple regression (e.g., interaction effects, additional variance explained by adding a curvilinear term, graphing the exact shape of the curve, etc.), which would allow for further moderator analyses to be conducted (Borenstein et al., 2009). However, these lines of research should also compare both methods to determine if any artefacts exist between the two strategies.

Second, while the meta-analysis supported the existence of a curvilinear relationship between autonomy and work outcomes, we were unable to determine the shape of the curve, and more specifically, the average point of inflection. While alternate formulae exist in which beta coefficients may be used to impute missing correlations in meta-analysis research, scholars have cautioned against this practice as beta estimation procedures can reduce the accuracy of meta-analytic findings (Roth et al., 2018). While the formula we have used to calculate *r*s isolates the semi-partial correlation from the incremental variance of the curvilinear effect above and beyond the linear term rather than the beta coefficient directly (for $k = 7$), the value of the curvilinear effect isolated using this strategy does not indicate the exact shape of the curve. While we have discussed the general trend of the curve, the exact meta-analytic shape of the curve and the "tipping point" are still unclear.

Third, the majority of the studies included measured autonomy on a subjective Likert scale (e.g., Strongly Disagree – Strongly Agree). While Likert scales are extremely popular in behavioral sciences, critics tend to cite the lowered sensitivity and ceiling effects (Masino & Lam, 2014; Moret et al., 2007). Specifically, a recent study by Vergauwe et al. (2018) demonstrated that the Likert scale severely limits the variance associated with the higher ends of the rating scales, arguing that high Likert scale scores may not actually differentiate between having a lot, and having too much of a characteristic (Kaiser & Kaplan, 2005). To illustrate, respondents reporting that they "strongly agree" with items measuring autonomy do not differentiate between a functional amount of high autonomy and a dysfunctional level of excessive autonomy. This in turn decreases the probability of finding a curvilinear effect (Vergauwe et al., 2018). If a ceiling effect does exist in the Likert scale ratings of autonomy, this suggests a more distinct curvilinear trend of autonomy than indicated by our findings may exist.

Fourth, a frequent criticism of meta-analyses is that the included sample may be biased. Commonly referred to as the "file drawer problem" (Rosenthal, 1979), this argument purports that studies may have searched for but not found curvilinear effects of autonomy, and thus may have published only the significant linear effects, or not have published those results at all. Rosenthal's fail-safe *N* indicated that publication bias was not detected. In addition, we included six studies which did not include the curvilinear relationship of autonomy with outcomes as the main focus of the study. Analyses suggested that these "unpublished" relationships were just as likely to be curvilinear in nature. However, as this represents only a small number of papers, we acknowledge that the file drawer problem may still pose a potential limitation to this study.

Lastly, only three studies included in the meta-analysis had longitudinal designs, while the majority were cross-sectional (k = 21) or multi-phasic (k = 3). No studies found in the search included an experimental design, which limits the conclusion of a causal effect. Results from longitudinal studies tend to be more robust for two main reasons (Payne & Payne, 2004). Firstly, cross-sectional studies might not provide definite information about the direction of relationships. Specifically, because most of the primary studies included in this meta-analysis are cross-sectional and correlational in nature, it is unclear to what extent the curvilinear relationships between autonomy and outcome variables may be reciprocal in nature. Secondly, cross-sectional studies do not consider unobserved factors in any relationships established. Therefore, a larger proportion of longitudinal studies included in the meta-analysis would have improved the robustness of the results. It is worth noting that two additional longitudinal studies were found in the initial search, with one study demonstrating a curvilinear effect of autonomy on emotional exhaustion (Teuchmann et al., 1999), while the other did not find a curvilinear trend (Mäkikangas et al., 2007). However, these studies were not included in the meta-analysis as attempts to access to the required data were unsuccessful.

Implications for Future Research and Practice

This meta-analysis presents a first attempt at building upon previous research and meta-analyses that to date have investigated only linear effects (e.g., Fried & Ferris, 1987; Humphrey et al., 2007). Given the summative nature of the meta-analytical results, the findings provide direction for future research and work design practices. Researchers have argued that nonlinearity is likely to occur in behavioral research (Cortina, 1993), and this meta-analysis has demonstrated this relationship

with respect to autonomy. Building on this insight, we propose the following pathways for future research.

While the curvilinear effects of autonomy have been established through this meta-analysis, the relatively small number of primary studies which have looked into the existence of curvilinear effects have limited the extent of our findings. In order to bridge the gap between findings from linear meta-analyses and this study, future research should investigate the curvilinear effects in studies that report only linear effects through a meta-regression.

Findings from this meta-analysis indicate that extreme levels of autonomy may lead to worse outcomes. This aligns with the argument that the unlimited growth of the positive impact of any work design characteristic is a logical impossibility (Selenko & Warr, 2015), and has implications for research into other work design characteristics typically included in researched as linear variables. These findings also provide support for the call to include a non-linear term in any moderated hierarchical regression models. Including a non-linear term can help researchers to either demonstrate a nonlinear relationship if the addition of this term is statistically significant, or to increase the robustness of their argument for linear moderated relationships, if the addition of this term is not statistically significant. Future research should also investigate the curvilinear effect of autonomy on a wider variety of outcomes, particularly for physical (e.g., BMI, cortisol levels, etc.) and behavioral (e.g., turnover intentions, performance, etc.) outcomes.

While the results from this meta-analysis demonstrate the existence of curvilinear effects of autonomy, the mechanics of these curvilinear effects are still unclear. Four possible mechanisms are outlined: first, extremely high autonomy may give rise to cognitive overload, whereby individuals have to dedicate limited

resources to evaluating each option. Second, such high levels of autonomy may also lead to individuals setting vague goals or not committing to one choice due to the fear that they may not make the right decision. Third, extremely high levels of autonomy may lead to increased demands due to autonomy being inextricably intertwined with extremely high levels of role overload, causing what scholars term the "paradox of autonomy" (Putnam et al., 2014). Lastly, it is also plausible that extreme levels of autonomy are confounded with roles that are not clearly defined (Putnam et al., 2014). Future research should work towards better understanding the mechanics behind these curvilinear effects.

From a practical perspective, there are rising concerns about mental health globally (Harnois & Gabriel, 2000). In Australia, it is estimated that one in five working-aged people suffer from mental illness and an estimated 45% of people will experience a mental disorder at some point in their lives (Australian Bureau of Statistics, 2007). Similarly, in the United States of America, one in five adults suffer from mental illness, with an estimated 4% of all adults seriously considering suicide (Mental Health America, 2019). In Europe, one in four adults experience either depression or anxiety, with 50% of chronic sickness absenteeism attributed to these mental illnesses (World Health Organisation, 2018). The World Health Organization (2019) estimates that the annual cost to the global economy from lost productivity due to mental illnesses stands at US$1 trillion. The World Health Organization (2019) also reports that poor work design can exacerbate mental ill health. Various government policy guidelines (e.g., Ardito et al., 2012; Comcare, n.d.; Safe Work Australia, 2014; Streit et al., 2019) targeted at improving health and well-being through work design typically include increasing autonomy as an area for improvement. However, results from this meta-analysis suggest that there may be a

limit to the benefits of such recommendations, and that the efficacy of increasing autonomy in the workplace may vary based on individual organizations' current work design policies.

Results from this study suggests that too much autonomy may indeed not reap any additional benefits, and in some cases, may even be detrimental. Organizations that invest additional resources to increase autonomy above a certain level may have a low return-on-investment, or worse, obtain worse outcomes. Therefore, organizations should be encouraged to carefully assess the level of autonomy that work provides to their employees. Organizations which already provide employees with moderate to high amounts of autonomy may choose to invest their limited resources to improving other aspects of job design, rather than attempting to provide even higher levels of autonomy, which may in fact worsen employees' well-being and other outcomes.

Chapter 4: A Field Study of the Curvilinear Effects of Autonomy

Introduction to Chapter 4

In this chapter, I present a two-wave longitudinal survey to investigate the curvilinear relationship between autonomy and outcomes (including performance, well-being and strain). In order to extend the findings from the meta-analysis, I specifically investigated the shapes of the curves and calculated the inflection points at which the relationship between autonomy and outcomes turns asymptotic or reverses in direction. This chapter is presented in a traditional thesis format which builds on earlier chapters.

The Present Study

The meta-analysis presented in Chapter 3 demonstrated the presence of curvilinear relationships between autonomy and outcomes such as behavioural, well-being and strain in the existing literature. The majority of the curvilinear effects identified followed the additional decrement curvature – that is, after a certain point, any additional autonomy related to lower scores on positive outcomes (or higher scores on negative outcomes). However, the exact curvature of these relationships could not be statistically determined. Further, the point of inflection – the point at which the relationship between autonomy and outcomes reverses in direction or becomes asymptotic – could not be determined. Identifying the point of inflection has critical implications in the way that autonomy is theoretically defined and practically applied. In addition, I identified a lack of longitudinal primary studies in the meta-analysis, which limited more robust inferences to be drawn regarding the relationship between autonomy and its outcomes. This is not a limitation unique to research into curvilinear relationships or autonomy. For example, de Lange et al. (2003, p. 302) called for more longitudinal research in general to “obtain a fuller

understanding of the dynamic interplay between work and worker health". Adopting a longitudinal design can help to establish extremely low and extremely high levels of autonomy as a risk factor that precedes (or even causes) the manifestation of poor performance, lowered psychological well-being and increased psychological ill-health (Spector & Meier, 2014). While a longitudinal design consisting of two time points may not necessarily be sufficient to establish causal processes, identifying the curvilinear effects of autonomy on negative outcomes assessed at a later point in time can help to provide a more robust insight into the curvilinear relationship between the autonomy and outcomes compared to cross-sectional self-report studies (Spector & Meier, 2014). Understanding this relationship has implications for how autonomy is managed at work to support both organisational and individual needs. For example, if extremely high levels of autonomy do not demonstrate detrimental effects cross-sectionally but these detrimental effects are observed only when outcomes are assessed at a later point, this suggests this effect is not immediate but takes some time to emerge. Additional resources can then be put in place to support employees in the longer term to manage these long-term detrimental effects.

Building on the findings of the meta-analysis presented in Chapter 3, my aims for this chapter are two-fold. First, I aim to establish a more robust inference of the curvilinear relationship between autonomy and outcomes via a longitudinal study, and investigate if the curvilinear relationships between autonomy and various outcomes occur cross-sectionally, or display a lagged effect. Secondly, if a curvilinear relationship is shown in either the cross-sectional or the lagged design, I aim to determine the inflection point at which the relationship between autonomy and the criterion variable changes in direction or tapers off. Outcomes that I include in this study are aligned with the outcomes investigated in the meta-analysis: self-

rated performance (aligning with behavioural outcomes), meaningfulness (aligning with psychological well-being) and psychological distress (aligning with psychological ill-health). I discuss each of these in turn.

Performance

In this chapter, performance is considered as an outcome on which autonomy has curvilinear effects. The performance concept I focus on is based on the model of individual work role performance by Griffin et al. (2007). I specifically consider the subdimension of individual task proficiency, that is, the "degree to which an employee meets the known expectations and requirements" of their role (Griffin et al., 2007, p. 331). This dimension represents a core aspect of performance (Griffin et al., 2007). For example, a mechanic who effectively fixes a broken car engine (i.e., meets expectations) would be considered proficient. Because individual task proficiency is core to concepts such as "task performance" and "work role behaviour", Griffin et al. (2007) astutely observed that this subdimension has been the traditional focus of performance research, with traditional performance management systems almost exclusively focussing on this dimension of performance. As a concept that is at the core of performance and work, it is important to investigate the impact of too much autonomy on individual task proficiency.

Work typically comprises many different simultaneous tasks, requiring individuals to deliver on multiple fronts to perform proficiently. Conventional theories in work design (e.g., job characteristics model; Hackman & Oldham, 1976; job demands-resources model; Demerouti et al., 2001) posit that at low levels of autonomy, any increase in autonomy may increase the psychosocial resources available to successfully address the various requirements of the job, thereby

achieving higher task proficiency. To illustrate, a person who has to complete any number of tasks in a workday may benefit from exercising their personal discretion in order to determine how and when to complete one task vis-à-vis the other required tasks. For example, time-sensitive tasks may be completed first, and by choosing to use a method that one is familiar with, one may thereby improve efficiency. Therefore, any additional autonomy may be viewed as energising and supporting the worker in meeting the expectations and requirements of their work role. However, from theories such as the vitamin model (Warr, 2002) and the conservation of resources theory (Hobfoll, 1989), this effect may only occur to a certain level of autonomy. Accordingly, extremely high levels of autonomy may require an individual to dedicate often scarce resources to manage that autonomy – that is, assessing and evaluating each of their possible choices. In other words, the curvilinear effect of autonmomy on performance may work through the psychological mechanism of excessive choice (i.e., choice overload). As a result, while autonomy is considered an additional resource, limited psychosocial resources are then required to manage too much of this autonomy, instead of being dedicated to meeting task requirements. Accordingly, these extremely high levels of autonomy may inadvertently negatively impact on individual task proficiency, leading to what scholars term the "paradox of autonomy" (Putnam et al., 2014). Therefore, I hypothesise:

> *Hypothesis 1a*: Autonomy demonstrates a cross-sectional curvilinear relationship with proficiency that follows an additional decrement curvature.

Additionally, the impact of work characteristics such as autonomy may have effects that are lagged. Building on the conservation of resources theory (Hobfoll, 1989), individuals provided with extremely high levels of autonomy need to further

dedicate resources to manage this autonomy. Over time, this negative effect is likely to compound, resulting in a negative loss spiral (Hobfoll & Shirom, 2001), where high autonomy leads to resource loss, which in turn reduces an individual's ability to further manage that autonomy, ultimately over time having a damaging effect on performance. Therefore, I further hypothesise:

> *Hypothesis 1b*: Autonomy demonstrates a curvilinear effect on proficiency measured six months later, following an additional decrement curvature.

The Dual Axiom of Psychological Well-being and Ill-health

Psychological well-being and ill-health, both subjective experiences, comprise two of the main psychological outcomes within organisational behaviour research. The dual-axiom model (Keyes, 2005) posits that well-being and ill-health are two distinct aspects of psychological health that should be considered in tandem for a complete picture of the state of an individual's mental health. Rather than conceptualising well-being and strain on either ends of a bipolar "mental health" dimension, Keyes (2005) theorised that well-being does not necessarily imply the absence of ill-health. Rather, well-being and ill-health should be viewed as unipolar, albeit negatively correlated, dimensions (Keyes, 2005). I discuss well-being and ill-health in turn, applying theoretical perspectives to derive the curvilinear effects of autonomy on each concept.

Psychological Well-Being

In this chapter, I explore psychological well-being from the eudaimonic perspective, that is, psychological well-being as related to self-realisation and the full functioning of the person (Ryan & Deci, 2001)[5]. In line with this, I have chosen to

[5] Please see Chapter 2 for an overview of psychological well-being.

capture psychological well-being via perceived meaningfulness at work. Meaningfulness refers to the degree of significance and value one feels at work, and is frequently used as an indicator of subjective work well-being (Monnot & Beehr, 2014; Pratt & Asforth, 2003). From the self-determination theory perspective, autonomy is one of three basic psychological needs (Deci & Ryan, 1985), which when met, leads to positive outcomes such as meaningfulness. Lepisto and Pratt (2017) proposed a dual process of meaningfulness, where meaningfulness at work can be achieved through both a realisation process (i.e., a sense of self that is fully expressed at work) as well as a justification process (i.e., proactively developing an account that justifies the worthiness of work).

At low levels of autonomy, any additional levels of autonomy reflect the ability to exercise self-discretion at work, meeting the basic psychological need of autonomy (realisation process). Increasing levels of autonomy also imply an increasing level of responsibility (Evans & Fischer, 1992; Warr, 2016), and embodies a high level of trust in and appreciation for an employee's competence (Muecke & Iseke, 2019), which may result in employees feeling appreciated and valued (justification process). This is likely to hold until moderately high levels of autonomy. While autonomy may be a reflection of trust, it has also been suggested that autonomy may be viewed as a subtle form of control, in that employees are made to feel accountable and responsible for their own performance (Alexander, 1991). Beyond moderately high levels to extremely high levels of autonomy, this may be interpreted as a way for their leaders or the organisation to be absent, or worse, abdicate their responsibilities and duties to employees, instead leaving employees to make, and be accountable for, their own decisions (Humborstad et al., 2008). In turn, this may reduce the perception that the work is worthy of attention

from their supervisors (justification process). In other words, the curvilinear effect of autonomy on psychological well-being may occur through the mechanism of excessive perceived responsibility. Therefore, I hypothesise:

> *Hypothesis 2a*: Autonomy has a cross-sectional curvilinear relationship with meaningfulness following an additional decrement curvature.

Like all subjective experiences, perceived meaningfulness is fluid and can be conceptualised at both the broad and granular levels (Vogel et al., 2020). While meaningfulness may fluctuate on a day-to-day basis based on their perceived autonomy and the specific tasks to be completed, at the broad level, individuals tend to view work as a long-term aspect of their lives. Thus, work-related meaningfulness may reflect a long-term process and can represent a persistent and pervasive positive state of mind (Vogel et al., 2020). Building upon the justification process outlined above, the effects of extremely high autonomy may compound over time, causing individuals to reframe their job as less worthy and meaningful on the whole. Taken together, it is likely that there may be a further lagged curvilinear effect of autonomy. Following, I hypothesise:

> *Hypothesis 2b*: Autonomy demonstrates a curvilinear effect on meaningfulness assessed six months later, following an additional decrement curvature.

Psychological Ill-Health

Finally, I consider psychological ill-health as an outcome represented by an individual's levels of psychological distress. Psychological distress refers to non-specific feelings of anxiety, depression and stress (Viertiö et al., 2021), and is widely used as a marker for psychological ill-health (e.g., Isaacs et al., 2018; Viertiö et al., 2021). Similar to well-being, autonomy is expected to have a positive effect on

psychological ill-health between low to moderately high levels of autonomy. At those levels, autonomy represents a psychological resource that supports individuals in meeting the demands of their jobs. However, extremely high levels of autonomy could be detrimental as it may be perceived as unpleasantly coercive, rather than beneficial (Warr, 2002). This sense of coercion may be the results of individuals perceiving an intense level of personal responsibility to perform under conditions of extreme autonomy (Warr, 2002, 2016). Because they have seemingly been afforded all the resources to support them in their work, individuals may feel an unhealthy degree of accountability for the outcomes of their work (Warr, 2016), leading to feelings of nervousness, inability to cope, or even worthlessness. Similar to psychological well-being, the curvilinear effect of autonomy on psychological ill-health may work through the mechanism of perceived responsibility. Therefore, I hypothesise:

> *Hypothesis 3a*: Autonomy demonstrates a cross-sectional curvilinear relationship with psychological distress following an additional decrement curvature.

With extremely high levels of autonomy leading to psychological distress in the short term, based on the conservation of resources theory (Hobfoll & Shirom, 2001; Hobfoll, 1989), psychological distress is also likely to reduce the number of psychosocial resources available, reducing the individual's ability to manage autonomy, thereby setting off a negative spiral over time. To illustrate, extremely high levels of autonomy may lead to increased psychological distress in the short term, which in turn reduces an individual's capacity to manage the demands of extremely high levels of autonomy. This in turn leads to more psychological distress over time. Therefore, I further hypothesise:

Hypothesis 3b: Autonomy demonstrates a curvilinear effect on psychological distress assessed six months later, following an additional decrement curvature.

Because psychological well-being and ill-health are expected to be negatively correlated (Keyes, 2005), I hypothesise that the curvilinear effect of autonomy on psychological distress will be in the opposite direction (i.e., a U-shaped curve) compared to meaningfulness (i.e., an inverted-U shaped curve).

Method

This study used data that was collected as part of a larger ongoing research project funded by the Australian Research Council Centre of Excellence in Population Ageing Research. The ongoing project investigates mature workers in the context of the COVID-19 pandemic to consider a combination of factors that is unique to this group of workers. This study received ethical approval from Curtin University's Human Research Ethics Committee (approval number HRE2019-0053). The study design is a two-wave longitudinal survey with a time lag of six months. All variables were measured at both T1 and T2 which allowed me to statistically control the corresponding T1 outcome variable for each longitudinal analysis.

Sample

Participants were recruited from a panel managed by the survey company Qualtrics. The prerequisites for participation were for individuals to be at least 45 years of age, and currently employed, seeking employment, or recently retired. Older workers tend to occupy leadership roles (e.g., managers, including executive positions; American Community Survey, 2016), which are characterised by greater levels of autonomy compared to more junior employees (Noonan, 2005), indicating the suitability of this sample for studying the effects of extreme levels of autonomy.

In addition, this panel study was primarily focused on the working from home arrangements due to COVID-19. The two waves of this study coincided with global lockdowns which compelled most of the workforce to work from home where possible, imposing an even greater level of autonomy on employees.

An initial sample size of 2,625 was targeted. In total, 1,937 participants completed the survey at T1 (response rate 73.79%). Participants were then followed-up after six months. T2 questionnaires were available to all participants who completed the survey at T1. In total, 924 participants completed the survey at both T1 and T2, resulting in a retention rate of 47.70%. Four participants completed the T2 survey twice due to a technical glitch. Out of an abundance of caution, all data related to these participants were deleted list wise, leaving a sample size of 920.

Because I specifically focus on the effects of work design on work outcomes, only participants who reported to be currently employed at both T1 and T2 (including self-employed) were retained in the sample. This resulted in a final sample size of 727 (53.78% female). The age of participants in the final sample ranged from 45 to 85 years (M = 58.09, SD = 7.86) with a mean tenure with their current organization of 13.40 years (SD = 10.96).

Data Screening

To ensure that careless responses were excluded from the data, a single item honesty indicator was included in the questionnaire, stating “It is vital to our study that we only include responses from people that devoted their full attention to this study. Otherwise, years of effort (the researchers and the time of other participants) could be wasted. You will receive credit for this study no matter what. In your honest opinion, should we use your data in our analyses in this study?” (Meade & Craig, 2012, p. 442). Forty-eight participants responded “no” at either or both time points.

Only participants who responded "yes" to this item at both T1 and T2 (n = 679) were included in the data analysis.

Post Hoc Power Analysis

I conducted a *post hoc* power analysis using G*Power (Faul et al., 2007). I selected the F-tests family and linear multiple regression (fixed model, R^2 increase) as the statistical test, and included the parameters: Partial R^2= .02 (resulting in an effect size f^2 = .02); α error probability = .05; total sample size = 679; number of tested predictors = 1; total number of predictors = 4. The power achieved was β = .96, suggesting that the probability of a Type 2 error in the analysis is low.

Procedure

Upon providing informed consent, participants were asked to create a unique identifier using a combination of abridged personal information (first two letters of each of the following: first name, month of birth, city of birth, mother or guardian's first name), resulting in an eight-character unique identifier in order to allow the longitudinal linking of the surveys without requiring any identifiable personal information. The survey was then presented, beginning with the demographic questions such as age and gender, followed by questions related to work experiences. Participants were then debriefed and thanked, and informed that they will be contacted again in six months to complete the second wave of the survey. After each wave, participants were paid by Qualtrics at a rate that was agreed upon between Qualtrics and the participants.

Measures

Across all measures, mean scores were calculated for each scale or sub-scale and used for further analyses, with higher scores indicating a higher rating on that

measure. Unless otherwise stated, all items did not require reverse coding. See Appendix D for the full list of items.

Independent Variable

Autonomy was measured using a combination of two items from the decision-making subscale and one item from the work methods subscale of the Work Design Questionnaire (Morgeson & Humphrey, 2006). Because the primary interest of this panel study was working arrangements during COVID-19, two additional items measuring scheduling autonomy specific to the work schedule were developed and added to the autonomy scale ("The job allows me to decide my hours of work" and "The job allows me to be flexible in terms of when I work"). Items were measured on a five-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*). Cronbach's α ranged for all the autonomy items from .83 (T2) - .85 (T1), indicating a high level of internal consistency. Because a quadratic term is created by squaring the linear term, multicollinearity between the linear and curvilinear terms may interfere with the interpretation of the results (Aiken & West, 1996; Cohen & Cohen, 2003). To reduce this potential issue of multicollinearity, I calculated the quadratic autonomy term from the mean-centred linear autonomy term, according to guidelines by Aiken and West (1996) and Cohen and Cohen (2003).

Dependent Variables

Performance. The three-item individual task proficiency subscale from Griffin et al. (2007) was used to measure performance (e.g., "Over the past month at work, how often have you carried out each of the behaviours described below? Carried out the core parts of my role well"). Items were measured on a five-point Likert scale (1 = *never* to 5 = *all the time*). Cronbach's α ranged from .88 (T2) to .90 (T1).

Psychological Well-Being. Psychological well-being was measured using two items from the meaningfulness scale of May et al. (2004). The two items ("The work I do is very important to me" and "My job activities are personally meaningful to me") were measured on a five-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*). Internal consistency ranged from α = .90 (T1) - .92 (T2).

Psychological Ill-Health. Psychological ill-health was measured using the six-item Kessler Psychological Distress Scale (K6; Kessler et al., 2002; e.g., "In the past month, how often did you feel so depressed that nothing could cheer you up?"). These items were measured on a five-point Likert scale (1 = *none of the time* to 5 = *all of the time*). Higher scores indicate greater psychological ill-health. Internal consistency ranged from .90 (T2) to .91 (T1).

Control Variables

Age. While the sample is limited to mature aged workers, by virtue of the population of interest of the research project, a meta-analysis by Ng and Feldman (2008) on the age-differential effects of job autonomy on various outcomes found mixed results, concluding that age may moderate the relationship between job autonomy and some, but not all, outcomes, even amongst the differing age groups of mature aged workers. While the present study focused on mature aged workers, there was still some age variation in the sample. Due to the differing evidence of the impact of age, I included age as a control variable.

Gender. Autonomy has also been found to have differential effects across gender (Doherty, 2004). This difference is theorised to be based on gender role norms around responsibilities to the family and home, where women to with more flexibility in their working schedules are better able to balance their work responsibilities with the needs of the family and home (Adler, 2005). As a

consequence, women may reap more benefits from very high levels of autonomy compared to men, as this supports them in reducing any work home conflicts. Therefore, in this study, I also included gender (male, female, or non-binary) as a control.

Results

Data Cleaning

All data analyses were conducted in IBM SPSS Statistics version 27. Prior to data analysis, I checked that univariate and multivariate assumptions were met.

Univariate Assumptions

First, all variables were examined for univariate outliers. Meaningfulness and psychological distress at both T1 and T2 contained extreme outliers (greater than +3*SD* or -3*SD* from the mean). I used a replacement strategy outlined by Allen et al. (2014), where these extreme data points were replaced with a value of 3*SD* above or below the mean. All skewness and kurtosis values were within the acceptable ranges (-2 and +2, and -7 and +7, respectively) outlined by various authors such as Hair et al. (2010) and Byrne (2010), indicating univariate normality.

Multivariate Assumptions

Multivariate assumptions were examined for each regression model separately. The assumption of normality of residuals were met for all analyses through the visual inspections of histograms. The assumption of homoscedasticity of residuals was checked using scatterplots of standardised residuals against standardised predictors. No discernible patterns emerged from the scatterplots, indicating that the assumption of homoscedasticity was met across all analyses. Tolerance statistics were all well above the threshold of 0.2, indicating that multicollinearity would not interfere with the interpretation of the results (Menard,

2002). Lastly, I screened for multivariate outliers. Cook's distance for all analyses were well below the threshold of 1, indicating that there were no multivariate outliers that had an extreme influence on the analyses. However, where Mahalanobis' distance exceeded the critical χ^2 cut-off of 18.47 ($df = 4$, $p < .001$) or 20.52 ($df = 5$, $p < .001$), or where standardised residuals exceeded -3*SD* or +3*SD*, these cases were removed from the corresponding regression analyses, and are noted in the respective sections below.

Data Analysis

To test the hypotheses regarding the non-linear relationships between autonomy and proficiency, meaningfulness as well as psychological distress, I conducted a series of hierarchical regression analyses for each outcome variable. Regression models for all three outcomes were conducted separately for the curvilinear effect of autonomy on the three outcomes at T1, T2 and longitudinally, controlling for age and gender reported at T1.

Cross-Sectional Analyses

In step 1, I included the controls age and gender reported at T1. In step 2, the linear autonomy term was included, and finally in step 3, the quadratic autonomy term (autonomy^2).

Longitudinal Analyses

To investigate the longitudinal curvilinear effects of autonomy, I ran three separate hierarchical regression models to test the effect of autonomy reported at T1 on the three outcome variables at T2. As with the cross-sectional analysis, step 1 included the control variables age and gender reported at T1. I further controlled for the corresponding T1 measure of each of the three outcomes in step 2 of the

regression model. In step 3, I included the linear autonomy term, and finally the quadratic autonomy term (autonomy^2) in step 4.

Point of Inflection

Where a curvilinear relationship was indicated, I used the equation by Le et al. (2011) to identify the point of inflection for each of the curves. For a regression model:

$$Y = B_0 + B_1X + B_2X^2, \quad (4.1)$$

the inflection point occurs at the following value of the predictor X (Weisberg, 2014):

$$X_{inflexion} = \frac{-B_1}{2B_2}. \quad (4.2)$$

The point of inflection identified would therefore be interpreted as the standardised score on the autonomy scale corresponding to the inflection point of the curve reflecting the relationship between autonomy and each outcome variable separately. In other words, the inflection point represents the level of autonomy at which the relationship between autonomy and the outcome starts to change in direction or reaches an asymptotic point.

Descriptive Statistics

Little's missing completely at random test indicated that there were no notable missing values, $\chi^2(33, n = 679) = 41.67$, $p = .14$. The descriptive statistics and bivariate correlations for all variables are presented in Table 4.1. As expected, all variables were positively and significantly correlated between T1 measurements and the corresponding T2 measurements ($r > .50$, $p < .05$).

Table 4.1

Descriptive Statistics and Bivariate Correlations for all Variables

		M(*SD*)	1	2	3	4	5	6	7	8	9	10	11	12
	1. Age	58.09 (7.89)	—											
	2. Gender[a]	—	-.14**	—										
T1	3. Autonomy	3.54 (0.91)	.14**	-.24**	(.85)									
	4. Autonomy (quadratic)	0.83 (1.18)	.07	.08	-.38**	—								
	5. Proficiency	4.32 (0.73)	.05	.05	.13**	.08	(.90)							
	6. Meaningfulness	3.80 (0.89)	.13**	.05	.35**	-.10*	.23**	(.90)						
	7. Psychological Distress[b]	1.62 (0.72)	-.19**	.10*	-.23**	.14**	-.19**	.14**	(.91)					
T2	8. Autonomy	3.49 (0.89)	.11*	-.19**	.80**	-.31**	.06	.33**	-.19**	(.83)				
	9. Autonomy (quadratic)	0.79 (1.09)	.03	.09*	-.27**	.72**	.14**	-.10*	.07	-.30**	—			
	10. Proficiency	4.46 (0.56)	.08	.06	.10*	.07	.50**	.20**	-.20**	.12**	.10*	(.88)		
	11. Meaningfulness	3.80 (0.92)	.15**	.03	.33**	-.14**	.22**	.77**	-.18**	.38**	-.13**	.29**	(.92)	
	12. Psychological Distress[a]	1.58 (0.66)	-.21**	.17**	-.25**	.13**	-.15**	-.15**	.78**	-.21**	.07	-.20**	-.19**	(.90)

Note. $N = 679$. Cronbach's coefficient alphas are reported in parentheses along the diagonal.
[a] 0 = Male, 1 = Female, 2 = Non-binary
[b] Higher scores indicate greater psychological distress
* $p < .05$, ** $p < .01$

Proficiency

Cross-Sectional Analysis (Hypothesis 1a)

Hypothesis 1a predicted that autonomy will demonstrate a cross-sectional curvilinear relationship with proficiency at each time point, such that moderate levels of autonomy will be related to highest levels of proficiency. Hierarchical multiple regressions indicated that after controlling for the effects of age and gender in step 1 (R^2_{T1} = .01, p = .202; R^2_{T2}= .02, p = .002), the linear autonomy term significantly contributed to the variance in proficiency in step 2 (ΔR^2_{T1} = .01, p = .002; ΔR^2_{T2}= .02, p = .002). The quadratic autonomy term included in step 3 accounted for a further 2.24% of variance above and beyond the linear autonomy term at T1 ($\Delta F(4,642) = 15.00$, $p < .001$), and 1.92% of variance at T2 ($\Delta F(4,656) = 13.32$, $p < .001$; see Table 4.2), suggesting that the cross-sectional relationship between autonomy and performance was curvilinear. The signs of the quadratic coefficients were positive at both T1 (β = 0.16) and T2, (β = 0.14), indicating that this relationship was not in the direction hypothesised. Instead of the predicted inverted J-shaped curve indicating an additional decrement effect, a curve resembling a J-shape was found. Figure 4.1 displays the cross-sectional curvilinear relationships between autonomy and proficiency at T1 and T2. The point of inflection occurred at -0.62 *SD* (T1) and -0.54 *SD* (T2), suggesting a positive relationship between autonomy and proficiency at low to moderately low levels of autonomy. However, between moderately low to extremely high levels of autonomy, the positive relationship between autonomy and proficiency was stronger, resulting in a steeper slope. In other words, at low to moderately low levels of autonomy, participants tended to report similarly low levels of proficiency. However, beyond the point of inflection, the slope depicting the positive relationship between autonomy and proficiency

increased at an increasing rate, such that participants who reported the highest levels of autonomy also reported the highest levels of proficiency. Therefore, Hypothesis 1a was not supported.

Table 4.2

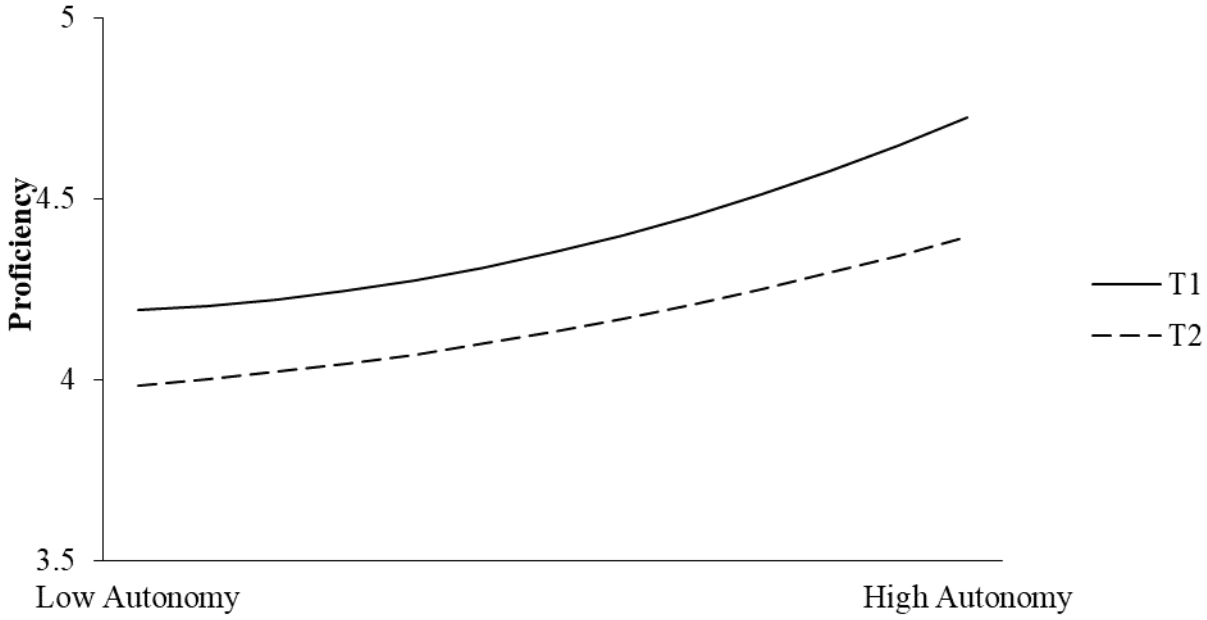
Cross-sectional and Longitudinal Curvilinear Effects of Autonomy on Proficiency

	R^2	ΔR^2	*B*	*SE*	β
T1 Proficiency (*N* = 647)					
Step 1	.01				
Age			0.00	0.00	0.05
Gender[a]			0.07	0.05	0.06
Step 2	.02	.01			
Autonomy			0.08	0.03	0.13**
Step 3	.04	.02			
Autonomy^2			0.09	0.02	0.16**
T2 Proficiency (*N* = 661)					
Step 1	.02				
Age			0.01	0.00	0.13**
Gender[a]			0.08	0.04	0.07
Step 2	.03	.01			
Autonomy			0.08	0.02	0.12**
Step 3	.05	.02			
Autonomy^2			0.08	0.02	0.14**
Longitudinal Proficiency[b] (*N* = 662)					
Step 1	.01				
Age			0.01	0.00	0.10*
Gender[a]			0.07	0.04	0.06
Step 2	.35	.34			
Proficiency T1			0.47	0.03	0.58**
Step 3	.35	.00			
Autonomy			0.02	0.02	0.04
Step 4	.36	.004			
Autonomy^2			-0.37	0.02	0.07*

Note. [a] 0 = Male, 1 = Female, 2 = Non-binary
[b] Longitudinal proficiency refers to the effect of autonomy (T1) on proficiency (T2), controlling for the effect of proficiency (T1)
* $p < .05$, ** $p < .01$

Figure 4.1

Cross-sectional Curvilinear Relationship Between Autonomy and Proficiency



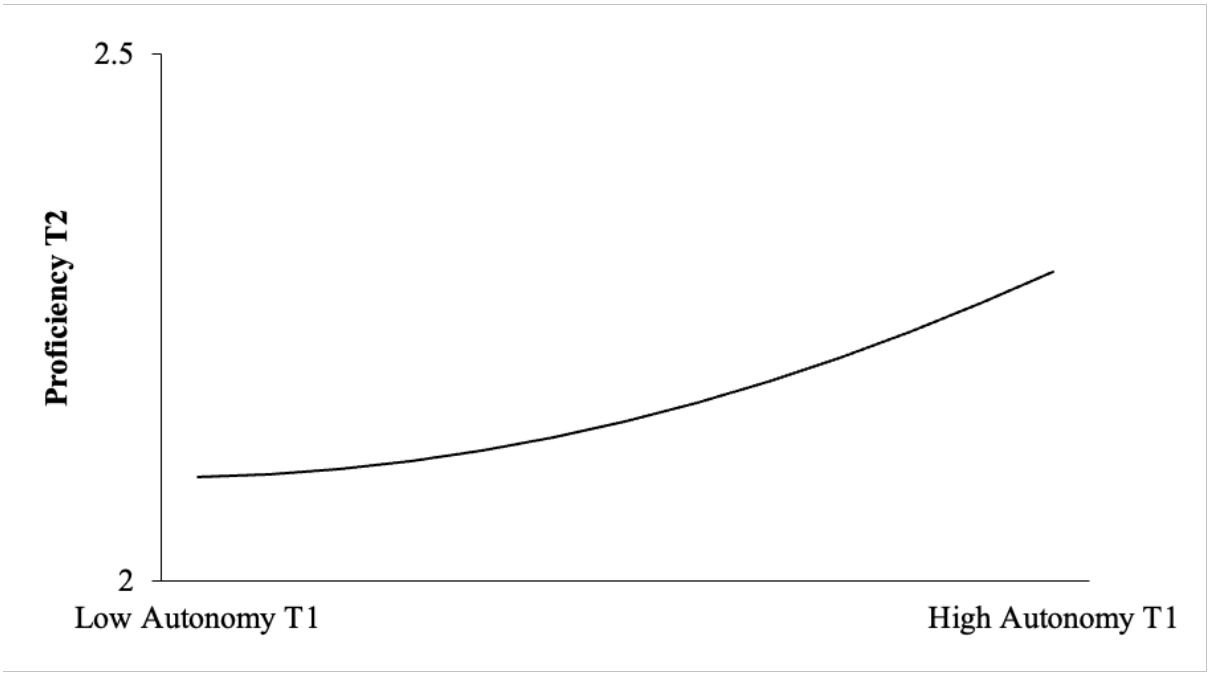
Longitudinal Analysis (Hypothesis 1b)

Hypothesis 1b predicted that the curvilinear effect of autonomy on proficiency will predict outcomes at a later time, such that moderately high levels of autonomy at T1 will result in the highest levels of proficiency at T2, after controlling for proficiency at T1. A hierarchical multiple regression showed that after controlling for the effects of age and gender at T1 (step 1; $R^2 = .01$, $p = .032$), as well as the effect of proficiency at T1 (step 2; $\Delta R^2 = .34$, $p < .001$), the linear autonomy term at T1 did not contribute significantly to the model (step 3; $\Delta R^2 = .00$, $p = .27$). Adding the quadratic autonomy term at T1 in step 4 accounted for an additional 0.40% of variance in proficiency at T2 ($\Delta F(5,656) = 4.10$, $p = .043$; see Table 4.2), which was significant, supporting a curvilinear, rather than linear, longitudinal effect of autonomy on proficiency. As with the cross-sectional relationship, the direction of the curve of the longitudinal relationship between autonomy and proficiency was counter to the hypothesised relationship. The point of inflection was similarly found

to occur at a moderately low level of autonomy (-0.49 *SD*). After this inflection point, the positive relationship between autonomy and proficiency increased at a higher rate, resulting in a steeper slope. Figure 4.2 illustrates the longitudinal curvilinear relationship between autonomy and proficiency. Hypothesis 1b was also not supported.

Figure 4.2

Longitudinal Curvilinear Relationship Between Autonomy and Proficiency



Meaningfulness

Cross-Sectional Analysis (Hypothesis 2a)

Hypothesis 2a predicted that autonomy will demonstrate an additional decrement curvature with meaningfulness at each time point, such that moderately high levels of perceived autonomy will be related to the highest levels of meaningfulness. Hierarchical multiple regression analyses revealed that beyond the combined effects of the controls age and gender (R^2_{T1} = .036, p < .001; R^2_{T2}= .031, p < .001), the linear autonomy term explained a significant amount of variance in meaningfulness at both T1 (ΔR^2 = .111, p < .001) and T2 (ΔR^2 = .10, p < .001).

However, no significant curvilinear relationship between autonomy and meaningfulness was identified at either T1 ($\Delta R^2 = .00$, $\Delta F(4,655) = 0.19$ $p = .66$) or T2 ($\Delta R^2 = .00$, $\Delta F(4,658) = 0.64$ $p = .42$; see Table 4.3). These results indicate that the cross-sectional relationship between perceived autonomy and meaningfulness is linear, but not curvilinear. Figure 5.3 illustrates the relationship between autonomy and meaningfulness at T1 and T2. Accordingly, Hypothesis 2a was not supported.

Table 4.3

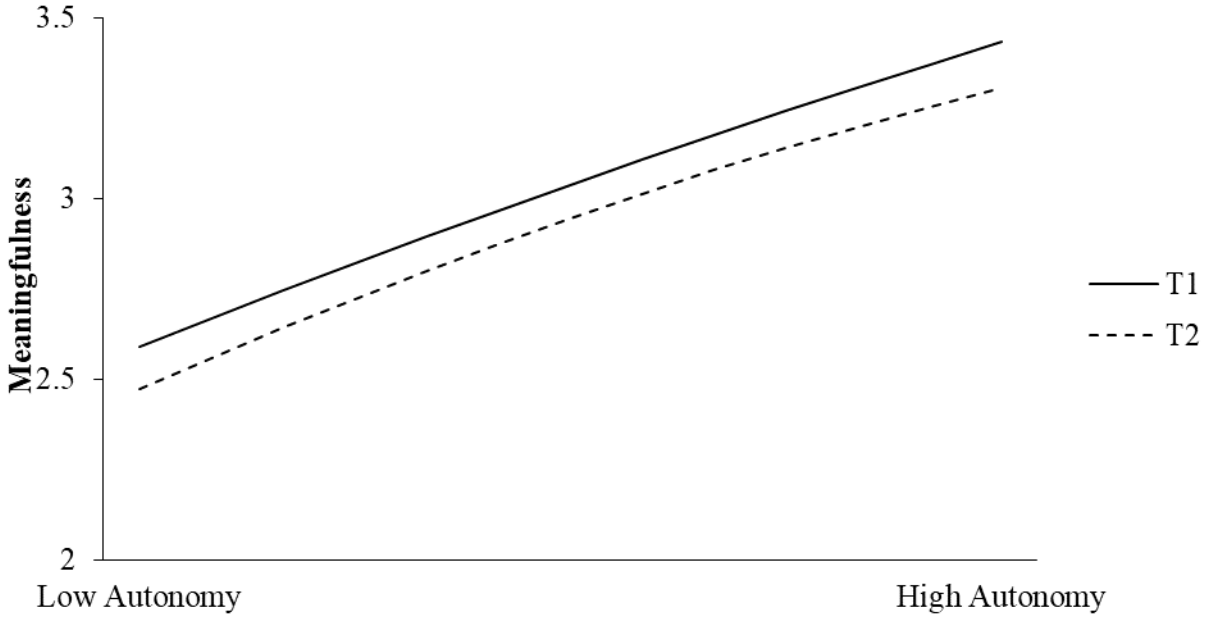
Cross-sectional and Longitudinal Curvilinear Effects of Autonomy on Meaningfulness

	R^2	ΔR^2	*B*	*SE*	β
T1 Meaningfulness (*N* = 660)					
Step 1	.04				
Age			0.02	0.00	0.19*
Gender[a]			0.12	0.06	0.07
Step 2	.15	.11			
Autonomy			0.33	0.04	0.35*
Step 3	.15	.00			
Autonomy^2			-0.01	0.03	-0.02
T2 Meaningfulness (*N* = 663)					
Step 1	.03				
Age			0.02	0.00	0.18**
Gender[a]			0.06	0.07	0.04
Step 2	.13	.10			
Autonomy			0.33	0.04	0.32**
Step 3	.13	.00			
Autonomy^2			-0.03	0.04	-0.03
Longitudinal Meaningfulness[b] (*N* = 659)					
Step 1	.03				
Age			0.02	0.00	0.16**
Gender[a]			0.08	0.07	0.05
Step 2	.61	.58			
Meaningfulness T1			0.79	0.03	0.77**
Step 3	.61	.00			
Autonomy			0.07	0.03	0.06*
Step 4	.61	.002			
Autonomy^2			-0.05	0.02	-0.05*

Note. [a] 0 = Male, 1 = Female, 2 = Non-binary
[b] Longitudinal meaningfulness refers to the effect of autonomy (T1) on meaningfulness (T2), controlling for the effect of meaningfulness (T1)
* $p < .05$, ** $p < .01$

Figure 4.3

Cross-sectional Relationship Between Autonomy and Meaningfulness

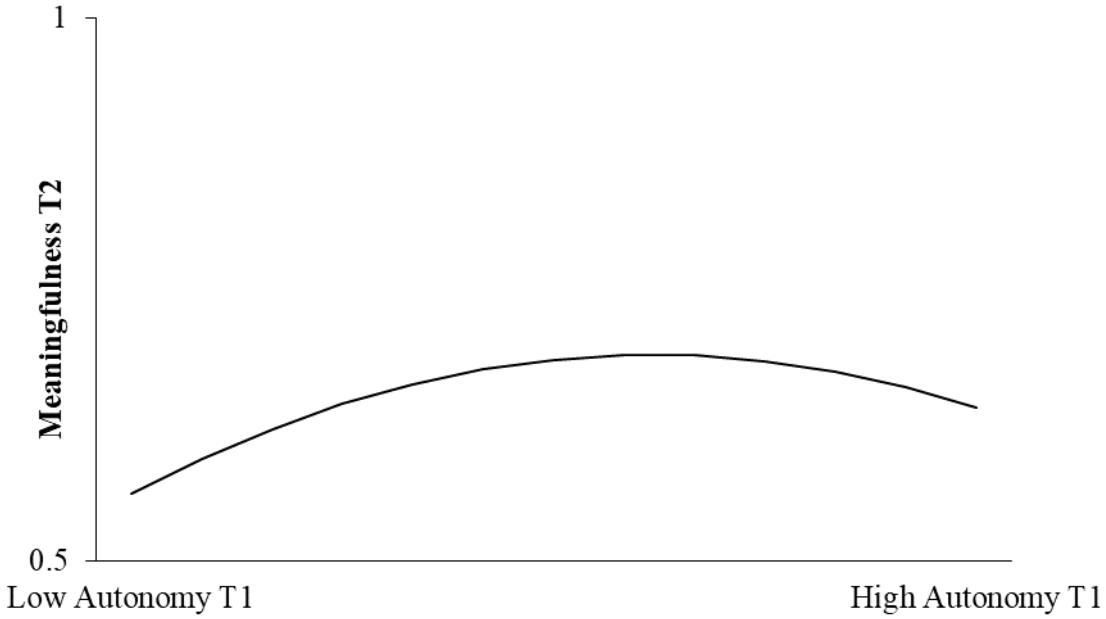


Longitudinal Analysis (Hypothesis 2b)

Hypothesis 2b predicted that autonomy demonstrates a longitudinal curvilinear effect on meaningfulness following an additional decrement curvature. After controlling for the effects of age and gender at T1 (step 1; $R^2 = .025$, $p < .001$), and meaningfulness at T1 (step 2; $\Delta R^2 = .582$, $p < .001$), the linear autonomy term at T1 was found to be significant (step 3; $\Delta R^2 = .003$, $p = .017$). Adding the quadratic autonomy term in step 4 explained 0.24% variance above and beyond the linear autonomy term ($\Delta F(5,653) = 4.10$, $p = .04$; see Table 4.3). The quadratic effect was negative ($\beta = -0.05$), indicating that the curvilinear effect followed an additional decrement curvature as hypothesised (see Figure 4.4). The point of inflection occurred at +0.56 *SD* above the mean, suggesting that the positive effect of autonomy on meaningfulness reversed at moderately high levels of autonomy. Therefore, Hypothesis 2b was supported.

Figure 4.4

Longitudinal Curvilinear Relationship Between Autonomy and Meaningfulness



Psychological Distress

Cross-Sectional Analysis (Hypothesis 3a)

Hypothesis 3a proposed curvilinear relationships between autonomy and psychological distress. Specifically, I hypothesised that the curvilinear relationship between autonomy and psychological distress follows an additional decrement curvature, such that moderately high levels of autonomy will be associated with the lowest levels of psychological distress at T1 and T2 (i.e., following a U-shaped, rather than an inverted U-shaped curve). After controlling for age and gender (R^2_{T1} = .059, $p < .001$; R^2_{T2}= .068, $p < .001$), the linear autonomy term explained a significant amount of variance in psychological distress at both T1 ($\Delta R^2 = .032$, $p <$ .001) and T2 ($\Delta R^2 = .021$, $p < .001$). Adding the quadratic autonomy term explained 0.99% of the variance beyond the linear autonomy term at T1 ($\Delta F(4,655) = 7.19$, $p =$ .01), and 0.64% of variance at T2 ($\Delta F(4,656) = 4.62$, $p = .03$; see Table 4.4). The quadratic coefficients were positive at both T1 ($\beta = 0.10$) and T2 ($\beta = 0.08$). This

positive quadratic coefficient supports the hypothesis that the curvilinear effect of autonomy on psychological distress will be in the opposite direction to meaningfulness (i.e., a U-shaped, rather than inverted-U shaped curve). Figure 4.5 illustrates the relationship between autonomy and psychological distress at T1 and T2. The points of inflection occurred at +0.87 *SD* (T1) and +0.88 *SD* (T2). Taken together, this demonstrates that psychological distress decreased as autonomy increased from low to moderately high levels. However, beyond moderately high levels of autonomy, any increase in autonomy did not have any additional benefits for improving psychological distress. This suggests a constant effect (i.e., plateau), rather than an additional decrement, curvature. Therefore, Hypothesis 3a was partially supported.

Table 4.4

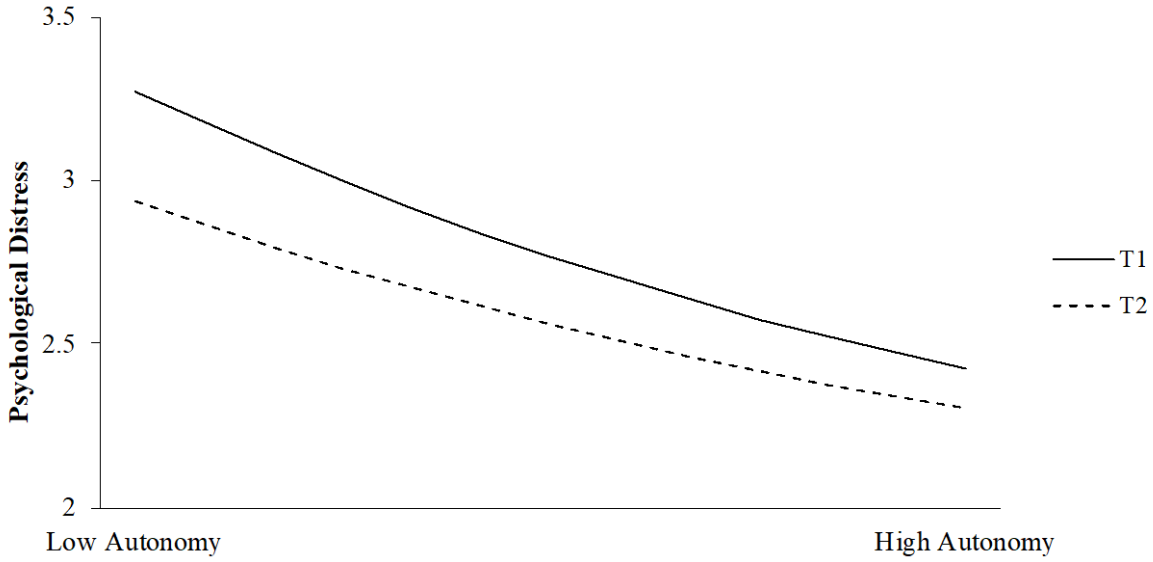
Cross-sectional and Longitudinal Curvilinear Effects of Autonomy on Psychological Distress

	R^2	ΔR^2	*B*	*SE*	β
T1 Psychological Distress (*N* = 660)					
Step 1	.06				
Age			-0.02	0.00	-0.19**
Gender[a]			0.16	0.05	0.12**
Step 2	.09	.03			
Autonomy			-0.14	0.03	-0.19**
Step 3	.10	.01			
Autonomy^2			0.07	0.03	0.10*
T2 Psychological Distress (*N* = 661)					
Step 1	.07				
Age			-0.01	0.00	-0.17**
Gender[a]			0.21	0.05	0.17**
Step 2	.09	.02			
Autonomy			-0.11	0.03	-0.15**
Step 3	.10	.01			
Autonomy^2			0.06	0.03	0.08*
Longitudinal Psychological Distress[b] (*N* = 660)					
Step 1	.06				
Age			-0.01	0.00	-0.17**
Gender[a]			0.2	0.05	0.15**
Step 2	.71	.65			
Psychological distress T1			0.77	0.02	0.83**
Step 3	.71	.00			
Autonomy			0.01	0.02	0.01
Step 4	.71	.00			
Autonomy^2			0.01	0.01	0.01

Note. [a] 0 = Male, 1 = Female, 2 = Non-binary
[b] Longitudinal psychological distress refers to the effect of autonomy (T1) on psychological distress (T2), controlling for the effect of psychological distress (T1)
* $p < .05$, ** $p < .01$

Figure 4.5

Cross-sectional Curvilinear Relationship Between Autonomy and Psychological Distress



Longitudinal Analysis (Hypothesis 3b)

Hypothesis 3b predicted that autonomy demonstrates a longitudinal curvilinear effect on psychological distress following an additional decrement curvature. After controlling for the effects of age and gender at T1 (step 1; $R^2 = .063$, $p < .001$), and psychological distress at T1 (step 2; $\Delta R^2 = .651$, $p < .001$), neither the linear (step 3; $\Delta R^2 = .00$, $p = .716$) nor quadratic (step 4; $\Delta R^2 = .00$, $p = .683$) T1 autonomy term significantly explained any additional variance in the model. Therefore, there was neither a linear nor curvilinear longitudinal effect of autonomy on psychological distress. Hypothesis 3b was not supported.

Discussion

In this chapter, I investigated both the cross-sectional and lagged curvilinear effects of autonomy on performance, psychological well-being and psychological ill-health (captured respectively as proficiency, meaningfulness, and psychological

distress). The main goal of this study was to extend the findings of Chapter 3. The main limitation of the existing literature I identified in the meta-analysis was that most of the studies included were cross-sectional and based on self-reports. This limited the conclusions that could be drawn not only from each individual study, but also the studies included in the meta-analysis on the whole. In the present study, I set out to establish if autonomy demonstrates a curvilinear effect on these outcomes via a longitudinal study to provide stronger evidence for the existence of these effects in a field setting. Where a curvilinear effect was found, I additionally sought to identify the point of inflection in order to provide further insights into the way that autonomy is theoretically defined and practically applied.

While I found both cross-sectional and lagged curvilinear effects of autonomy on self-rated performance (i.e., proficiency) above and beyond a positive linear relationship, the results were contrary to the hypothesised curvilinear relationship. Instead of an additional decrement curvature where moderately high levels of autonomy are related to the highest levels of performance, results revealed a curvature that resembled the inverse. Low to moderately low levels of autonomy were related to similarly lower levels of performance, while higher levels of autonomy were related to higher self-rated performance. This pattern was found both cross-sectionally and longitudinally. Therefore, Hypotheses 1a and 1b were not supported.

Investigating psychological well-being (i.e., perceived meaningfulness) as a psychological outcome, results showed a positive linear, but not curvilinear, cross-sectional relationship between autonomy and meaningfulness. Thus, Hypothesis 2a was not supported. However, a lagged curvilinear effect of autonomy on well-being following an additional decrement curvature emerged (above and beyond a lagged

positive linear relationship). Specifically, meaningfulness increased as autonomy increased from low to moderately high levels. However, past the point of inflection at a moderately high level of autonomy, a negative effect of autonomy on meaningfulness was found. Therefore, Hypothesis 2b was fully supported.

Lastly, investigating psychological ill-health (i.e., psychological distress) as a psychological outcome, results indicated cross-sectional curvilinear relationships above and beyond negative linear relationships between autonomy and strain at both T1 and T2. However, these curves did not follow the hypothesised additional decrement curvature as hypothesised – psychological strain did not increase at extremely high levels of autonomy, instead appearing to plateau after the point of inflection, indicating a constant effect, rather than additional decrement, curvature. Therefore, Hypothesis 3a was partially supported. Turning to the longitudinal analysis, there was no significant linear nor curvilinear effect of autonomy on strain, and Hypothesis 3b was not supported.

While curvilinear relationships were established in the meta-analysis (Chapter 3), the exact shape of the relationships could not be determined. Further, only three longitudinal studies resulting from the search elaborated on whether a lagged curvilinear relationship existed between autonomy and varying outcomes. While there was insufficient evidence to support a lagged curvilinear effect of autonomy on performance in these three studies, a curvilinear lagged effect of autonomy was found for emotional exhaustion (psychological ill-health; Teuchmann et al., 1999). In addition, cross-sectional, but not lagged, curvilinear relationships between autonomy and engagement (psychological well-being; Heinrichs et al., 2020), enthusiasm (psychological well-being), and depression (psychological ill-health; Mäkikangas et al., 2007), was found. These patterns run counter to the

relationships found in the present study, where I found a lagged, but not cross-sectional, curvilinear effect of autonomy on psychological well-being, and no curvilinear relationship between autonomy and psychological ill-health. However, it is worth noting that the studies gathered in the meta-analysis varied in length, ranging from four weeks (Teuchmann et al., 1999) to 7.5 years (Heinrichs et al., 2020), and was different to the time lag of this study. Research suggest that the time required to observe a lagged effects of work design may differ across various outcomes (de Lange et al., 2003), which needs to be additionally considered in view of the disparate results.

The findings from this study, while overall mixed, generally indicate that curvilinear relationships exist between autonomy and outcomes such as performance, well-being, and strain. However, the differences found in curvilinear relationships across the different outcomes suggest that the curvilinear effect of autonomy may not always follow a "too much of a good thing" (i.e., additional decrement curve) effect across all outcomes. Overall, the mixed results from this study suggest that there are benefits, detriments, and in other cases no additional benefit or detriment relating to extremely high levels of autonomy. Each of the outcome types demonstrated a different relationship with autonomy. Of note, high levels of autonomy were related to greater levels of performance, but at the potential cost of lowered well-being in the longer term, with no additional benefit or detriment to psychological ill-health in the short term. Interestingly, there was no significant lagged effect of autonomy on psychological ill-health. Taken together, these findings suggest that extremely high autonomy may be a 'double-edged sword' (Konze et al., 2017), which needs to be managed carefully.

In general, the findings do provide broad support for traditional theories such as the job characteristics model (Hackman & Oldham, 1976) and the job demands-resources model (Demerouti et al., 2001). Considering both extreme ends of perceived autonomy (i.e., very low vs. very high), providing individuals with more autonomy is beneficial compared to low levels of autonomy, as indicated by the significant linear relationships. When comparing only the extremely high to extremely low levels of autonomy in this linear fashion, respondents generally reported greater levels of performance and psychological well-being (cross-sectionally and longitudinally), and lower levels of psychological ill-health (cross-sectionally). From these perspectives, providing employees with autonomy can help to increase the amount of psychosocial resources available to successfully address the various requirements of the job, thereby leading to better performance and wellbeing, as well as a reduction in strain.

However, investigating these positive relationships in more detail by including the curvilinear term suggests that while there is a general beneficial relationship between autonomy and desirable outcomes, the relationships between autonomy and various outcomes do not necessarily operate in a linear fashion. Instead, the rate at which any increase in autonomy affects outcomes differs across outcome types as well as according to the level of perceived autonomy. This suggests that conventional theories of work design need to be refined, such as through considering the nuances associated with increasing levels of autonomy. The findings from this study suggest that the amount of autonomy afforded by the job must be carefully managed to ensure that any increase in performance does not come at the expense of reduced long-term psychological well-being.

As discussed in Chapter 2, despite scholars making the case for researchers to consider curvilinearity – if only to rule out the possibility of curvilinear effects – the majority of studies do not search for such patterns (Cortina, 1993). Findings from this study provide some support for such propositions, and illustrate how the exclusion of a quadratic term may sometimes lead researchers to prematurely conclude the linear effects of autonomy on outcomes. Importantly, these findings suggest that curvilinear relationships are complex and may not be easily identified. For example, nonlinear effects may be hidden by interaction effects (Cortina, 1993; Matuschek & Kliegl, 2018). It is therefore important to understand the conditions and circumstances under which these nonlinear effects are more or less likely to occur.

Not considering the curvilinear effects of autonomy has both theoretical and practical implications. Theoretically, the categorisation of work design factors as positive or negative needs to be re-examined in light of the curvilinear effect. Practically, organisations should carefully manage the amount of resources given to employees, such that organisations with the intent to support their employees by increasing job resources do not inadvertently place even more requirements on employees.

Strengths of Study

The main strength of this study is its longitudinal design. Specifically, this design responded to the limitation of insufficient longitudinal studies identified in the meta-analysis presented in Chapter 3. The longitudinal design measured both autonomy and all outcomes at both time points. It has distinct advantages over cross-sectional and even other lagged studies such as multi-phase studies, as it allows stronger inferences to be drawn regarding the relationships between autonomy and

various outcomes. Autonomy and all outcomes were measured at both time points, therefore the causality model by Hakanen et al. (2008) was used to establish the temporal order of autonomy on outcomes, which allowed me to draw more robust inferences of the curvilinear effect of autonomy on these outcomes.

Another strength of this study is its investigation into the inflection points at which any additional autonomy is no longer beneficial (e.g., psychological ill-health), or worse, detrimental (e.g., psychological well-being). Understanding the inflection point provides further valuable information into the curvilinear effects of autonomy on outcomes, and how autonomy operates on outcomes such as psychological well-being and ill-health. Findings provide practical guidance on the provision of autonomy within workplaces and work design or redesign efforts, such that organisations seeking to provide resources to support employees in meeting demands do not inadvertently increase requirements. For example, organisations which provide employees with extremely high levels of autonomy (or indeed, if extremely high levels of autonomy is an unavoidable requirement of the work) to improve performance may need to consider providing additional resources aimed at supporting employees' mental health to attenuate the detrimental effects of extremely high autonomy on psychological well-being.

Limitations and Considerations for Future Research

While the results from the present study provide some indication about the curvilinear effects of autonomy, these results should be interpreted with care, due to some limitations that may influence the generalisability of the findings. First, the study was based on self-report surveys. While scholars such as Spector (1994) have argued that self-reports are useful as indicators of the subjective work environment (e.g., perceived autonomy, psychological well-being and ill-health), they note that

criticisms of self-reports have been focused on measuring other aspects of the work environment, which may benefit from more objective measures (e.g., performance measurement). In general, the use of self-report across all variables in this study may give rise to common method variance, social desirability and reporting biases. Common method variance is the "systematic error variance shared among variables measured with and introduced as a function of the same method and/or source" (Richardson et al., 2009, p. 763). Scholars have argued for the limited utility of findings from studies affected by common method variance, specifically when “the data for both the predictor and criterion variable are obtained from the same person in the same measurement context” (Podsakoff et al., 2003, p. 885). Social desirability may be particularly detrimental to psychological constructs such as psychological well-being and ill-health, because societal expectations for individuals to behave in a pleasant manner even during episodes of negative psychological states may cause inflated responses to questionnaire items such as those measuring psychological well-being and ill-health (McCrae, 2002). Interestingly, a ceiling effect of self-rated performance was found in the data, with limited variance. That is, participants tended to rate their own performance highly, which may have skewed the results. This may be attributed to the risk of social desirability bias inherent to self-report measures, where participants may display a tendency to respond in a way that puts them in a positive light, whether consciously or unknowingly believing the overly positive responses to be true (Paulhus & Trapnell, 2008). While it is possible that performance was indeed very high across all participants, it should also be considered that this finding may be an artefact of the self-report measure. In a similar vein, the high ratings obtained via self-report measures in combination with Likert scales may further exacerbate the potential issue of ceiling effects, which may hinder

the detection of true curvilinear effects (Grant & Schwartz, 2011). For example, in the context of the present study, participants experiencing high and extremely high autonomy may have both reported that they "strongly agree" with the autonomy items, but range restrictions may limit the interpretability of these findings.

Second, the present study was part of a larger study that was primarily designed to investigate mature workers' experiences at work. Although there was variance in the participants' age and I included age as a statistical control, the overall sample would still be relatively restricted in age, suggesting that there might have been some range restriction in the sample characteristic. Age has been positively linked to better resource (Ng & Feldman, 2015) and emotion regulation (Hansen & Slagsvold, 2012), and it is argued that older individuals tend to have more experience with managing these psychosocial resources. This may be due to learning effects across the lifetime, such that over time, workers learn or develop strategies learn to manage extremely high autonomy as a result of their experience in gradually increasing levels of autonomy as they progress in their careers (Ng & Feldman, 2015). Age has also been found to be related to some dimensions of performance, such as organisational citizenship behaviour (Ng & Feldman, 2008), perhaps due to their conviction to develop the younger generation of workers. Further, this may be reflective of survivor bias, for example, individuals who were unable to develop successful strategies to manage extremely high autonomy coped by leaving the workforce via earlier retirement (Roberts et al., 2006). This suggests that the data included in this study may be limited in its generalisability and external validity, especially in extending these findings to the general working population.

Third, the study was a two-wave study carried out over a six-month period. Traditional longitudinal studies tend to measure lags of 12 months (Zapf et al.,

1996). This may be due to arbitrary, yet practical reasons, but it has also been argued that annual measurements can help to attenuate seasonal changes, such as changes in the sales or performance feedback cycles (de Lange et al., 2003). On the other hand, the approach of the present study aligns with calls of scholars to investigate shorter lags (e.g., Dormann & Griffin, 2015), because the temporal effects of psychological variables may occur differently across varying periods (de Lange et al., 2003). Impeding these efforts is the fact that current research in organisational behaviour lacks precise suggestions of expected time-lag effects (Mitchell & James, 2001). Due to practical reasons, the present study included only a six-month time lag, which may not be equally suited to all the outcomes included. Moreover, the two-wave design can only examine relationships in a single direction (i.e., X → Y), but not reverse (i.e., Y → X) or reciprocal relationships (e.g.., X → Y → X; Zapf et al., 1996). Future research should extend this study by including a third wave of data collection, which could account for a 12-month time lag. This will not only account for the possibility of seasonal changes (de Lange et al., 2003), but also allow for the investigation into the trajectories of different outcome types over several time points, as well as provide further clarity into the expected time-lag effects of autonomy.

Lastly, inherent to the field study design is the possibility of endogeneity, that is, there may be other work design factors causing relationships between the predictor and criterion variables which were not considered in the present study (Spector, 2019). To elaborate, work design characteristics such as work autonomy do not operate in a vacuum – extremely high levels of autonomy are likely to be confounded by and coexist with decreased role clarity (i.e., more ambiguous roles; Bolumole et al., 2016) or relentless overload (Warr, 2002), and it may be this ambiguity or overload that leads to the curvilinear effect of autonomy. Conversely,

extremely high levels of autonomy may also coexist with other resources (e.g., social support) that may help to buffer the detrimental effects of extremely high autonomy. Future field research studies may consider measuring other work design characteristics that may moderate the curvilinear relationships between autonomy and outcomes.

Conclusion

This study contributes to the understanding of curvilinear effects of autonomy on performance, psychological well-being and ill-health over a 6-month time lag. Results suggest that there is a lagged curvilinear effect of autonomy on performance and well-being, but not strain. The effect of autonomy on well-being followed the additional decrement curvature, while its effect on performance was in a contrary direction to what was hypothesised. The curvatures varied according to different outcomes, suggesting that further research needs to be done in order to understand the complexity behind the curvilinear effects of autonomy.

In the following chapter, I aim to further extend insights into curvilinear effects of autonomy and to address some of the limitations identified above from a few angles. The mixed findings from the present study suggested that the curvilinear effect of autonomy may occur only under certain conditions. I therefore seek to investigate some mechanisms through which the curvilinear effect may occur, in order to improve current understanding about the way autonomy affects outcomes. To address the methodological limitations of the present study, I present an experimental paradigm such that data for the predictor and criterion variables are obtained from different sources (i.e., externally manipulated predictor, self- and other-rated criterion variables). I manipulate the experimental design to create conditions of low, moderately high and extremely high autonomy in order to tease

apart any nuances between high and extremely high autonomy discussed in this chapter. The use of an experimental manipulation also helps to minimise the potential problem of endogeneity identified, thereby establishing causality.

Chapter 5: An Experimental Investigation into the Curvilinear Effect of Autonomy at Work

Introduction to Chapter 5

In this chapter, I further build upon the findings of the field study in Chapter 4 to establish the causality and underlying mechanisms of the curvilinear effects of autonomy. To do so, I use an experimental paradigm to manipulate autonomy on a work task, and I include an objective, other-rated measure of performance. This chapter is presented in a traditional thesis format which builds on earlier chapters.

The Present Study

The studies presented in both Chapter 3 (meta-analysis) and Chapter 4 (longitudinal field study) do not investigate *how* this curvilinear effect occurs. Understanding the pathways in which extremely high autonomy may be detrimental to outcomes will lead to greater theoretical and practical understanding of the curvilinear effects of autonomy. Theoretically, establishing the mechanisms underlying the curvilinear effect of autonomy can strengthen the causal argument presented, but also has practical implications for managing work environments of extremely high autonomy, such as the shift towards work-from-home arrangements. The present study therefore aims to experimentally investigate the mechanisms by which the curvilinear effect of autonomy occurs.

The longitudinal effects found in Chapter 4 allowed me to draw some inference on causality and the existence of curvilinear effects. Specifically, findings demonstrated curvilinear effects both cross-sectionally and longitudinally (performance) or appearing only after a six-month time lag (psychological well-being). Psychological ill-health displayed a curvilinear relationship with autonomy only cross-sectionally at T1 and T2, but not longitudinally. While a longitudinal

design is stronger than a single-source cross-sectional study (Spector, 2019), causality cannot be established. I now turn to describe a between-subjects experiment in which I externally manipulate the levels of autonomy provided, allowing an inference of the causal effect of autonomy.

In order to build on the findings from the field study, I designed this study to measure constructs similar to those investigated in Chapter 4 (i.e., performance, psychological well-being and ill-health) in a curvilinear manner. I discuss autonomy and each of these constructs in turn, focussing on the operationalisation of these constructs specific to this experimental design.

Autonomy

In this study, I designed an experiment to focus on the differences between high and extremely high autonomy. The findings from Chapter 4 (where I utilised a self-report measure of autonomy) indicated that the inflection point of autonomy occurred at +0.5 *SD* to +1 *SD* above the mean. This suggests that the point at which autonomy is no longer beneficial (or becomes detrimental) occurs at moderately high, rather than moderate, levels of autonomy. To understand the curvilinear effects of autonomy, the implication of this finding is the point at which the relationship between autonomy and an outcome reverses might occur between high and extremely high levels of autonomy, resulting in a curve that represents an inverted-J shape (for example, see Figure 5.1 for a conceptualisation of the hypothesised curve between autonomy and performance). Therefore, in order to experimentally manipulate autonomy, three levels of autonomy were identified: low, moderately high and extremely high autonomy. Specifically, there were three conditions: (1) participants were provided no discretion over their decisions, schedules or methods of completing a task (low autonomy), (2) participants were provided considerable

discretion, but set within some boundaries (high autonomy), or (3) participants were provided a great deal of discretion with no boundaries (extremely high autonomy). I discuss each of these conditions in greater detail below.

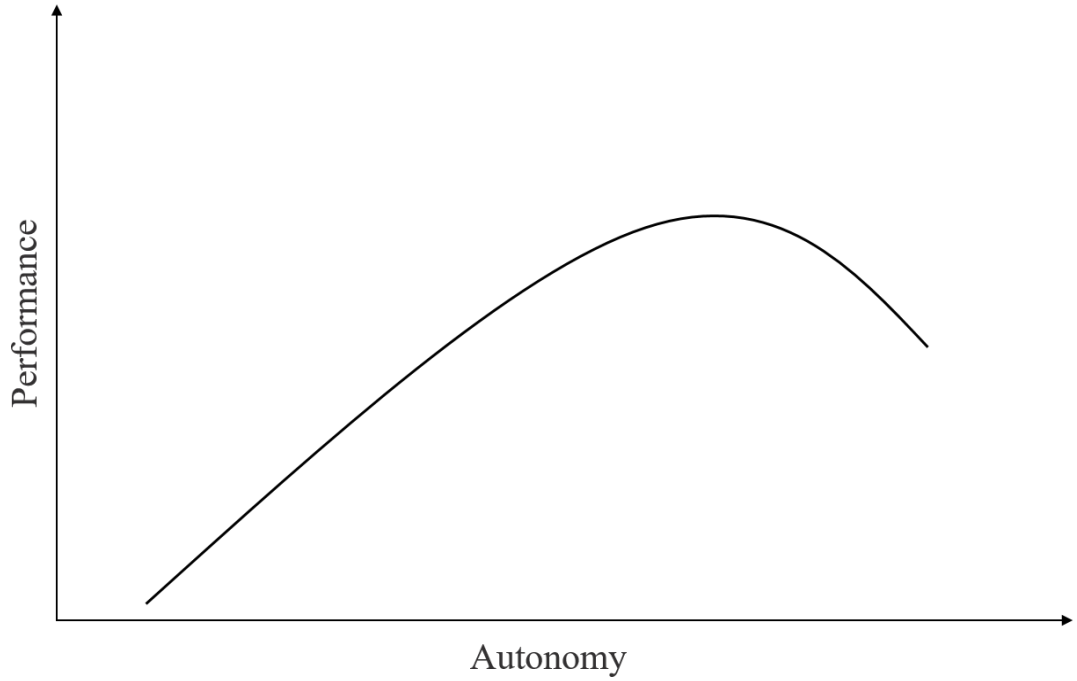
Performance

Aligned with Chapter 4, performance in this chapter is based on the model of individual work role performance by Griffin et al. (2007). Specifically, in this study, I focus on the facet of individual task proficiency and task proactivity. While it is important to note that the Griffin et al. (2007) model also includes a third facet, individual task adaptivity as part of a holistic view of individual task performance, individual task adaptivity relates to real-world jobs that exist within the context of "dynamic, unpredictable markets and rapidly changing technologies resulting in unanticipated changes to work requirements" (Griffin et al., 2007, p. 331). As this study employs an experimental design within a controlled environment, this particular aspect of individual task performance may be less applicable. Therefore, while I operationalise task performance based on the model of work role performance by Griffin et al. (2007), I focus specifically on the aspects of individual task proficiency and proactivity. In order to investigate the curvilinear effect of autonomy, similar to Chapter 4, I hypothesise that:

> *Hypothesis 1*: Autonomy demonstrates a significant curvilinear effect on performance, such that at low levels of autonomy, any increment in autonomy results in a positive relationship with outcomes, but at extremely high levels of autonomy, any additional autonomy has a negative effect on performance. The resulting relationship between autonomy and performance will resemble an inverted-J shape (as seen in Figure 5.1).

Figure 5.1

Conceptualisation of the Hypothesised Relationship between Autonomy and Performance



Psychological Well-Being and Ill-Health

Given that this study involves an experimental manipulation designed to disrupt the homeostatic psychological well-being and ill-health of individuals in the present moment, I use affect as a short-term indicator of psychological well-being and ill-health (Cummins, 2010). Affect refers to an individual's subjective experience occurring at a specific moment in time (Yik et al., 2011). It is a concept which maps psychological constructs such as emotions, well-being and mood, onto two dimensions: arousal (high activation – low activation), and affective valance (positive affect – negative affect; Warr et al., 2014), resulting in a total of four possible combinations (i.e., high activation positive affect, HAPA; low activation positive affect, LAPA; high activation negative affect, HANA; low activation negative affect, LANA). Positive and negative affect are transitory state-like constructs and have been considered to reflect subjective well-being in the short term

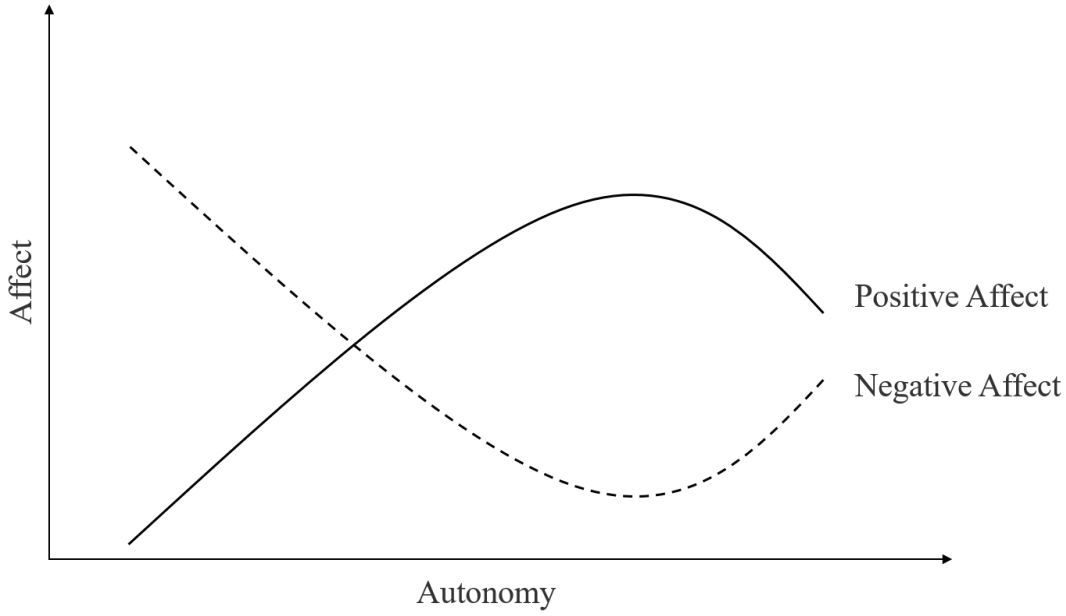
(Cummins, 2010; Mishra et al., 2014). They are thought of to vary across individuals across the contexts of social interactions at any point in time (Cummins, 2010). Therefore, in the present study, I use positive affect and negative affect as short-term indicators for psychological well-being and ill-health, and hypothesise:

> *Hypothesis 2*: Autonomy demonstrates a significant curvilinear effect on positive affect (both high and low activation), such that at low levels of autonomy, any increment in autonomy results in an increase in positive affect, but at extremely high levels of autonomy, any additional autonomy leads to a decrease in positive affect, resulting in an inverted-J shaped relationship.
>
> *Hypothesis 3*: Autonomy demonstrates a significant curvilinear effect on negative affect (both high and low activation), such that at low levels of autonomy, any increment in autonomy results in a decrease in negative affect, but at extremely high levels of autonomy, any additional autonomy leads to an increase in negative affect.

This will result in a curvilinear relationship between autonomy and negative affect, where the lowest amount of negative effect is associated with a moderate amount of autonomy (see Figure 5.2).

Figure 5.2

Hypothesised Curvilinear Effect of Autonomy on Affect



Potential Mechanisms

Understanding the mechanisms through which the curvilinear effect of autonomy operates has theoretical implications such as strengthening causal arguments, as well as practical implications for managing work environments. In this chapter, I investigate three pathways through which extremely high autonomy may be detrimental to outcomes (perceived responsibility, goal-setting, and choice overload). I discuss each of these mechanisms in turn.

Perceived Responsibility

Activation theory (Gardner, 1986) posits that people have optimal levels of activation. When their experienced arousal deviates from their optimal level (i.e., too little or too much arousal), people experience stress, which in turn negatively impacts mental, behavioural, and somatic outcomes (Gardner & Cummings, 1988). Viewed from a work design perspective of autonomy, too little or too much autonomy could cause individuals to experience stress, which in turn can negatively impact on their performance, psychological well-being or ill-health.

At extremely low levels of autonomy, individuals are not provided the opportunity to exercise personal discretion, but rather are prescribed the methods and schedule required for producing work that meets their goals (Parasuraman & Purohit, 2000). Such under-stimulating tasks may lead individuals to experience an inability to actualise their working potential, and thus 'boredom stress' may occur (Gardner, 1986; Parasuraman & Purohit, 2000). As autonomy increases, individuals are likely to feel more stimulated and more responsible for their behaviours and performance, as they reach a level of arousal where their activation is optimal (Hackman & Oldham, 1976). Beyond this point of optimal activation, at extremely high levels of autonomy, individuals may be induced to feel that their actions are not strictly regulated (Zhou, 2020) and may therefore perceive less responsibility. As I elaborate in Chapter 4, this extremely high level of autonomy may be interpreted by employees as the organisation being laissez-faire especially with tracking or monitoring, resulting in a decline in compliance with performance and behavioural norms (Zhou, 2020). I therefore propose:

> *Hypothesis 4a*: Autonomy demonstrates a significant curvilinear effect on perceived responsibility, such that at low levels of autonomy, any increment in autonomy results in an increase in perceived responsibility, but at extremely high levels of autonomy, any additional autonomy leads to a decrease in perceived responsibility, resulting in an inverted-J shaped curve.

Goal-Setting

Next, I consider goal-setting as a process involved in the curvilinear effects of autonomy. The goal-setting theory of motivation states that setting specific and realistic, yet challenging goals contribute to better outcomes such as performance, because specific goals can help individuals to understand what needs to be done and

how to go about doing a task (Latham & Locke, 1979). Goal-setting can facilitate self-regulation, in that a self-set goal defines a personally acceptable standard of work for an individual (Latham & Locke, 1991). Goal attainment from the goal-setting perspective theory is a function of both ability and motivation. Goal-setting is also often found to mediate the effects of other motivating variables, such as job autonomy (Locke & Latham, 2006).

Low autonomy environments may restrict individuals' opportunities to attain a different outcome than desired as these environments limit opportunities for individuals to set ambitious goals. At low levels of autonomy, employees may not see the opportunity or necessity to set specific goals, since the methods and schedules to achieve their goals have already been prescribed to them. At such low levels of autonomy, any increase in autonomy represents an increase in opportunity to self-set goals. This is likely to hold true until a moderately high level of autonomy. At this level, while the number of choices to be made has increased, there is still a limit to that number. This upper limit to the number of choices available allows for individuals to set specific personal goals that are challenging, yet within reasonable bounds. Beyond this moderate to high level of autonomy (i.e., at extremely high levels of autonomy), individuals may set vague goals or avoid committing to one choice due to the fear that they are not making the best decision (Schwartz, 2005). Consequently, individuals provided with extreme levels of autonomy may engage in poorer goal-setting behaviours (i.e., setting vague goals). Therefore, I hypothesise:

> *Hypothesis 5a*: Autonomy demonstrates a significant curvilinear effect on goal-setting, such that at low levels of autonomy, any increment in autonomy results in an increase in goal-setting, but at extremely high levels of

autonomy, any additional autonomy leads to a decrease in goal-setting, resulting in an inverted-J shaped curve.

Choice Overload

Choice overload, also known as the paradox of choice, refers to a cognitive state in which individuals experience difficulties in making decisions when faced with many options (Schwartz, 2005). The availability of more choices requires more decisions to be made, which in turn requires mental effort – that is limited in supply – to address (Schwartz, 2005). Mental effort has been described as the cognitive process in which individuals invest psychological resources during a task (Trujillo, 2019). As more mental effort is expanded, more cognitive resources are required to attend to the task at hand.

As autonomy increases, the number of choices about how to complete the task (e.g., when and how) increases. At low levels of autonomy, individuals are likely to be faced with a choice "underload", such that any additional increments of autonomy represent an increase in possible choices which supports individuals in meeting the demands of the task. Any allowances to exercise personal discretion can be seen as providing an individual with resources, and results in feeling energised. Up to a certain point (i.e., moderately high level) of autonomy, the demands of the task can stay manageable (conservation of resources theory; Hobfoll, 1989). However, beyond this point, extreme levels of autonomy may correspond to an extremely high number of choices, requiring individuals to dedicate an elevated amount of resources to cope with the increase in number of choices that need to be made. To illustrate, with a large number of choices relating to how to complete a task available to an individual, individuals may feel constantly preoccupied with the choices to be made, ruminate over choices that they regret, or even not committing to

a choice at all (Schwartz, 2005). This phenomenon may be explained by what researchers describe as "expectation-disconfirmation", where individuals believe that as the number of choices increases, the more likely it is for their ideal option to exist, resulting in the belief that they need to evaluate all choices thoroughly (Diehl & Poynor, 2010). Therefore, I hypothesise:

> *Hypothesis 6a*: Autonomy demonstrates a significant curvilinear effect on choice, such that at low to moderately high levels of autonomy, individuals are not overloaded with choice, however after moderately high levels of autonomy, any additional autonomy leads an increase in choice overload.

Mediation Effects

I further propose that the mechanisms outlined above mediate the autonomy-outcome relationships. The hypothesised curvilinear relationship between autonomy and perceived responsibility is outlined in the previous section, such that under- and over-stimulating tasks may lead individuals to experience 'boredom stress' and a sense of diffused responsibility, respectively. I further propose that these conditions of under- and over-stimulation lead to feelings of negative affect and in the longer term, psychological ill-health (Hobfoll, 1989). In contrast, moderately high levels of autonomy cause optimal levels of stimulation, in turn leading to the highest levels of performance and positive affect, and the lowest levels of negative affect. Therefore, I further propose:

> *Hypothesis 4b*: The curvilinear effect of autonomy on outcomes (performance and affect) is mediated by the curvilinear effect of autonomy on perceived responsibility.

Next, I propose that autonomy-outcome relationships are meditated by goal-setting. I argue that the curvilinear relationship between autonomy and goal-setting

results from an individual's reluctance to commit to set a specific goal at extremely high levels of autonomy due to the fear that they are not making the best choice (Schwartz, 2005). Setting vague goals in the face of extreme autonomy can have a psychologically protective effect, in that vague goals are compatible with a wide variety of different outcomes, including performance levels that are lower than an individual's actual best effort (Latham & Locke, 1991). As result of this process, poorer goal-setting has been found to have a negative effect on performance. Therefore, I further hypothesise:

Hypothesis 5b: The curvilinear effect of autonomy on outcomes (performance and affect) is mediated by the curvilinear effect of autonomy on goal-setting.

Lastly, I propose that the autonomy-outcome relationships are mediated by choice. At extremely high levels of autonomy, individuals are presented with a large number of choices relating to how to complete a task, causing them to experience choice overload where they are constantly preoccupied with choices to be made, or ruminate over choices that they regret, or not choosing at all, thereby negatively impacting on performance and well-being (Schwartz, 2005). Further, an extremely high level of effort associated with decision-making from a large number of choices is generally viewed as an unpleasant experience and can induce mental fatigue which negatively affects performance and affect (Trujillo, 2019). Therefore, I propose:

Hypothesis 6b: The curvilinear effect of autonomy on outcomes (performance and affect) occurs through the mediator choice overload.

Methods

Task Development and Experimental Design

Task Development

This study used an online experimental task with three levels of autonomy (a between-subjects design). Participants were tasked to create a flyer on behalf of an organisation trying to recruit participants for a 20-year longitudinal study ("working across life and careers"; WALC), adapted from the experimental task developed by Klonek et al. (2020). Participants were provided with marketing materials (see Appendix E) and told that the information provided currently existed on the organisation's website. These materials were not presented in a format that would be useable for a flyer (e.g., typographical and spelling errors, small fonts, poor use of colours, inclusion of hyperlinks and website live counters, etc.), and thus contained multiple areas for improvement, allowing participants to demonstrate effort and proactivity (i.e., "coming up with ideas to improve the way things are done"). All participants were provided with the same information, but the amount of work method, scheduling, and decision-making autonomies varied in each condition as is described in the next section.

Experimental Manipulation and Validation

A two-staged pilot study was carried out to develop the manipulation of the levels of autonomy in the task. During the first stage, seven subject-matter experts were presented with fictional scenarios describing three levels (low, moderately high, and high) for each of the three facets of autonomy (scheduling, work methods, and decision-making autonomy), for a total of nine scenarios. They were asked to rate the amount of autonomy they thought each scenario provided, on a five-point Likert scale (1 = *very low autonomy* to 5 = *very high autonomy*). Due to the small sample size, no statistical analysis was conducted. However, the experts' ratings of each scenario aligned with the intended experimental conditions of low (range: 1–1.67),

moderately high (range: 3.16–3.83), and high (range: 4.16–5.00) autonomy, providing support for face validity.

Following this, three scenarios were created for the second stage of the piloting process, representing low, moderate, and high autonomy conditions. For example, the low autonomy condition consisted of a combination of the low scheduling (e.g., had to spend 20 minutes on the task including an enforced two-minute break), work method (e.g., told to use a specific computer program), and decision-making autonomy (e.g., told what search terms to use to locate images) scenarios. In contrast, the extremely high autonomy condition consisted of a combination of extremely high scheduling (e.g., allowed to spend as much time as they liked), work method (e.g., use any programs they liked), and decision making (e.g., decide if images should be used, and if so to pick an appropriate image). The moderately high autonomy condition provided some autonomy, but within set bounds, for scheduling (e.g., allowed to spend up to 22 minutes on the task if they did not want to take a break), work method (e.g., told to use a commonly accessible program), and decision making (e.g., told to include an appropriate image of their choice).

Participants were recruited from the online platform Prolific Academic and were randomly presented with one of the three conditions. In a series of six pilots, they were tasked to create the flyer based on the instructions provided, which represented the condition they were assigned to. Between six to 42 participants were included in each pilot, with at least two participants in each of the three conditions. These pilots were run to refine the three experimental conditions, so that they had appropriately differing levels of autonomy. As a manipulation check, all participants filled in a short survey about their perceptions of autonomy around the scenario that

they were in. Because the concept of autonomy can be unintentionally confounded with decreased role clarity (e.g., Bolumole et al., 2016; Singh, 1993), role clarity was also included in the manipulation check to ensure that it was consistent across all three autonomy conditions. After each pilot, preliminary data analyses were used to compare the mean perceived level of autonomy and role clarity. The conditions were then adjusted based on the participants' reported perceived levels of autonomy and role clarity provided, to ensure that the experimental conditions were perceived as intended.

After the final pilot, a one-way Analysis of Variance (ANOVA) revealed that there were significant differences in the mean perceived levels of autonomy across all three levels of the low (M = 1.69, SD = .46), moderately high (M = 3.98, SD = .49) and high (M = 4.51, SD = .39) autonomy conditions, $F(2,23) = 93.28$, $p < .001$, $\eta^2 = .89$. Planned comparisons indicated that participants in the high and extremely high autonomy conditions reported significantly different levels of perceived autonomy, $t(23), = 2.52$, $p = .02$, $d = 1.19$.

As described earlier, research has suggested that the provision of role clarity might encroach on any autonomy that is provided to individuals (Juillerat, 2010; Wallace, 1995). To ensure that the concept of autonomy was not confounded with the concept of role clarity in this study, I also measured perceptions of role clarity (Breaugh & Colihan, 1994). An ANOVA revealed that there was no significant difference in mean perceived role clarity due to levels of autonomy across the final three conditions, $F(2,23) = .34$, $p = .72$, $\eta^2 = .03$, providing support for the consistent amount of role clarity across all three levels of autonomy. Therefore, the final experimental manipulation consisted of these three levels of autonomy (low, moderately high, and extremely high), with each level made up of the corresponding

level of the three facets of autonomy (scheduling, work methods, and decision-making autonomy). A summary of the three experimental conditions is presented in Table 5.1.

Table 5.1

Summary of Experimental Conditions

	Scheduling autonomy	Work Method Autonomy	Decision Making Autonomy
Low Autonomy	Participants were presented with 11 individual subtasks in a pre-determined order, with a pre-determined amount of time allocated for each subtask, totalling 20 minutes. A two-minute rest break was also enforced.	Participants were told to use only Microsoft Word. They were provided with a template to build their flyer, with pre-set fonts and a colour scheme in line with the WALC marketing materials.	Participants were told to navigate their browser to www.pixabay.com, search for 'working across the life and careers', and to use the first picture in the results. Participants were also told to use the information as-is from the background materials.
Moderately high Autonomy	Participants were presented with one list of 11 subtasks, and told that they were able to choose the order in which to complete the task, time spent on each subtask, and if they wanted to take a two-minute break. However, they had to spend between 10–22 minutes on the entire task.	Participants were told to use any software available to them, as long as the final product was in a commonly accessible format. They were given a template as a reference, but were told that they could use their creativity to create their own flyer. There were no prescribed fonts or colour schemes, but participants were reminded that the flyer had to be readable.	Participants were told to include an image, and to ensure that the image they used was copyright-free. They were provided with an example list of copyright-free image hosting websites. They were also told that they could use information as-is from the background materials, or to make any edits that they saw fit, as long as the end product was within the goals of recruiting for WALC.
Extremely High Autonomy	Participants were told that they were able to choose the order in which to complete the task and if they wanted to take a two-minute break. They were also allowed to spend as little or as much time as they needed on the task.	Participants were told to use any software available to them, as long as the product was a one-page flyer. They were not provided with a template, but were told to use their creativity to create a one-page flyer. There were no prescribed fonts or colour schemes, but participants were reminded that the flyer had to be readable.	Participants were told that images tend to attract attention, and to decide if they wanted to use an image. However, if they did, they need to make sure the images were copyright-free. They were also provided with background materials, but were told that they could make any edits, as long as the end product was within the goals of recruiting for WALC.

Sample Size Determination

The sample size was determined via an *a priori* analysis using GPower 3.1 (Faul et al., 2007). I selected the *F*-tests family and linear multiple regression (fixed model, R^2 increase) as the statistical test, and included the parameters: α error probability = .05; power (1-β error probability) = .95; number of predictors = 5 (based on two contrasts and three mediators); effect size = 0.21 (based on Bosco et al.'s (2015) meta-analytic effect size of individual performance). The power analysis indicated that a minimum sample size of 100 participants would be required across all three groups. In order to be cautious, a second *a priori* power analysis holding all factors constant but with a smaller effect size = 0.14 (based on Bosco et al.'s (2015) meta-analytic effect size of *objective* individual performance) indicated that a sample size of 147 would be required.

Participants

As with the pilot phase, participants for this study were recruited from the online platform Prolific Academic (N = 143; 45.50% female). The majority (64.34%) of participants were currently employed in full-time, part-time, or casual roles. In addition, nearly all (93.71%) participants reported having previous employment. The mean age of participants was 28.84 years (SD = 9.05).

Procedure

All procedures adopted in this study had received ethical approval from Curtin University's Human Research Ethics Committee (approval number HRE2020-0101). There were several prerequisites for a participant to take part in the study. These requirements were implemented as a primary screening process on the platform. Firstly, as the task required the use of an external software to create a flyer, participants had to access the study through a desktop (e.g., laptop or desktop), rather

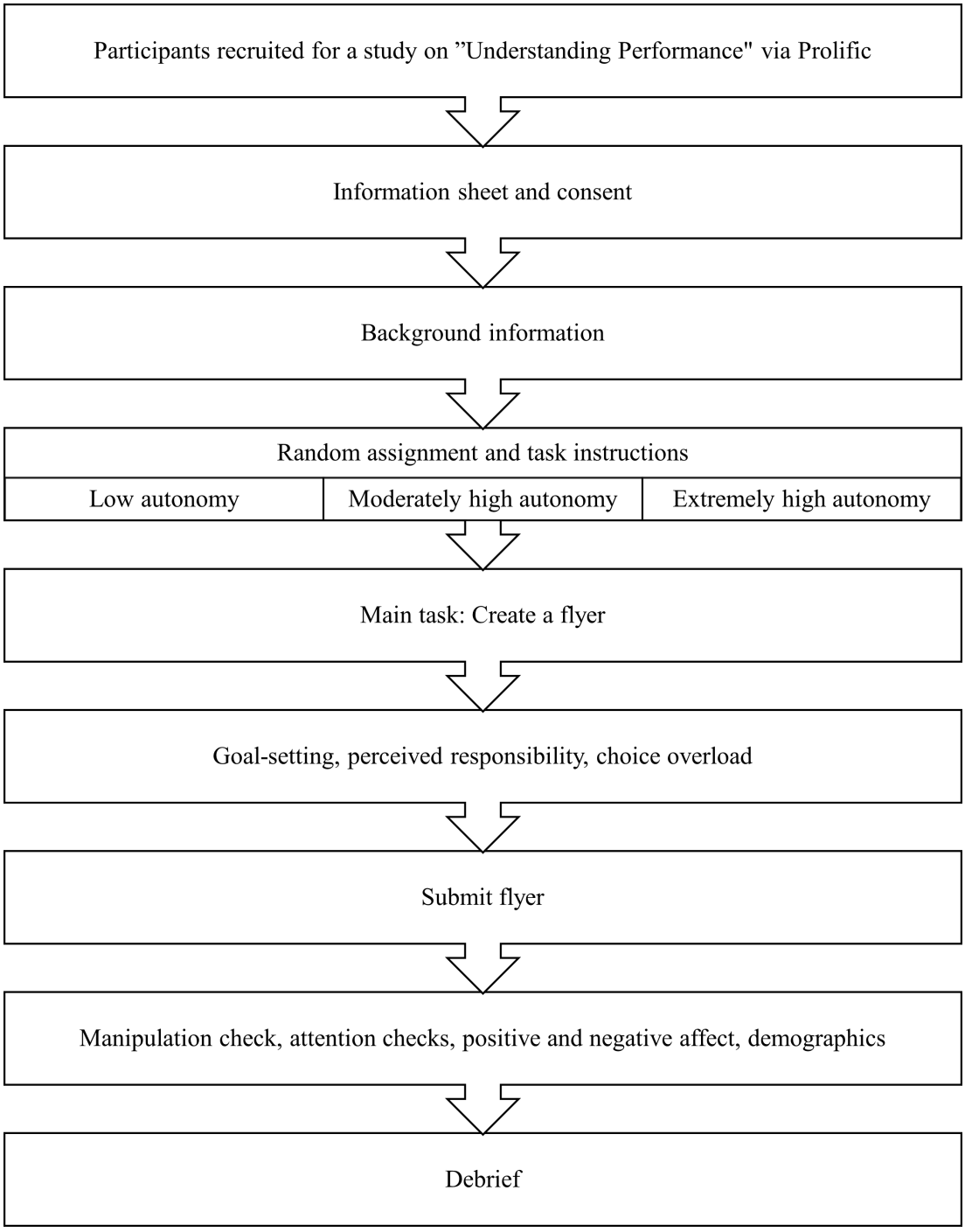
than a mobile device (e.g., phone). The study and task were delivered in English, so it was also a requirement that participants were fluent in written English.

Upon providing informed consent, participants were randomly assigned to one of three conditions (low, moderately high, and extremely high autonomy). All participants were provided instructions relating to the task. However, the specific instructions provided varied according to the condition they were assigned to (see Table 5.1 for a summary of the three conditions).

Before submitting their work, participants were asked to answer some survey questions relating to how they felt while working on the task. This section included the perceived responsibility, goal-setting and choice overload scales. Participants were then directed to upload their work. This was followed by a second questionnaire which asked about the task (i.e., autonomy manipulation check, role clarity), how they were feeling at that present moment (i.e., positive and negative affect), as well as some demographic questions. Participants were then thanked and debriefed on the three autonomy conditions, before returning to the Prolific platform. The entire study took about 30 minutes to complete, and all participants were compensated AUD7.40 for their time. The procedure of the experiment is outlined in a flow-chart in Figure 5.3.

Figure 5.3

Flow-chart of the Experimental Procedure



Measures

Across all measures, mean scores were calculated for each scale or sub-scale and used for further analyses, with higher scores indicating a higher rating on that measure. Unless otherwise stated, all items were measured on a five-point Likert

scale (1 = s*trongly disagree* to 5 = *strongly agree*) and did not require reverse coding. Internal consistencies are reported in Table 5.3 and were all at α = .70 or above. See Appendix F for the full list of items and descriptive statistics, including items which required reverse coding.

Manipulation Check

Autonomy. Autonomy was measured using the three autonomy sub-scales from the Work Design Questionnaire (Morgeson & Humphrey, 2006), comprising nine items in total. Each of the three sub-scales – work method autonomy (e.g., "I was allowed to make decisions about what methods I use to complete the task"), scheduling autonomy (e.g., "I was allowed to decide on the order in which things were done on the task"), and decision making autonomy (e.g., "I was allowed to make a lot of decisions on my own") – consisted of three items. Participants completed the autonomy measure using a five-point Likert scale (1 = s*trongly disagree* to 5 = *strongly agree*).

Role Clarity. The role clarity measure used was a nine-item scale from Breaugh and Colihan (1994). This includes three sub-scales: work method clarity (e.g., "I knew what the best way was to go about getting the task done"), scheduling clarity (e.g., "I was certain about the sequencing of my activities"), and performance clarity (e.g., "I knew what level of performance would be considered acceptable").

Mediator Variables

Mediators were measured before participants submitted their flyers to capture experiences related to the task directly in the moment of completing the task. Items in this questionnaire were adapted to specifically refer to the flyer task where applicable.

Perceived Responsibility. Three items measuring perceived responsibility were adapted from Gosling et al. (2006; e.g., "Do you personally feel responsible for the flyer you have just completed?). These items were rated on a five-point Likert scale (1 = *not at all responsible* to 5 = *totally responsible*).

Setting of Vague Goals. A total of four items were adapted from two measures of goal setting by Erez and Judge (2001) and Latham and Locke (1979; e.g., "When completing this task, I aspired to produce a flyer of the highest standard."). All items required reverse coding, such that a higher score reflected a higher tendency to set vague goals, and a lower score indicative of setting more specific goals.

Choice Overload. Three items measuring choice overload were adapted from Diehl and Poynor (2010). An example item is "There were so many ways of creating the flyer that I felt confused.".

Outcome Variables

Positive and Negative Affect. The 24-item Multi-affect Indicator (Warr et al., 2014) was used to measure four distinct affective states – high activation positive affect (e.g., "Alert"), low activation positive affect (e.g., "Calm"), high activation negative affect (e.g., "Anxious"), and low activation negative affect (e.g., "Depressed"). Participants were asked to rate how they felt on each item "at the present moment" (i.e., with regards to the task) on a five-point Likert scale ranging from *not at all* (1), *moderately* (3) to *extremely* (5).

Performance. Performance was assessed via independent coding of the flyers. The operationalisation of performance in the coding scheme broadly aligned with the model of work role performance by Griffin et al. (2007), with a focus on task proficiency.

To reliably rate performance on the flyer task, I followed guidelines by Syed and Nelson (2015) and Mayring (2000). To ensure the coding of performance was reliable, two psychologists with backgrounds in industrial and organisational psychology (one "master coder" and one "reliability coder") participated in the interrater reliability exercise. Both coders were trained to use the coding scheme and rated each flyer independently. They were blind to the experimental condition which each flyer was from. Both coders co-coded approximately 20% of all flyers, and this data was used to establish interrater reliability (Syed & Nelson, 2015). Interrater reliability was assessed using Krippendorff's Alpha (Hayes & Krippendorff, 2007), which indicated that the coders were highly consistent in their ratings (α_{Kripp} = .83, 95%CI [.79, .87]; Krippendorff, 2013). Ratings from the master coder were used in the final analysis for all flyers. The following rating scales were included in the coding scheme.

Task proficiency was coded using three items adapted from the Griffin et al. (2007) individual task proficiency subscale. Items from the original self-report scale (e.g., "Completed your core tasks well using the standard procedures."), were adapted to suit an other-rated scale (e.g., "The participant carried out the core task well using the standard procedures."). Each participant's demonstrated task proficiency was rated by the coders independently on a five-point Likert scale (1 = s*trongly disagree* to 5 = *strongly agree*).

Control Variables

Industry. Performance on the flyer task was partially assessed on creativity and innovation. Participants who worked in creative industries (e.g., graphic design, social media) would be more familiar with such tasks, and thus would likely perform better compared to participants who did not work in creative industries. Therefore, as

part of the demographics section of the survey, participants were asked to report the industry that they worked in. Industry type was then coded as a nominal variable (0 = *not creative*, 1 = *creative*), and used as a control. Of the sample, eight participants (5.59%) reported being currently or previously employed in a creative industry.

Age. Research has linked age to various aspects relevant to the study, such as at the independent variable (autonomy), and outcome (affect) levels. For example, older workers may value job autonomy more compared to younger workers (Ng & Feldman, 2015). In addition to the link between age and autonomy, as well as age and well-being, discussed in the previous chapter (Chapter 4), longitudinal studies have also found a general upward trend of conscientiousness increasing with age (Roberts et al., 2006), possibly reflecting the common theme of improved impulse control and reliability as a function of increased life experiences (Jackson et al., 2009). In addition, specific to short-term measures of well-being, mature individuals are more likely to be able to regulate their affect (Hansen & Slagsvold, 2012). However, empirical evidence is mixed: some studies found that positive affect increased, and negative affect decreased with age (Charles et al., 2001), while others found a curvilinear relationship, such that positive affect was highest and negative affect lowest in middle age (Blanchflower, 2021). According to these effects of age being described in the literature, age was also included as a control variable.

Results

Data Screening

To identify how carefully participants read instructions and the items, I used a combination of one instructed-response item (e.g., “Select disagree for this item.”), three fact-variable items based on the task and survey (e.g., “I was tasked to create a one-page flyer for WALC.”), and one self-report measure of response quality (e.g.,

"In your honest opinion, should we use your data in our analyses in this study?") based on guidelines for dealing with careless responding by Meade and Craig (2012). Participants were assured that they would still receive their monetary reward even if they felt that their responses were not of adequate quality. In total, six participants (n_{low} = 2; n_{high} = 1; $n_{extremely\ high}$ = 3) failed at least one of the four attention checks, and were thus excluded from the analyses.

Second, to check how carefully participants read the instructions, I monitored how long they spent reading the instructions. On average, participants spent 17.16 minutes (*SD* = 8.43; range: 0.16–50.67) before moving on from the instructions to submit their flyer. The expected mean reading speed was 1.48 minutes (*SD* = 0.87), based on a meta-analytic estimate by Brysbaert (2019). Ten participants spent less than 0.89 minutes (approximately -3*SD* from the meta-analytic mean) on the task instructions. However, all ten passed the attention checks, therefore no participant was removed at this stage. The final sample included 137 participants.

Data cleaning

Prior to any data analysis, I checked the data to ensure that univariate and multivariate assumptions were met. This was conducted in IBM SPSS Statistics version 27. Data cleaning followed the same principles and strategy as before (in Chapter 4).

Univariate Assumptions

Three extreme outliers (greater than +3 *SD* from the mean) were identified[6], and these extreme datapoints were replaced with a value of 3 *SD* above the mean. In addition, all skewness and kurtosis values were within the acceptable ranges (-2 and

[6] One extreme outlier was identified on each of the following variables: Goal setting (mediator), HANA (outcome) and LANA (outcome).

+2, and -7 –and +7, respectively) as outlined by various authors such as Hair et al. (2010) and Byrne (2010), which indicate univariate normality.

Multivariate Assumptions

The assumptions of normality and homoscedasticity of residuals as well as multicollinearity were met across all analyses. Lastly, I screened for multivariate outliers. Cook's distance[7] and Mahalanobis' distance[8] for all analyses were below the acceptable thresholds. Standardised residuals also mostly fell between the -3*SD* and +3*SD* range, except where specified.

Data Analysis

To test the main effects of autonomy on the three outcome variables, I conducted three separate one-way between-groups ANOVAs (one each for proficiency, positive affect, and negative affect) were used to compare the means of the outcomes across the three levels of the autonomy. In addition, I also conducted the one-way between-groups ANOVAs to investigate if the effect of autonomy on the proposed mechanisms were curvilinear.

To test the indirect effects of autonomy on the three outcome variables via the three proposed mechanisms of perceived responsibility, setting of vague goals, and choice overload, I used the PROCESS macro (model 4; Hayes, 2017) to test these paths using the multiple mediators in parallel for each outcome in turn (utilizing 5,000 bootstrap samples and 95% bootstrap confidence intervals). As the independent variable is ordinal in nature, sequential coding in PROCESS was used as an initial stage analysis (Hayes, 2017). Sequential coding allows for the comparison of one condition to the group one ordinal position higher on the categorical variable.

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[7] Cook's distance did not exceed 1.

[8] Mahalanobis' distances did not exceed the critical χ^2 of 18.47 (for $df = 4$, $p = .001$) or 20.52 (for $df = 5$, $p = .001$).

In this analysis, sequential coding contrasts 1) the effect of moderately high autonomy relative to low autonomy, with 2) the effect of extremely high autonomy relative to moderately high autonomy. The contrasts are illustrated in Table 5.2.

Table 5.2

Sequential Coding Contrasts for the Low, Moderately High, and Extremely High Autonomy Conditions

	Contrast 1	Contrast 2
Low autonomy	0	0
Moderately high autonomy	1	0
Extremely high autonomy	0	1

Descriptive Statistics

Little's missing completely at random test indicated that there were no notable missing values, $\chi^2(5651, n = 137) = 5708.99, p = .29$. The descriptive statistics and bivariate correlations for all variables are presented in Table 5.3.

Table 5.3

Descriptive Statistics and Bivariate Correlations for all Variables

	M(*SD*)	1	2	3	4	5	6	7	8	9	10
1. Low vs. High Autonomy[a]	—	—	—								
2. High vs. Extremely High Autonomy[b]	—	—	—	—							
3. Perceived responsibility	3.57(0.97)	.07	-.15	(.80)							
4. Setting vague goals	1.93(0.64)	-.23**	-.18	-.55**	(.73)						
5. Choice overload	3.19(1.09)	.07	.05	-.13	.19*	(.86)					
6. HAPA	2.55(0.87)	.08	.04	.39**	-.47**	-.07	(.90)				
7. LAPA	2.50(0.73)	-.02	-.10	.12	-.16	-.14	.60**	(.83)			
8. HANA	1.67(0.66)	-.01	.01	-.13	.19*	.29**	-.22*	-.36**	(.86)		
9. LANA	1.52(0.66)	.03	.06	-.14	.20*	.13	-.21*	-.01	.61**	(.90)	
10. Proficiency	2.58(1.04)	.44**	.31**	0.1	-.17*	.08	.00	-0.1	-.10	-.13	(.94)

Note. $N = 137$. Items were reverse scored where necessary (see Appendix E for an indication of items which were reverse scored). Higher scores indicate higher self-reported scores on each construct. Cronbach's coefficient alphas are reported in parentheses along the diagonal.
HAPA = High Activation Positive Affect; LAPA = Low Activation Positive Affect; HANA = High Activation Negative Affect; LANA = Low Activation Negative Affect
[a]Contrast code: Low Autonomy = -1; High Autonomy = 1
[b]Contrast code: High Autonomy = 1; Extremely High Autonomy = -1
*$p < .05$, **$p < .01$

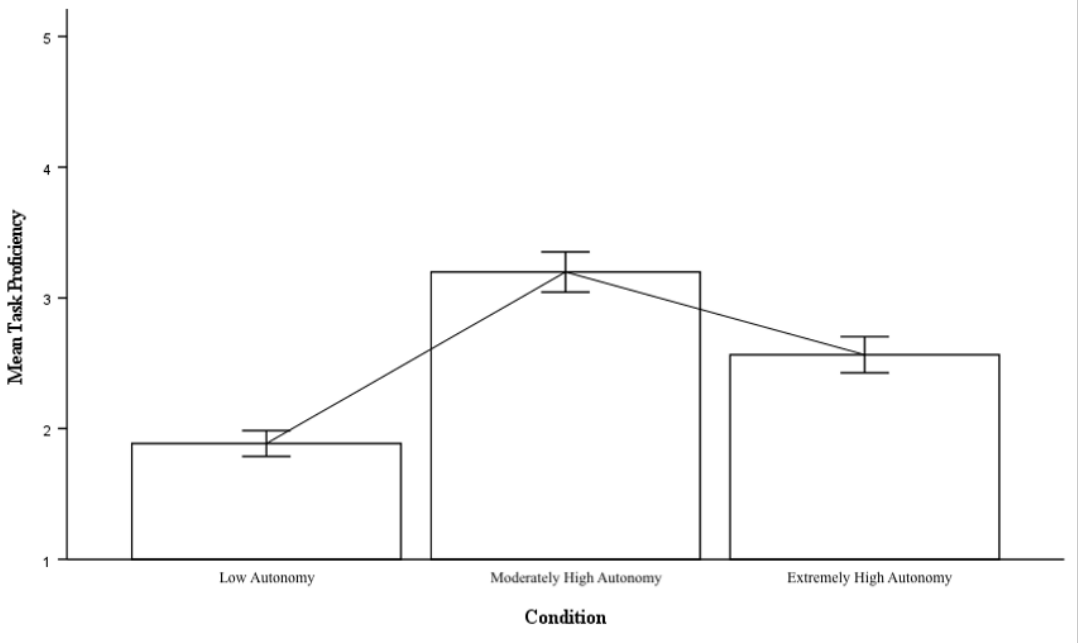
Main Effects

Proficiency (Hypothesis 1)

Hypothesis 1 predicted that autonomy would have a curvilinear (inverted-J shaped) effect on performance. To test this hypothesis, a one-way between-groups ANOVA was used to compare the means of proficiency across the three levels of the autonomy. The variance was heterogeneous ($F = 8.85$, $p < .001$), therefore, the Welch test was interpreted. Across autonomy conditions, there were significant differences in the mean other-rated proficiency, $F(2,85.53) = 27.27$, $p < .001$, $\eta^2 = .26$. Planned contrasts revealed that the moderately high autonomy ($M = 3.20$, $SD = 1.06$) condition was related to a higher mean proficiency compared to both the low autonomy ($M = 1.89$, $SD = .63$) condition, $t(76.60) = 7.18$, $p < .001$, $d = 1.45$, as well as the extremely high autonomy ($M = 2.57$, $SD = .94$) condition, $t(90.16) = -3.06$, $p = .003$, $d = -.70$ (see Figure 5.4).

Figure 5.4

Mean Proficiency Scores for Different Levels of Autonomy



Note. Mean differences between all three conditions were significant, $p < .05$. Error bars show standard errors.

These findings support the hypothesis that autonomy demonstrates a significant curvilinear effect on proficiency. The effects show that at low levels of autonomy, any increment in autonomy results in a positive relationship with proficiency, but at extremely high levels of autonomy, any additional autonomy has a negative effect on proficiency, resulting in an inverted-J shape relationship. Therefore, Hypothesis 1 was supported.

Positive Affect (Hypothesis 2)

Hypothesis 2 predicted a curvilinear effect of autonomy on positive affect where the moderately-high autonomy condition would be related to the highest levels of positive affect (resembling an inverted-J shape). Tests of homogeneity of variances indicated that HAPA ($F = .12$, $p = .89$), satisfied the assumption of homogeneity of variances, but not LAPA ($F = 3.70$, $p = .03$). Therefore, the Welch test was interpreted for LAPA. A one-way between-subjects ANOVA revealed that across autonomy conditions, there were no significant mean differences in either high activation positive affect, $F(2,134) = .86$, $p = .43$, $\eta^2 = .01$, or low activation positive affect, $F(2,87.45) = .80$, $p = .45$, $\eta^2 = .01$. Therefore, Hypothesis 2 was not supported, indicating that there was no curvilinear main effect of autonomy on positive affect.

Negative Affect (Hypothesis 3)

Hypothesis 3 predicted that autonomy demonstrates a significant curvilinear effect on negative affect, such that the moderately high autonomy condition would be related to the lowest levels of negative affect. Tests of homogeneity of variances indicated that both HANA ($F = .22$, $p = .81$) and LANA ($F = 1.26$, $p = .29$) met the assumption of homogeneity of variances. A one-way between subjects ANOVA indicated no significant mean differences in either high activation negative affect

$F(2,134) = .07$, $p = .93$, $\eta^2 = .001$, or low activation negative affect, $F(2,134) = .21$, $p = .81$, $\eta^2 = .003$. Therefore, Hypothesis 3 was not supported, with no curvilinear main effect of autonomy on negative affect found.

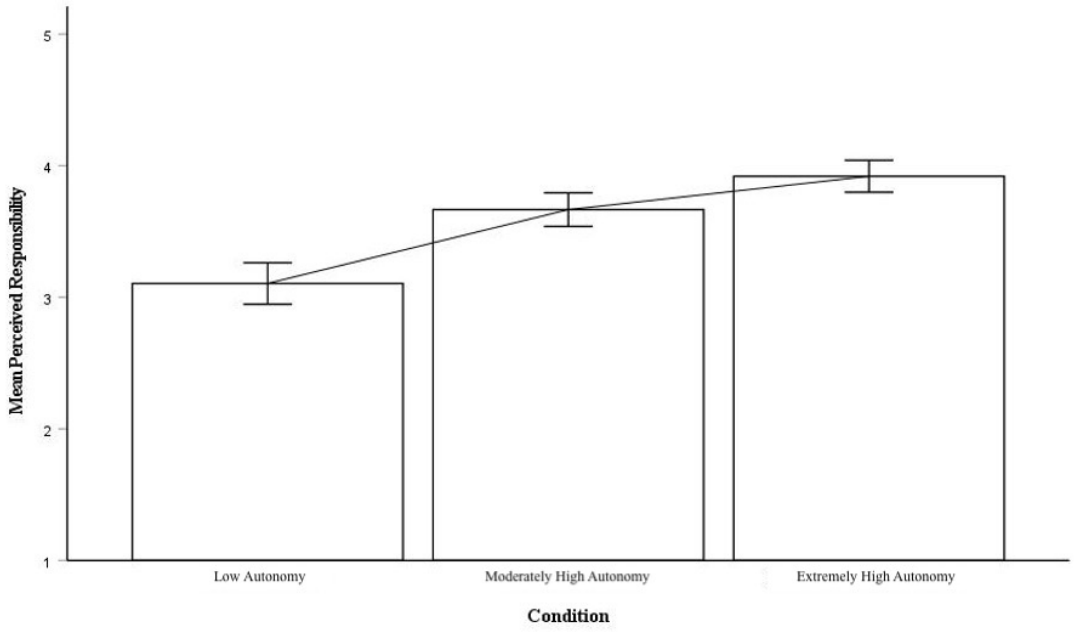
Taken together, the lack of support for Hypotheses 2 and 3 indicate that there are no direct curvilinear main effects of autonomy on affect (positive and negative). Nevertheless, indirect effects were examined to consider potential mechanisms through which autonomy impacts on performance and affect outcomes.

Perceived Responsibility (Hypothesis 4a)

Hypothesis 4a predicted that autonomy demonstrates a significant curvilinear effect on the mechanism perceived responsibility, following an additional decrement curvature. A one-way between groups ANOVA found a curvilinear effect of autonomy on perceived responsibility following the constant effect (plateau) pattern, $F(2,135) = 9.30$, $p < .001$, $\eta^2 = .12$. Planned contrasts revealed that the high autonomy ($M = 3.67$, $SD = .86$) condition was related to a significantly higher mean perceived responsibility compared to the low autonomy ($M = 3.11$, $SD = 1.05$) condition, $t(133) = 2.91$, $p = .004$, $d = .61$, and that this relationship stayed constant from the high to extremely high ($M = 3.92$, $SD = .82$) autonomy conditions, $t(133) = 1.33$, $p = .19$, $d = .28$ (see Figure 5.5). Therefore, Hypothesis 4a was partially supported, such that while a curvilinear effect of autonomy was found, this followed the constant effect, rather than the additional decrement, curvature.

Figure 5.5

Curvilinear Effect of Autonomy on Perceived Responsibility (Mechanism)



Note. The mean difference between low and high autonomy was significant, $p < .05$. The mean difference between high and extremely high autonomy was not significant, $p > .05$. Error bars show standard errors.

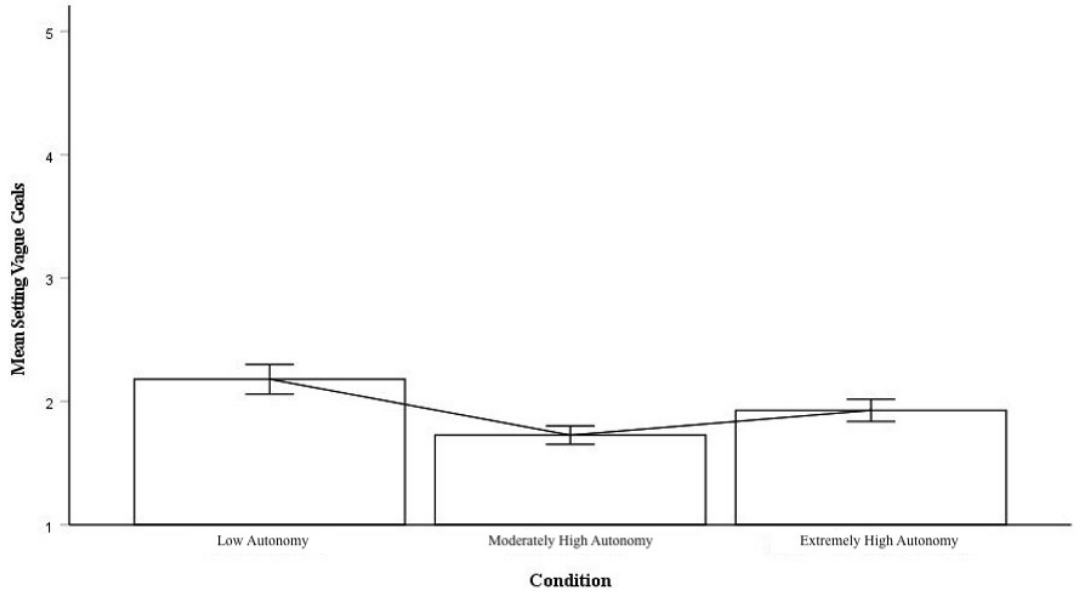
Setting Vague Goals (Hypothesis 5a)

Hypothesis 5a predicted a curvilinear effect of autonomy on the mechanism goal-setting, such that the moderately high autonomy condition would be result in participants setting the most specific goals. A one-way between-groups ANOVA found support for the curvilinear effect of autonomy on vague goals which followed the constant effect curvature, $F(2,84.63) = 5.20$, $p = .01$, $\eta^2 = .08$. Planned contrasts revealed that the moderately high autonomy condition ($M = 1.73$, $SD = .51$) was related to a significantly lower score on setting vague goals (i.e., participants in the moderately high autonomy condition reported setting the most specific goals) compared to the low autonomy condition ($M = 2.18$, $SD = .79$), $t(70.81) = -3.20$, $p = .002$, $d = .73$, however this was not significantly different from the extremely high autonomy condition ($M = 1.90$, $SD = .54$), $t(90.55) = -1.63.$, $p = .11$, $d = .29$ (see Figure 5.6). That is, participants in the moderately high and extremely high

autonomy conditions set similarly specific goals. Therefore, Hypothesis 5a was partially supported, such that a constant effect, rather than an additional decrement, curvature was found.

Figure 5.6

Curvilinear Effect of Autonomy on Vague Goals (Mechanism)



Note. The mean difference between low and high autonomy was significant, $p < .05$. The mean difference between high and extremely high autonomy was not significant, $p > .05$. Error bars show standard errors.

Choice Overload (Hypothesis 6a)

Hypothesis 6a predicted that autonomy demonstrates a curvilinear effect on choice overload, such that low to moderately high levels of autonomy will be associated with lower levels of choice overload, however the relationship of autonomy and choice overload between moderately high and extremely high levels of autonomy is positive and linear. A one-way between-groups ANOVA found that there was no curvilinear effect of autonomy on choice overload, $F(2,136) = 0.53$, $p = .59$, $\eta^2 = .01$. Therefore, Hypothesis 6a was not supported.

Indirect Effects (Hypotheses 4b, 5b, and 6b)

Hypotheses 4b, 5b and 6b predicted that the curvilinear effect of autonomy on outcomes occurs through the curvilinear effect of autonomy on the mechanisms perceived responsibility, goal-setting, and choice overload, respectively. Prior to the analyses, multivariate assumptions were checked using the procedure outlined above. Regarding the regression model including LANA as the outcome variable, two additional cases were found to be multivariate outliers with standardised residuals exceeding +3 *SD* from the mean, these two cases were thus removed from the analysis including LANA as the outcome variable.

While a direct curvilinear relationship between autonomy and proficiency was found, indirect curvilinear links between autonomy and proficiency via the mediators were not found for perceived responsibility (contrasts 1 and 2 95% CIs [-.19, .07] and [-.11, .04] respectively), vague goals (contrasts 1 and 2 95% CIs [-.07, .23] and [-.11, .03] respectively), and choice overload (contrasts 1 and 2 95% CIs [-.04, .08] and [-.04, .04] respectively; see Table 3). When the 95% CI intervals include 0, the contrasts are not significant (α = .05; Allen et al., 2014). Accordingly, Hypotheses 4b, 5b and 6b were not supported for proficiency as an outcome.

In support of the indirect curvilinear links between autonomy and positive affect, there was an indirect curvilinear effect of autonomy on HAPA through two mediators: perceived responsibility and setting vague goals, but not choice overload (contrasts 1 and 2 for choice overload 95% CIs [-.05, .05] and [-.03, .03] respectively; see Table 5.4). For the mediators perceived responsibility and setting vague goals, contrast 1 (the contrast between moderately high and low autonomy) showed a positive indirect relationship between autonomy and HAPA through perceived responsibility (*B* = .10, *SE* = .06, 95% CI [.002, .25]) and setting vague goals (*B* = .22, *SE* = .09, 95% CI [.07, .41]). Contrast 2 (the contrast between

extremely high and moderately high autonomy) revealed that beyond a high level of autonomy, any additional autonomy had no beneficial effects on HAPA through either perceived responsibility (*B* = .05, *SE* = .04 95% CI [-.02, .15]), or setting vague goals (*B* = -.09, *SE* = .06, 95% CI [-.22, .01]), resulting in a plateau (constant effect). Therefore, while there was a curvilinear effect of autonomy on positive affect through the mechanisms perceived responsibility and setting vague goals, this curvature followed a constant effect, rather than the hypothesised additional decrement curvature. There was no indirect curvilinear effect of autonomy on LAPA (via perceived responsibility: contrasts 1 and 2 95% CIs [-.09, .09] and [-.05, .05] respectively; vague goals: contrasts 1 and 2 95% CIs [-.04, .21] and [-.10, .02] respectively; choice overload: contrasts 1 and 2 95% CIs [-.10, .02] and [-.05, .06] respectively). Accordingly, Hypotheses 4b and 5b (but not 6b) were partially supported for positive affect as an outcome.

There was also an indirect curvilinear effect of autonomy on negative affect, specifically LANA, through the mechanisms setting vague goals, but not perceived responsibility (contrasts 1 and 2 95% CIs [-.10, .06] and [-.05, .03] respectively) or choice overload (contrasts 1 and 2 95% CIs [-.02, .05] and [-.03, .02] respectively). For setting vague goals, contrast 1 (moderately high vs. low autonomy) indicated a negative indirect relationship between autonomy and LANA through setting vague goals (*B* = -.10, *SE* = .05, 95% CI [-.21, -.02]). Beyond a moderately high level of autonomy (contrast 2; extremely high vs. moderately high autonomy), any additional autonomy had no beneficial effect on LANA through setting vague goals (*B* = .04, *SE* = .03, 95% CI [-.01, .11]), resulting in a plateau (constant effect). There was no indirect curvilinear effect of autonomy on HANA via perceived responsibility (contrasts 1 and 2 95% CIs [-.08 .08] and [-.04, .04] respectively), vague goals

(contrasts 1 and 2 95% CIs [-.20, .00] and [-.01, .10] respectively), or choice overload (contrasts 1 and 2 95% CIs [-.02, .10] and [-.05, .05] respectively; see Table 5.3). Therefore, Hypothesis 5b (but not Hypothesis 4b or 6b) was partially supported.

In summary, the data supported the curvilinear relationship between autonomy and affect (in the specific cases of HAPA and LANA) to be indirect and occurring through the mechanisms of perceived responsibility and setting vague goals, but not choice overload. No indirect links between autonomy and performance, LAPA or HANA were found for any of the mechanisms. Therefore, results provided partial support for Hypotheses 4b and 5b, but there was no support found for Hypothesis 6b.

Table 5.4

Summary of Mediation Analyses, Controlling for Age and Creative Industry

	Contrast 1		Contrast 2	
	B	*SE B*	*B*	*SE B*
Proficiency				
Direct effect	1.40*	.20	-.58*	.19
Indirect effects				
Mediator: Perceived Responsibility	-.05	.06	-.02	.03
Mediator: Vague goals	.06	.07	-.02	.03
Mediator: Overload	.01	.03	.00	.02
High Activation Positive Affect				
Direct effect	-.13	.17	.03	.16
Indirect effects				
Mediator: Perceived Responsibility	.10*	.06	.05	.04
Mediator: Vague goals	.22*	.09	-.09	.06
Mediator: Overload	.00	.02	.00	.01
Low Activation Positive Affect				
Direct effect	-.03	.16	.22	.15
Indirect effects				
Mediator: Perceived Responsibility	.00	.05	.00	.02
Mediator: Vague goals	.07	.06	-.03	.03
Mediator: Overload	-.03	.03	.00	.03
High Activation Negative Affect				
Direct effect	0.02	.13	0.03	.13
Indirect effects				
Mediator: Perceived Responsibility	.00	.04	.00	.02
Mediator: Vague goals	-.07	.05	.03	.03
Mediator: Overload	.03	.03	.00	.03
Low Activation Negative Affect				
Direct effect	.12	.12	-.01	.12
Indirect effects				
Mediator: Perceived Responsibility	-.01	.04	-.01	.02
Mediator: Vague goals	-.10*	.05	.04	.03
Mediator: Overload	.01	.02	.00	.01

Note. The unstandardised coefficients (*B*) and the corresponding standard error of the estimate (*SE B*) are reported in accordance with guidelines by Hayes (2017). Contrast 1 = high autonomy vs. low autonomy; Contrast 2 = extremely high autonomy vs. high autonomy. See Appendix G for all mediation analysis pathways.
*$p < .05$

Discussion

The aims of this study were threefold. First, I set out to investigate the short-term curvilinear effects of autonomy on outcomes. Second, I investigated the mechanisms through which the curvilinear effect of autonomy operates. Last, I probed these relationships to understand if the curvilinear effects of autonomy manifest differently across different people.

On the basis of the vitamin model (Warr, 2002), I found support for a curvilinear effect of autonomy in this study using an experimental design. Overall, two distinct patterns in the curvilinear effects emerged, depending on the outcome. First, the three manipulated levels of autonomy – low, moderately high, and extremely high – demonstrated a curvilinear effect on performance, following the additional decrement curvature. Between low to moderately high levels of autonomy, any increase in autonomy was found to be beneficial for performance, however this positive effect of autonomy reversed after moderately high levels, such that any additional autonomy beyond moderately high levels led to worse performance. These findings provide full support for Hypothesis 1. In contrast, there was no direct curvilinear effect of autonomy on affect positive and negative affect (operationalised as a short-term measure for psychological well-being and ill-health respectively), providing no support for Hypotheses 2 and 3. This suggests that extremely high autonomy may operate differently across different outcomes. Previous research has found evidence for the direct additional decrement curvilinear effect of autonomy on objective performance (e.g., hourly cognitive failure; Daniels et al., 2013). Interestingly, both the findings from the present study and Daniels et al. (2013) operationalised performance as objective *and* in the short term, which might explain the consistent positive finding of curvilinearity between Daniels et al. (2013) and the

present study. In addition, when using other operationalisations of performance (e.g., self-rated performance), other researchers have searched for, but concluded that there is no significant additional decrement curvilinear effect of autonomy (e.g., Muldoon et al., 2017; see also Chapter 4 results). This suggests firstly a possible artefact of the operationalisation of performance that may explain these differences in findings. To elaborate, Pransky et al. (2006) compared objective and self-rated performance and suggested that not only may self-rated performance be impacted by recall bias, but objective and subjective measures of performance may in fact be measuring two different aspects of work performance. Secondly, findings suggest that the curvilinear effect of autonomy on performance operates in the short, rather than longer, term.

With regards to the second aim, the curvilinear effects of autonomy on performance did not occur through any of the mechanisms hypothesised. The curvilinear effect of autonomy on affect was not direct, but instead occurred indirectly through mechanisms such as perceived responsibility (partially supporting Hypotheses 4a and 4b) and setting of vague goals (partially supporting Hypotheses 5a and 5b), but not choice overload (providing no support for Hypotheses 6a and 6b). Specifically, I found support for an indirect curvilinear effect of autonomy on both positive (HAPA) and negative (LANA) affect. All indirect curvilinear effects of autonomy on affect followed the constant effect curvature, such that there was neither a benefit nor detriment to increasing autonomy beyond moderately high levels. The indirect effect of autonomy on HAPA and LANA occurred through the curvilinear relationship between autonomy and setting of vague goals. To illustrate, as autonomy increased from low to moderately high levels, participants reported setting more specific goals. However, between moderately to extremely high

autonomy levels, participants began to set more vague goals, resulting in an indirect curvilinear effect of autonomy on HAPA and LANA. In addition, the indirect effect of autonomy on HAPA also occurred through the curvilinear relationship between autonomy and perceived responsibility. To elaborate, there was a positive effect of autonomy on perceived responsibility from low to moderately high autonomy. In other words, as autonomy increased, participants tended to feel more responsible for the task. However, beyond the moderately high autonomy level, there was no additional benefit of autonomy on perceived responsibility, and in turn HAPA. These findings support theoretical arguments that the curvilinear effect of autonomy occurs through mechanisms such as perceived responsibility and setting vague goals. Of note, these findings do not completely align with previous studies of psychological well-being and ill-health (operationalised in this study as positive and negative affect respectively) – that is, while previous studies found an additional decrement curvature, I found a constant effect curvature, such that the effect of extremely high autonomy was neither beneficial nor detrimental to affect. For example, Baltes et al. (2002) and Rydstedt et al. (2006) found an additional decrement curvature of autonomy on well-being (job satisfaction), while Kubicek et al. (2014) found an additional decrement curvature of autonomy on psychological well-being (engagement) and ill-health (irritation and depersonalisation). In addition, results from the field study in Chapter 4 demonstrated lagged curvilinear main effects of autonomy on psychological well-being (meaningfulness), and short-term curvilinear main effects of autonomy on psychological ill-health (psychological distress), that followed the additional decrement curvature. However, no indirect effects were tested in the field study. Interestingly, some empirical studies found no significant curvilinear main effect of autonomy when outcome variables included psychological

well-being (e.g., Chung-Yan, 2010) and positive affect (e.g., Daniels, et al., 2013). Taken together, this suggests that autonomy affects subjective (or hedonic; Di Fabio & Palazzeschi, 2015) well-being, as measured in this study, and longer-term characterisations of well-being (or eudaimonic well-being; Di Fabio & Palazzeschi, 2015), differently. One possibility could be that while the impact of autonomy on affect (as a short-term measurement of psychological well-being and ill-health) is indirect, over the longer term, these curvilinear effects become stronger such that direct curvilinear effects of autonomy on psychological well-being and ill-health emerge.

Theoretical and Practical Implications

In sum, these findings suggest that the paths in which the curvilinear effects of autonomy affect outcomes vary across different outcomes. The curvilinear effect of autonomy on performance appeared to occur directly, while its curvilinear impact on positive and negative affect occurred indirectly through mechanisms such as setting vague goals and perceived responsibility, suggesting that the curvilinear effect of autonomy operates differently across different outcomes. Following traditional theories of work design such as the job-demands resources theory (Demerouti et al., 2001) and the job characteristics model (Hackman & Oldham, 1976), at low levels of autonomy, any additional autonomy positively affects both performance and affect. However, in line with the predictions of curvilinearity by theories such as the vitamin model (Warr, 1987), too much autonomy was found to be detrimental to performance, resulting in an inverted-J shaped curve (additional decrement). This finding suggests that the 'too-much-of-a-good-thing' effect as proposed by Pierce and Aguinis (2013) may be more applicable to performance, especially in the short-term context. On the other hand, in instances where autonomy

exceeded the moderately high level, there was no detriment to affect, however no additional benefit to affect was observed either, resulting in a plateau (constant effect; Warr, 1987). This may be in part explained by the findings that the effect of autonomy on affect is indirect, occurring instead through mechanisms such as perceived responsibility and vague goals. In more distal outcomes such as these, the possible effects of extremely high autonomy on these outcomes may be more likely to be buffered by contextual factors, leading to a less pronounced curvilinear effect.

Of note, only HAPA (but not LAPA) and LANA (but not HANA) had significant indirect relationships with autonomy. However, these findings are not surprising. Warr et al. (2014) suggested that links between high activation (rather than low activation) positive affect and positive behaviours are expected to be strongest for behaviours that are more self-discretionary (that is, behaviours that are required in moderately high and extremely high autonomy settings). These findings align with Lazarus (1991), who emphasised that LAPA is primarily linked to the loss or absence of something desired, such as control over when and how a task is completed (i.e., autonomy). In contrast, HAPA has energizing potential that is likely to stimulate approach-oriented positive behaviour (Warr et al., 2014). These findings also follow general models of behaviour (e.g., Carver & Scheier, 1998) and emotions (e.g., Higgins, 1997), which theorised that a deficiency of desirable features (e.g., autonomy) and poor performance results in more LANA compared to HANA. Within the four-quadrant theory by Warr et al. (2014), HAPA and LANA are theorised to be conceptual opposites. In addition, empirical findings have found the HAPA-LANA axis to be more closely associated with work behaviours and work design, such as the amounts of autonomy, compared to the HANA-LAPA axis (Warr et al., 2014). As such, the higher relevance of HAPA and LANA to work and

autonomy as a work design attribute may explain why this study only found curvilinear effects for these two quadrants.

Findings from this study suggest that understanding the mechanisms by which the curvilinear effects of autonomy impact positive and negative affect has valuable theoretical and practical implications. Traditional theories such as the job characteristics model posit that the beneficial effect of autonomy on outcomes occurs through engendering feelings of responsibility. Findings from this study support this theorised mechanism and extends this theory by identifying that there is a limit on the extent to which autonomy, and hence perceived responsibility, is beneficial. Understanding the paths through which too much autonomy impacts affect can contribute to the theoretical understanding of how autonomy operates and impacts people. Practically, when redesigning work, practitioners should consider the possibility of a curvilinear effect. In jobs that are inherently high in autonomy, and as jobs tend to move towards a hybrid of working from home (thereby increasing autonomy) employees can still be supported by having specific goals set and communicated to them.

Strengths of Study

A major strength of this study lies in its design. Firstly, the experimental manipulation allows the causal inference of the too-much-of-a-good-thing effect of autonomy. Specifically, because the differences across conditions lie in the amount of autonomy afforded to individuals, any differences in the outcomes can be attributed to the experimental manipulations. In addition, participants were also randomly assigned to one of the three experimental conditions, and were not aware of the other alternative conditions until they were debriefed after the experiment.

Secondly, this experiment used multi-source data. This is especially relevant with performance as an outcome, as performance in this study was rated objectively by two raters who were blind to the experimental conditions. This reduced the amount of common method variance. Common method variance is the "systematic error variance shared among variables measured with and introduced as a function of the same method and/or source" (Richardson et al., 2009, p. 763). Scholars have strongly criticised studies with common method variance, specifically when “the data for both the predictor and criterion variable are obtained from the same person in the same measurement context” (Podsakoff et al., 2003, p. 885). However, the general agreement is that a study can be improved by introducing measures from other sources (Podsakoff et al., 2003). In this study, the independent variable (autonomy) was experimentally manipulated, while the outcomes were both other-rated (performance) and self-rated (affect), and lastly the mechanisms were self-rated, providing a variety of data sources. Therefore, by having different data sources at each level of the analysis, the findings with regard to performance may present as a more robust model of the curvilinear effect of autonomy.

Limitations and Future Research

A key limitation of this study is that although the model suggests a causal curvilinear effect of autonomy, it cannot yet be ruled out that the observed effects were brought about by other unmeasured mechanisms. For example, although this present research found no mediated effects between autonomy and performance through the mechanisms of perceived responsibility, setting vague goals, and choice overload, it does not rule out the possibility that autonomy may affect performance through other mechanisms. Future experimental studies that manipulate autonomy should focus on investigating additional mechanisms through which autonomy may

affect performance, such as perceived trust and appreciation by the organisation, and motivation (Cropanzano & Mitchell, 2005). It is also important to note that this study measured only the short-term impact of autonomy on individuals. While the results demonstrate that too much autonomy immediately affects performance negatively in the short term, more clarity is needed in future studies to investigate the mechanisms and moderators over the longer term.

Secondly, affect was measured with the Multi-affect Indicator (Warr et al., 2014), used as a short-term proxy for psychological well-being and ill-health in this study. The focus on affect was chosen to capture the short-term impact of autonomy on how people are feeling in that moment. Future experiments and longitudinal studies should investigate the curvilinear effects of autonomy and the mechanisms through which the curvilinear effects of autonomy are linked with well-being more directly with a focus on psychological well-being and ill-health.

A third limitation concerns the use of self-rated scales. While I previously discussed the use of a variety of data sources, the use of self-rated scales for the mediators and outcome of affect may have introduced a small amount of common method variance in the analysis. Future research may consider including measures of affect from other sources, such as salivary cortisol or heart rate as a physical indicator of stress and arousal (e.g., Järvelin-Pasanen et al., 2018; Qi et al., 2016).

Lastly, work design characteristics do not work in isolation. Within work environments, many work characteristics are highly dependent on, and reciprocally affect, one another (Vander Elst et al., 2014). The present study investigated autonomy only, which provided detailed and clear insights into the ways in which this particular work design characteristic affects people. While this allowed causal inferences to be drawn, the experimental design limits the external and ecological

validity of the findings. A field study “in the wild” will help to draw clearer conclusions about the mechanisms by which the curvilinear effect of autonomy work in the context of other work characteristics. This will provide more insights into how the curvilinear effect may occur in the workplace.

Chapter 6: General Discussion

Can there be too much of a good thing when it comes to some apparently-positive aspects of work design? While traditional work design theories have established the general beneficial effects of supporting employees with resources to meet the demands of their jobs, more recently scholars have suggested that this relationship may be more nuanced than originally theorised. In this thesis, I was guided by overarching arguments for non-linearity in considering work design, such as the too-much-of-a-good-thing perspective (Pierce & Aguinis, 2013) and the vitamin model (Warr, 1987), specifically applying these theories to the work design characteristic of job autonomy. I set out to investigate if there is an inflection point beyond which increasing autonomy is no longer beneficial, and whether this results in a plateau such that any additional autonomy results in no change to the outcomes (i.e., constant effect), or if the effect of additional autonomy on outcomes is in fact detrimental (i.e., additional decrement). To test these propositions, I purposefully designed and carried out three studies that complement each other in their design and research methods. In doing, so this thesis generates unique insights into the ways in which too much autonomy may be affecting workers. In this final chapter, I summarise the findings of the three empirical studies. I then discuss the theoretical and practical implications of the varying curvilinear effects of autonomy. Finally, I discuss the limitations of the three studies, as well as avenues for future research.

Summary of Studies and Findings

The first and overarching aim of this thesis is to determine if the effect of autonomy on a variety of outcomes is curvilinear. To address this aim, in Chapters 3, 4 and 5, I investigated this from three different angles using meta-analytic, cross-sectional and longitudinal, and lastly an experimental design.

Results from the meta-analysis in Chapter 3 demonstrated a small yet significant overall curvilinear relationship between autonomy and various outcomes. This curvilinearity was also found across behavioural, psychological well-being, and ill-health outcomes. The meta-analysis shows that while only a relatively small number of primary studies ($k = 27$) considered curvilinear effects of autonomy on outcomes, more importantly, when researchers look for curvilinearity of autonomy, they tend to find the hypothesised curvilinear effect. Findings from both Chapters 4 and 5 provide support for the findings in the meta-analysis within different contexts, as I will elaborate.

In Chapter 4, I utilised a field study to investigate the cross-sectional and longitudinal curvilinear effects of autonomy on performance, psychological well-being and ill-health. While a longitudinal design should not be treated as a panacea to the problem of drawing causal inferences (Spector, 2019), findings from the longitudinal study allowed me to investigate the curvilinear relationship more reliably compared to a solely cross-sectional, self-report design. Between low to moderately high levels, autonomy was found to have a beneficial effect on psychological well-being after a six-month lag, but not cross-sectionally at either T1 or T2. Additionally, the point of inflection occurred at moderately high levels, such that beyond moderately high levels of autonomy, any further increase in autonomy resulted in poorer psychological well-being (i.e., additional decrement). This provides support for the 'too-much-of-a-good-thing' effect of autonomy on psychological well-being. Between low to moderately high levels, autonomy was found to have a beneficial effect on psychological ill-health. Past the point of inflection at moderately high levels, any increase in autonomy resulted in no additional benefit to reducing psychological ill-health. This effect held for both

cross-sectional, but not the longitudinal, analyses. However, the curvilinear effect of autonomy on performance was found to directly contradict my hypotheses, such that there was no effect of autonomy on performance between low to moderately low levels of autonomy, but this relationship became positive as autonomy increased beyond the inflection point. This effect was found both longitudinally and cross-sectionally. This finding suggests that extremely high levels of autonomy may be beneficial for performance, but it needs to be considered that this performance benefit may come at the potential cost of impaired psychological well-being. While a longitudinal study is more robust than a cross-sectional study design, nonetheless, the field study in Chapter 4 was associated with several limitations. First, the field study utilised single-source data, which is more likely to be influenced by potential response biases such as social desirability, particularly for subjective psychological outcomes, rather than performance, which may be a more objective variable. An aspect related to the response scale was the issue of range restriction of the measured job autonomy and performance, where the sample appeared to disproportionately perceive high levels of autonomy and performance. In addition, the inclusion of only two measurement waves further limited my ability to determine causality. Therefore, I designed an experimental study to establish if a causal curvilinear effect of autonomy indeed exists, as well as to understand how it occurs.

In Chapter 5, I report on the findings of the experimental study I had designed to provide stronger causal evidence for the curvilinear effect of autonomy. Specifically, I designed a task with low, moderately high or extremely high levels of autonomy, externally manipulating the levels of autonomy provided to participants in order to establish a causal effect of autonomy on outcomes. Results showed curvilinear effects of autonomy with regards to performance, psychological well-

being and ill-health through different pathways. Participants in the moderately high autonomy condition performed significantly better than the extremely low and extremely high autonomy conditions. In contrast to performance, the curvilinear effect of autonomy on psychological well-being and ill-health followed a different pathway. While there were no direct curvilinear effects of autonomy on psychological outcomes, these curvilinear effects appeared to occur through various mechanisms, namely perceived responsibility and setting of vague goals. The curvilinear effect of autonomy on psychological well-being and ill-health through these mechanisms followed a constant effect curvature, such that autonomy had a positive effect between low and moderately high levels of, however beyond moderately high levels of autonomy, the effect of autonomy on outcomes tapered off to a plateau.

Synthesising the results across different studies and contexts, findings across this thesis support the general premise that contrary to conventional theory, autonomy operates in a curvilinear, rather than linear, fashion. Table 6.1 summarises the results across the three studies. Specifically, autonomy demonstrated a curvilinear effect on performance across all three studies. This was first demonstrated in the meta-analysis, where I found that a curvilinear relationship between autonomy and behavioural outcomes (which includes performance). In addition, 66.67% of studies which discussed the shape of the curve reported an additional decrement such that beyond the point of inflection, any additional autonomy resulted in worse outcomes. This is consistent with the curvilinear main effect of autonomy on performance found in the experiment which followed the additional decrement curvature. Interestingly, the autonomy-performance relationship in the field study was found to be curvilinear, but in the opposite

direction to what was hypothesised. Where the meta-analysis and the experiment indicated that extremely high levels of autonomy were detrimental to performance, extremely high autonomy was related to the highest levels of performance in the field study. While this is not unheard of in field studies (see for example De Jonge & Schaufeli, 1998) the authors also noted that important moderators such as individual differences were not considered, as the inclusion of moderators can change the shape of a curve. For example, this could have been affected by survivor bias, where in a sample of mature-aged workers, employees who have the personality, or developed the skills and ability to cope with and flourish in, situations of extremely high autonomy, choose to remain within the workforce, even after the general age of retirement (Roberts et al., 2006). In addition, the reliance on self-report measures introduces reporting biases which may have contributed to the unexpected result. These limitations underlie both Chapter 4 as well as the study by De Jonge and Schaufeli (1998). In lieu of these limitations, the experimental design which controls extraneous variables and uses multi-source data may be a more robust indication of the curvilinear effect of autonomy on performance.

Table 6.1

Summary of General Findings from Chapters 3, 4 and 5

	Chapter 3		Chapter 4		Chapter 5	
	Main effect by outcome type	Overall main effect	Cross-sectional	Longitudinal	Direct effect	Indirect effect
Performance[a]	$r = .07, p = .01$					n.s.
Well-being	$r = .09, p < .001$	$r = .07, p < .001$ 66.67% AD 16.67% CE 16.67% AD (inverted)	n.s.		n.s.	
Strain	$r = .13, p < .001$			n.s.	n.s.	

Note. While the values reported in Chapter 3 indicate a meta-analytic non-linear relationship, these values do not indicate the shape or direction of the curve. A non-statistical content analysis summarises the percentages of curvatures, when reported in the primary studies.
n.s. = no significant curvilinear effect
AD = Additional decrement; CE = Constant effect
[a] Chapter 3 included performance as a subset of a broader "behavioural" group of outcomes. Five studies were included in the meta-analysis on the basis of investigating "behavioural" outcomes. Of these five studies, four included outcomes coded as performance (e.g., creativity, proficiency, organisational citizenship behaviour, etc.).

With regard to psychological well-being, findings across all three chapters indicated similar results – autonomy demonstrates a curvilinear effect on psychological well-being. This was demonstrated in the meta-analysis, and further supported by findings in the field study and experiment. While both the field and experimental studies indicated that autonomy is beneficial between low to moderately high levels, results from the field study indicated that excessive autonomy directly led to lowered levels of psychological well-being over the longer term. In contrast, in the experiment, the relationship beyond the point of inflection resulted in a plateau, such that while there was neither an additional benefit nor detriment to increasing autonomy beyond moderately high levels. Further, this effect of autonomy on well-being was not direct, but instead occurred through the mechanisms of perceived responsibility and vague goals. The different study designs (i.e., field study vs. experiment) necessitate different measures of psychological well-being. To elaborate, the field study operationalised psychological well-being as meaningfulness, while the short-term nature of the experiment necessitated the use of positive affect as a short-term proxy of psychological well-being. While both constructs measure psychological well-being, it can be argued that they may be measuring slightly different facets of well-being. For example, Sirgy (2012) distinguished eudaimonic well-being from hedonic well-being. Eudaimonia focuses on a person's feelings of authenticity and life purpose and relates to concepts such as self-realisation and meaningfulness – the latter of which was used as a measure of psychological well-being in the field study. On the other hand, the hedonic approach defines well-being in terms of pleasure attainment, and the prevalence of positive, rather than negative, emotions (Di Fabio & Palazzeschi, 2015) – similar to the short-term proxy used in the experimental study. Additionally, it is possible that there may

be other external or third variables that may have contributed to a lowered perceived level of psychological well-being in the field study (e.g., work-home conflict, adapting to working from home arrangements due to COVID-19, etc.), such that the detrimental impact of extreme autonomy on psychological well-being occurs as a function of this third variable. Despite these differences across the three studies, autonomy was found to demonstrate a curvilinear effect on psychological well-being.

Lastly, investigating psychological ill-health, results from the meta-analysis revealed a curvilinear relationship between autonomy and psychological ill-health (coded in the meta-analysis as strain). Based on the conservation of resources theory (Hobfoll, 1989), extremely high autonomy is thought of to introduce additional demands through increased decision-making requirements, such that individuals need to dedicate limited resources to addressing this paradox. Therefore, I hypothesised that the curvilinear relationship of autonomy and psychological ill-health would follow the additional decrement curvature, such that between low to moderately high levels of autonomy, any increase in autonomy reduces psychological ill-health, however after the point of inflection, any additional autonomy leads to an increase in psychological ill-health. Findings from both the field study and experiment indicated that this curvilinear effect followed the constant effect curvature instead, such that after the point of inflection, any additional autonomy did not have any beneficial or detrimental impact on psychological ill-health. One possibility for this difference in curvature may lie in the options available within each study. Studies have suggested that the negative impact of extremely high levels of autonomy may be more pronounced when decision options and outcomes are negative (Warr, 2002).

In sum, findings across this thesis illustrate that while the curvilinear effect occurs across various outcomes, its specific nature (i.e., the shape of the curve and

whether it is direct or indirect) can vary. Given that to date, there is scant research into the curvilinear effects of autonomy, and still less research establishing causality, findings generated across the three studies in this thesis represent an important step towards better understanding the existence and process of the curvilinear effects of autonomy.

Theoretical Implications

Job autonomy is considered a core characteristic of work in most classical models of work design, such as the job characteristics model (Hackman & Oldham, 1976) and the job demands-resources model (Demerouti et al., 2001). Scholars are generally in agreement with regards to the various aspects of the definition of autonomy (Breaugh, 1985; Hackman & Oldham, 1976; Morgeson & Humphrey, 2006). Specifically, autonomy allows one to exercise one's personal discretion at work, and this encompasses multiple aspects of one's job, such as determining the method and timing, as well as boundary definitions of work (Evans & Fischer, 1992). Within these classical models of work design, autonomy is implied as a positive job characteristic. In other words, providing individuals with more autonomy will reap additional benefits, such as increased performance, better psychological well-being, and reduced psychological ill-health. An increasing number of scholars are starting to refine these classical models of work design. For example, Van den Broeck et al. (2010) argued that job characteristics are classified as demands or resources insofar as they are detrimental or beneficial to well-being respectively. In a similar vein, Pierce and Aguinis (2013) suggested that perhaps extremely high levels of any variable may actually constitute a different construct. To elaborate, autonomy is traditionally defined as a job resource because it is theorised (and indeed, empirically established) to have beneficial effects through engendering feelings of responsibility

(e.g., job characteristics model), or helping individuals to cope with the demands of work (i.e., job demands-resources model). However, extreme levels of autonomy correspond to extreme requirements for personal discretion and an extremely large number of decisions to be made, which may paradoxically become detrimental. In this thesis, I set out to understand this phenomenon and the theoretical implications of the curvilinear association of autonomy with work outcomes.

Understanding autonomy and other work design variables from this perspective is important, as findings may have implications for the way that work design characteristics are studied and implemented within organisations. Findings from this thesis complement the criticisms of the job demands-resources model by Van den Broeck et al. (2010), who further proposed that job demands are not as homogenous as implied by the job demands-resources model. While it is important to note that Van den Broeck et al. (2010) made a qualitative distinction within job demands (thereby separating job demands into classifications of challenges or hindrances based on their relationships with outcomes), a similar argument can be made that job resources may not be as quantitatively homogenous as is implied by the job demands-resources model. The findings in this thesis on the impact of autonomy on performance and wellbeing provide support for the notion that, counter to traditional knowledge, autonomy which is traditionally viewed as a "resource", may in fact pose additional requirements to workers at too high levels. Indeed, Kubicek et al. (2014) found that the increased levels of autonomy actually imposed additional requirements on employees, such as an increase in intensified planning, learning and decision-making demands, in turn leading to negative outcomes such as emotional exhaustion. In support of these findings, I examined potential mechanisms of the curvilinear effect of autonomy and found that excessive levels of autonomy led

individuals to set more vague goals, resulting in lowered positive affect and heightened negative affect. While autonomy remains an important job resource, results suggest that a more nuanced view of this work design characteristic is necessary in order to better understand the theoretical relationship between autonomy and important work outcomes.

Across all three studies, findings align with Warr's (1987) vitamin model of job characteristics. Specifically, the vitamin model posits that the association between various job characteristics and outcomes are analogous to the effects of vitamins on the human body. In general, vitamin intake improves physical health. However, beyond a particular level, any additional intake of vitamins can lead to no additional benefits, or worse, may lead to a toxic overconcentration of vitamins in the body. Warr (1987) posits that job characteristics display the same effects as vitamins – excessive levels of some job characteristics may neither further improve nor negatively impact on outcomes, however other job characteristics may lead to detrimental effects in excessive amounts. The three studies included in this thesis investigated three outcome themes – performance, psychological well-being and ill-health. Results indicate that in addition to Warr's (1987) theory that different job characteristics display different curvatures, the curvature may also differ based on the specific outcome type investigated.

Although the too-much-of-a-good-thing perspective (Pierce & Aguinis, 2013) and the vitamin model (Warr, 1987, 1990) offer a general theoretical framework for the curvilinear effects of work characteristics such as autonomy, they do not provide specific explanations about the mechanisms through which autonomy may exert a detrimental effect on performance, psychological well-being or ill-health. In Chapter 5 of this thesis, I demonstrated that this curvilinear effect was likely to occur via the

mechanisms of perceived responsibility and setting vague goals. Providing general support for the job characteristics model (Hackman & Oldham, 1976), there was a general positive effect of autonomy on perceived responsibility and setting specific goals for work done, which led to positive outcomes such as improved psychological well-being and reduced ill-health. In other words, autonomy caused individuals to experience a greater sense of responsibility and set more specific yet challenging goals in their work, which in turn engendered feelings of enthusiasm and excitement for the work. However, and contrary to the job characteristics model, this effect tapered off (for perceived responsibility) and even turned negative (for goal setting) beyond moderately high levels of autonomy, such that additional amounts of autonomy did not result in further perceived responsibility and resulted in setting more vague goals. This suggests that while influential theories such as the job characteristics model retain their general utility, the specific relationships proposed within these models may benefit from further refinement. Understanding the mechanisms of this effect can contribute to a more comprehensive and integrative understanding of the curvilinear effect of autonomy.

Extrapolating the findings from this thesis suggests that other job characteristics traditionally viewed as a "job resource" may also warrant a more differentiated view to understand whether other job resources affect outcomes in a non-linear fashion. For example, Warr (1994) suggested that other job characteristics (e.g., social support, task variety, task feedback) could follow an additional decrement curvature, where excessive levels lead to and cause worse outcomes such as poorer mental health. Using task feedback as an example, scholars and practitioners generally assume that more task feedback is desirable and leads to improved outcomes because feedback works as a mechanism for learning and

performance improvement. However, from the resource allocation theory perspective, individuals are argued to have a finite capacity for addressing job-related activities (Kanfer & Ackerman, 1989). When individuals are overwhelmed by task feedback (a self-regulatory job-related activity), they have less resources available to dedicate to both performing (in turn leading to poorer performance) as well as regulating their emotions (in turn leading to poorer psychological well-being and ill-health). Warr (1994) further contends that other job characteristics (e.g., safety, task significance) follow the constant effect curvature, such that any additional amounts of these characteristics beyond the inflection point leads to no additional benefit or detriment to work outcomes. For example, safety, which includes the absence of danger and physical risk, perhaps through the use of ergonomically adequate equipment is likely to have no additional benefit beyond a certain point. In support of this perspective, John (2012) argued that safety is likely to be subject to the economic law of diminishing marginal returns which states that as levels of safety increases, the marginal utility derived from each additional unit declines. To illustrate, at low to moderate levels of safety, introducing new safety procedures, policies or equipment leads to a large reduction in workplace injuries or fatalities. With each unit increase, the marginal utility decreases. Past a certain point where all reasonable safety systems have been provided, any additional safety procedures no longer have additional benefits (i.e., the point of inflection on the curve).

The curvilinear effects found within this thesis may also provide a theoretical explanation for the weaker than expected relationships emerging from research studying the linear effects of autonomy (Cortina, 1993; Langfred & Moye, 2004). Specifically, the curvilinear effect of autonomy may be masked by analyses which

neglect to consider non-linearity (Cortina, 1993). To illustrate, fitting a line of best fit in any of the curvilinear results found within this thesis results in a linear – albeit relatively weaker – relationship between autonomy and outcomes, and the true non-linear effects may have easily been overlooked. In other words, a curvilinear relationship of autonomy is likely to exist even within studies that only investigate linear relationships. Further extrapolation of the support for the non-linearity of autonomy to other job characteristics may provide a different perspective in explaining the reason for mixed evidence found in studies of the interactions between job demands and control. While scholars have typically tapped on the presence of potential unmeasured moderators to explain these inconsistencies, these may in part be explained by considering the theoretical nonlinearity of the job characteristic of interest, as described above. Findings from this thesis provide support for calls to include a non-linear term as an additional step in any hierarchical multiple regressions (e.g., Cortina, 1993; Matuschek & Kliegl, 2018), to ensure that scholars do not fail to recognise the possibility of non-linear relationships.

Limitations and Directions for Future Research

The small number of primary studies that were included in the meta-analysis is perhaps the first indication that not enough research is done where the non-linear effect of autonomy is specifically tested. This is an important finding of the meta-analysis. While the small number of studies inadvertently limit the statistical confidence of the findings from the meta-analysis, Chapters 4 and 5 provide further support for the curvilinear effect of autonomy on outcomes. In line with recommendations by statistical scholars (Cortina, 1993; Matuschek & Kliegl, 2018), future research studying the linear effects of autonomy involving hierarchical multiple regressions or model specification should always include a quadratic term as

an additional step. The benefit of this additional step is two-fold: firstly, if the quadratic term is not significant, it can provide more robust support for the linear argument (Cortina, 1993). Secondly, the inclusion of this information can contribute to future meta-analyses, such that any meta-analytic curvilinear effects can be deduced with more confidence, allowing scholars to continually refine work design theories.

Across Chapters 4 and 5, I have identified that the inflection point where the benefits of increasing autonomy changes in direction appears to occur at a moderately high level of autonomy. However, caution is warranted in its generalisability, as the inflection point is likely to change based on various factors such as individual differences and other contextual factors.

From an individual differences perspective, many scholars have argued – and empirically demonstrated – that personality interacts with the environment to affect outcomes such as behaviour (Barrick & Mount, 1993) and well-being (Biggio & Cortese, 2013). For example, the person-environment fit assumes that different environmental resources (e.g., autonomy) must fit individuals' preferences, which are in turn influenced by their individual characteristics (Edwards, 2008; Kristof-Brown et al., 2005). In other words, varying levels of autonomy may represent desirable or undesirable environments to individuals based on their differences. Three possible options result from this: a) a fit between the person's preferences and the environment, which occurs when the environment provides just enough autonomy that the person requires, b) a misfit, in which the amount of autonomy provided is deficient, and c) a misfit, in which the amount of autonomy provided is excessive (Stiglbauer & Kovacs, 2018). From this perspective, "fit" would lead to positive outcomes such as improved performance and psychological well-being, and

reduced psychological ill-health, while "misfit" would lead to negative outcomes such as decreased performance and psychological well-being, and increased psychological ill-health (Stiglbauer & Kovacs, 2018). For example, it is likely that individuals who are high in conscientiousness, defined as "impulse control that facilitates task- and goal-directed behaviour, such as thinking… following norms and rules, and planning, organising, and prioritising tasks" (John et al., 2008, p. 120) are more likely to experience "fit" in extremely high autonomy situations as they may fall back on their tendency to create an action plan to achieve their tasks, even when the environment does not prescribe the methods, schedule and decisions for task completion, in turn buffering the detrimental effects of extremely high autonomy as demonstrated in Chapters 4 and 5.

Research also suggests that work design variables do not operate in a vacuum, but instead interact with one another (Spector, 2019). Indeed, there is theoretical and empirical evidence that the curvilinear effect of autonomy interacts with other work design variables, such as feedback (e.g., Preston, 2013), and job complexity (e.g., Chung-Yan, 2010). While this is beyond the scope of my thesis, future research should investigate the boundary conditions at which the curvilinear effect of autonomy is more or less pronounced. Understanding boundary conditions will widen our currently limited understanding of the theories of curvilinearity, and has practical implications with regards to whether other job characteristics or job resources may help to buffer the curvilinear effects of autonomy (Busse et al., 2017). Taken in conjunction with the call by Cortina (1993) to include a quadratic term as outlined above, a larger pool of primary curvilinear studies including moderators and mediators can lead to future meta-analytic investigations into potential moderator

and mediator effects to better understand when and why the curvilinear effects of autonomy exist.

The differences across findings in Chapters 4 and 5 may also be partially attributed to the differences in study design, suggesting that the curvilinearity of autonomy may differ based on context. Specifically, the field study investigated *job* autonomy, while the experiment was limited to investigating autonomy on a single *task* by virtue of the experimental nature of the study, raising the question about the role of job crafting in helping individuals to cope with demanding work environments such as extreme autonomy.

Turning to within-person differences, previous research has indicated that intra-individual fluctuations of autonomy relates to variations in outcomes such as everyday creativity (Orth & Volmer, 2017). Extrapolating findings from this thesis, it is likely that when intra-individual autonomy fluctuates to extremely high levels, performance and affect in the moment may follow the additional decrement or constant effect curvatures. Future studies may therefore consider using a diary study to investigate how individuals experience autonomy across various tasks and time, as well as whether and how individuals tap on other work design variables to cope with extreme levels of autonomy. For example, job crafting can be viewed as changes that employees proactively undertake to balance their job demands and resources with their personal abilities and needs, which may fluctuate across tasks, days, or even weeks (Demerouti et al., 2020). While diary studies have been extensively utilised to investigate job characteristics (albeit in a linear fashion; De Gieter et al., 2018; Zacher, 2016), diary studies can also be used to investigate the curvilinear effects of autonomy at a within-person level, and are excellent for studying temporal dynamics (Bolger et al., 2003), especially when the temporal effects of autonomy are not

specified, like many job characteristics such as autonomy (Dettmers & Bredehöft, 2020).

Differences in findings across the chapters may also be attributed to potential measurement issues related to the use of Likert scales typically employed in field studies such as primary studies included in the meta-analysis (Chapter 3) and the longitudinal field study (Chapter 4). Specifically, Likert scales may be plagued by the potential issue of ceiling effects, which could mask the detection of true curvilinear effects (Grant & Schwartz, 2011). To illustrate, individuals reporting on their perceived amounts of job autonomy may "strongly agree" with items measuring autonomy, however the ceiling effect associated with the may not be able to accurately distinguish between a high amount of autonomy (which is functional) and an extremely high amount of autonomy (which is dysfunctional, i.e., too much autonomy). In other words, high Likert scale scores may not differentiate between having a lot, and having too much of a characteristic (Kaiser & Kaplan, 2005). Indeed, research has found that traditional Likert scales provide limited differentiation between high and extreme levels of behaviours and perceptions (Vergauwe et al., 2017). Different methods have been used to address this issue in field studies, specifically the use of ideal point models (Carter et al., 2014) such the too-much-too-little scale (Vergauwe et al., 2017). The too-much-too-little scale can be used independently where it has been demonstrated to be more sensitive in detecting curvilinear effects compared to traditional Likert scales. However, it can also be used in combination with Likert scales where participants are asked about their perceived amount of job autonomy as well as that amount of autonomy in relation to their personal preference. This allows for person-environment fit analyses to be conducted and provides a more refined view of "too much" versus "ideal

amounts" of high autonomy. As the results across all three studies included in this thesis indicated that a curvilinear effect of job autonomy is likely to exist, future studies should employ the too-much-too-little scale either as the primary response scale, or as a supplementary form of data to better seek out the curvature of the effects of autonomy.

Across both the field and experiment studies, autonomy was studied at the global, rather than facet, level. This decision was made in part due to reduced power arising from the small sample size. However, there is theoretical reason to expect that the different facets of autonomy – work method, scheduling, and decision-making – may demonstrate different curvilinear relationships with various outcomes. For example, Stiglbauer and Kovacs (2018) argued that the facets of work method and scheduling autonomy may relate more to work design, such that extremely high levels of these two aspects of autonomy may actually indicate an unstructured job. This suggests that the additional decrement curvature may be more prominent in work method and scheduling autonomy as opposed to decision-making autonomy. Therefore, future studies should investigate the curvilinear effect of autonomy at the facet, rather than global, level.

Practical Implications

Findings from this thesis have implications for practitioners working towards better work design. Practical recommendations for reducing psychosocial risk in the workplace typically include increasing autonomy in the workplace. While work design practitioners advocate for more resources to support employees in achieving desirable outcomes, findings from this thesis suggest that organisations should be mindful not to increase autonomy to extremely high levels. While a constant effect of extremely high levels of autonomy may not necessarily be detrimental, organisations

may do well to focus on increasing other resources instead, because any organisational investments to provide more autonomy beyond moderately high levels may not yield a proportionate return on investment. Worse still, where the effect of autonomy follows the additional decrement curvature, there may be potential negative side effects that could undermine the positive effects of increasing resources.

Rydstedt et al. (2006) stated that non-linear association of job characteristics indicate that a population approach to implementing general policies for reducing work stress may not be appropriate. Implementing a population or organisation-wide approach to improving well-being or reducing ill-health (for example by increasing autonomy, a job resource) has the potential to harm individuals who are already experiencing levels of autonomy that are beyond moderately high levels (i.e., past the point of inflection; Adams & White, 2005). Instead, policies and interventions aimed at improving well-being and reducing strain should be tailored to individuals who are experiencing psychological ill-health and reduced well-being as a result of extremely high autonomy.

The nature of work is inherently becoming more autonomous (e.g., working-from-home arrangements, gig economy; Shevchuk et al., 2021). Findings from Chapter 5 investigating the mechanisms by which the curvilinear effect of autonomy occurs provide some indication about how practitioners and organisations may seek to support employees in such conditions that could buffer the effects of extremely high autonomy when it cannot be avoided. For example, more training can be provided to support employee goal setting, which in turn may help to negate the detrimental effect of extremely high autonomy on goal setting.

Conclusion

My goal in this thesis was to refine traditional theories of work design to include considerations for the possibility of non-linear effects of autonomy in the workplace. Findings from this thesis provide support for the proposition that job autonomy does not only affect outcomes in a linear fashion as is conventionally operationalised. First, a curvilinear effect of autonomy, and perhaps other job characteristics, is likely to exist, suggesting that researchers should routinely test for these effects. In addition, these effects may occur through the curvilinear effect of autonomy on mechanisms such as perceived responsibility and goal setting.

Given the findings from this thesis, it is my hope that organisational scholars continue to refine and update traditional theories and conceptualisations of work design, as well as answer the call for a paradigmatic shift towards curvilinear models within studies of organisational psychology, management, and organisational behaviour.

References

Abdi, H. (2007). Part (semi partial) and partial regression coefficients. In N. Salkind (Ed.), *Encyclopedia of measurement and statistics*. SAGE Publications.

Adams, J., & White, M. (2005). When the population approach to prevention puts the health of individuals at risk. *International Journal of Epidemiology*, *34*(1), 40-43. https://doi.org/10.1093/ije/dyh232

Adler, M. (2005). Gender differences in job autonomy: The consequences of ocupational segregation and authority position. *The Sociological Quarterly*, *34*, 449-465. https://doi.org/10.1111/j.1533-8525.1993.tb00121.x

Adler, P. S., & Borys, B. (1996). Two types of bureaucracy: Enabling and coercive. *Administrative Science Quarterly*, *41*(1), 61-89. https://doi.org/10.2307/2393986

Aiken, L. S., & West, S. G. (1996). *Multiple regression: Testing and interpreting interactions*. SAGE.

Alexander, J. A. (1991). Adaptive change in corporate control practices. *Academy of Management Journal*, *34*(1), 162-193. https://doi.org/10.2307/256306

Allen, P., Bennett, K., & Heritage, B. (2014). *SPSS statistics version 22: A practical guide*. Cengage Learning.

American Community Survey. (2016). *American Community Survey Data.* https://www.census.gov/programs-surveys/acs/data.html

Ardito, C., Leombruni, R., Pacelli, L., & d'Errico, A. (2012). *Eurofound. Health and well-being at work: A report based on the fifth European working conditions survey*.

Australian Bureau of Statistics. (2007). *National survey of mental health and wellbeing: Summary of results*.

https://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/6AE6DA447F985FC2CA2574EA00122BD6/$File/National%20Survey%20of%20Mental%20Health%20and%20Wellbeing%20Summary%20of%20Results.pdf

Aycan, Z. (2005). The interplay between cultural and institutional/structural contingencies in human resource management practices. *The International Journal of Human Resource Management*, *16*(7), 1083-1119. https://doi.org/10.1080/09585190500143956

Bakker, A. B., & Demerouti, E. (2007). The job demands-resources model: State of the art. *Journal of Managerial Psychology*, *22*(3), 309-328. https://doi.org/10.1108/02683940710733115

Baltes, B., Bauer, C., Bajdo, L., & Parker, C. (2002). The use of multitrait–multimethod data for detecting nonlinear relationships: The case of psychological climate and job satisfaction. *Journal of Business and Psychology*, *17*(1), 3-17. https://doi.org/10.1023/A:1016231816394

Bambra, C., Egan, M., Thomas, S., Petticrew, M., & Whitehead, M. (2007). The psychosocial and health effects of workplace reorganisation. 2. A systematic review of task restructuring interventions. *Journal of Epidemiology and Community Health*, *61*(12), 1028-1037. https://doi.org/10.1136/jech.2006.054999

Barrick, M. R., & Mount, M. K. (1993). Autonomy as a moderator of the relationships between the big five personality dimensions and job performance. *Journal of Applied Psychology*, *78*(1), 111-118. https://doi.org/10.1037/0021-9010.78.1.111

Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science*, *16*(6), 351-355.

Bianchi, S. M., Casper, L. M., & King, R. B. (2005). *Work, family, health, and well-being*. Lawrence Erlbaum.

Biggio, G., & Cortese, C. G. (2013). Well-being in the workplace through interaction between individual characteristics and organizational context. *International Journal of Qualitative Studies on Health and Well-being*, *8*(1), Article 19823. https://doi.org/10.3402/qhw.v8i0.19823

Blanchflower, D. G. (2021). Is happiness U-shaped everywhere? Age and subjective well-being in 145 countries. *Journal of Population Economics*, *34*(2), 575-624. https://doi.org/10.1007/s00148-020-00797-z

Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual Review of Psychology*, *54*(1), 579-616. https://doi.org/10.1146/annurev.psych.54.101601.145030

Bolumole, Y. A., Grawe, S. J., & Daugherty, P. J. (2016). Customer service responsiveness in logistics outsourcing contracts: The influence of job autonomy and role clarity among on-site representatives. *Transportation Journal*, *55*(2), 124-148. https://doi.org/10.1353/tnp.2016.0007

Borenstein, M. (2019). *Common mistakes in meta-analysis and how to avoid them*. Biostat, Inc.

Borenstein, M., Hedges, L., Higgins, J., & Rothstein, H. (2011). *Comprehensive meta-analysis* (Version 3.0) [Computer software]. Biostat. https://meta-analysis.com/

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. John Wiley & Sons, Ltd. https://doi.org/10.1002/9780470743386

Bosco, F. A., Aguinis, H., Singh, K., Field, J. G., & Pierce, C. A. (2015). Correlational effect size benchmarks. *Journal of Applied Psychology*, *100*(2), 431-449. https://doi.org/10.1037/a0038047

Breaugh, J. A. (1985). The measurement of work autonomy. *Human Relations*, *38*(6), 551-570. https://doi.org/10.1177/001872678503800604

Breaugh, J. A. (1989). The work autonomy scales: Additional validity evidence. *Human Relations*, *42*(11), 1033-1056. https://doi.org/10.1177/001872678904201105

Breaugh, J. A., & Colihan, J. P. (1994). Measuring facets of job ambiguity: Construct validity evidence. *Journal of Applied Psychology*, *79*(2), 191-202. https://doi.org/10.1037/0021-9010.79.2.191

Brysbaert, M. (2019). How many words do we read per minute? A review and meta-analysis of reading rate. *Journal of Memory and Language*, *109*, Article 104047. https://doi.org/10.1016/j.jml.2019.104047

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

Büssing, A., & Glaser, J. (2002). *Das tätigkeits- und arbeitsanalyseverfahren für das krankenhaus - selbstbeobachtungsversion. (TAA- KH- S)*. Hogrefe-Verlag.

Byrne, B. M. (2010). *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. 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*(2), 239-270. https://doi.org/10.1080/00273171003680187

Carter, N. T., Dalal, D. K., Boyce, A. S., O'Connell, M. S., Kung, M.-C., & Delgado, K. M. (2014). Uncovering curvilinear relationships between conscientiousness and job performance: How theoretically appropriate measurement makes an empirical difference. *Journal of Applied Psychology*, *99*(4), 564-586. https://doi.org/10.1037/a0034688

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. Cambridge University Press. https://doi.org/10.1017/CBO9781139174794

Charles, S. T., Reynolds, C. A., & Gatz, M. (2001). Age-related differences and change in positive and negative affect over 23 years. *Journal of Personality and Social Psychology*, *80*(1), 136-151. https://doi.org/10.1037/0022-3514.80.1.136

Chua, S. N., Wong, N., & Koestner, R. (2014). Autonomy and controlling support are two sides of the same coin. *Personality and Individual Differences*, *68*, 48-52. https://doi.org/10.1016/j.paid.2014.04.008

Chung-Yan, G. A. (2010). The nonlinear effects of job complexity and autonomy on job satisfaction, turnover, and psychological well-being. *Journal of Occupational Health Psychology*, *15*(3), 237-251. https://doi.org/10.1037/a0019823

Cohen, J., & Cohen, P. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Lawrence Erlbaum Associates.

Comcare. (n.d.). *Working together: Promoting mental health and wellbeing at work*. https://www.comcare.gov.au/static/mental_health/files/assets/common/downloads/As%20One%20Working%20Together.pdf

Cordery, J. L., Morrison, D., Wright, B. M., & Wall, T. D. (2010). The impact of autonomy and task uncertainty on team performance: A longitudinal field study. *Journal of Organizational Behavior*, *31*(2-3), 240-258. https://doi.org/10.1002/job.657

Cortina, J. M. (1993). Interaction, nonlinearity, and multicollinearity: Implications for multiple regression. *Journal of Management*, *19*(4), 915-922. https://doi.org/10.1177/014920639301900411

Cortina, J. M. (2003). Apples and oranges (and pears, oh my!): The search for moderators in meta-analysis. *Organizational Research Methods*, *6*(4), 415-439. https://doi.org/10.1177/1094428103257358

Crawford, E. R., LePine, J. A., & Rich, B. L. (2010). Linking job demands and resources to employee engagement and burnout: A theoretical extension and meta-analytic test. *Journal of Applied Psychology*, *95*(5), 834-848. https://doi.org/10.1037/a0019364

Cropanzano, R., & Mitchell, M. S. (2005). Social exchange theory: An interdisciplinary review. *Journal of Management*, *31*(6), 874-900. https://doi.org/10.1177/0149206305279602

Cummins, R. A. (2010). Subjective wellbeing, homeostatically protected mood and depression: A synthesis. *Journal of Happiness Studies*, *11*(1), 1-17. https://doi.org/10.1007/s10902-009-9167-0

Daniels, K., Beesley, N., Wimalasiri, V., & Cheyne, A. (2013). Problem solving and well-being: Exploring the instrumental role of job control and social support. *Journal of Management*, *39*(4), 1016-1043. https://doi.org/10.1177/0149206311430262

De Gieter, S., Hofmans, J., & Bakker, A. B. (2018). Need satisfaction at work, job strain, and performance: A diary study. *Journal of Occupational Health Psychology*, *23*(3), 361-372. https://doi.org/10.1037/ocp0000098

De Jonge, J. (1995). *Job autonomy, well-being, and health: A study among Dutch health care workers*. Rijksuniversiteit Limburg.

De Jonge, J., Reuvers, M. M. E. N., Houtman, I. L. D., Bongers, P. M., & Kompier, M. A. J. (2000). Linear and nonlinear relations between psychosocial job characteristics, subjective outcomes, and sickness absence: Baseline results from SMASH. *Journal of Occupational Health Psychology*, *5*(2), 256-268. https://doi.org/10.1037/1076-8998.5.2.256

De Jonge, J., & Schaufeli, W. B. (1998). Job characteristics and employee well-being: A test of Warr's Vitamin Model in health care workers using structural equation modelling. *Journal of Organizational Behavior*, *19*(4), 387-407. https://doi.org/10.1002/(SICI)1099-1379(199807)19:4<387::AID-JOB851>3.0.CO2-9

de Lange, A. H., Taris, T. W., Kompier, M. A. J., Houtman, I. L. D., & Bongers, P. M. (2003). "The very best of the millennium": Longitudinal research and the demand-control-(support) model. *Journal of Occupational Health Psychology*, *8*(4), 282-305. https://doi.org/10.1037/1076-8998.8.4.282

Deci, E., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior.* Plenum Press. https://doi.org/https://doi.org/10.1007/978-1-4899-2271-7

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

Demerouti, E., Hewett, R., Haun, V., De Gieter, S., Roíguez-Sánchez, A., & Skakon, J. (2020). From job crafting to home crafting: A daily diary study among six European countries. *Human Factors*, *73*(7), 1010-1035. https://doi.org/10.1177/0018726719848809

Dettmers, J., & Bredehöft, F. (2020). The ambivalence of job autonomy and the role of job design demands. *Scandinavian Journal of Work and Organizational Psychology*, *5*(1). https://doi.org/10.16993/sjwop.81

Di Fabio, A., & Palazzeschi, L. (2015). Hedonic and eudaimonic well-being: The role of resilience beyond fluid intelligence and personality traits. *Frontiers in Psychology*, *6*, Article 1367. https://doi.org/10.3389/fpsyg.2015.01367

Diehl, K., & Poynor, C. (2010). Great expectations?! Assortment size, expectations, and satisfaction. *Journal of Marketing Research*, *47*(2), 312-322. https://doi.org/10.1509/jmkr.47.2.312

Diener, E., Tay, L., Heintzelman, S. J., Kushlev, K., Wirtz, D., Lutes, L. D., & Oishi, S. (2017). Findings all psychologists should know from the new science on subjective well-being. *Canadian Psychology, 58*(2), 87-104. https://doi.org/10.1037/cap0000063

Dierdorff, E. C., & Jensen, J. M. (2018). Crafting in context: Exploring when job crafting is dysfunctional for performance effectiveness. *Journal of Applied Psychology, 103*(5), 463-477.

Dodd, N. G., & Ganster, D. C. (1996). The interactive effects of variety, autonomy, and feedback on attitudes and performance. *Journal of Organizational Behavior*, *17*(4), 329-347. https://doi.org/10.1002/(SICI)1099-1379(199607)17:4<329::AID-JOB754>3.0.CO2-B

Doherty, L. (2004). Work-life balance initiatives: Implications for women. *Employee Relations*, *26*(4), 433-452. https://doi.org/10.1108/01425450410544524

Dormann, C., & Griffin, M. A. (2015). Optimal time lags in panel studies. *Psychological Methods*, *20*(4), 489-505. https://doi.org/10.1037/met0000041

Duval, S., & Tweedie, R. (2000). Trim and fill: A simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics*, *56*(2), 455-463. https://doi.org/10.1111/j.0006-341X.2000.00455.x

Edwards, J. R. (2008). 4 person-environment fit in organizations: An assessment of theoretical progress. *The Academy of Management Annals*, *2*(1), 167-230. https://doi.org/10.1080/19416520802211503

Einhorn, H. J., & Hogarth, R. M. (1975). Unit weighting schemes for decision making. *Organizational Behavior and Human Performance*, *13*(2), 171-192. https://doi.org/10.1016/0030-5073(75)90044-6

Erez, A., & Judge, T. A. (2001). Relationship of core self-evaluations to goal setting, motivation, and performance. *Journal of Applied Psychology*, *86*(6), 1270-1279. https://doi.org/10.1037/0021-9010.86.6.1270

Erez, M. (2010). Culture and job design. *Journal of Organizational Behavior*, *31*(2-3), 389-400. https://doi.org/10.1002/job.651

Evans, B. K., & Fischer, D. G. (1992). A hierarchical model of participatory decision-making, job autonomy, and perceived control. *Human Relations*, *45*(11), 1169-1189. https://doi.org/10.1177/001872679204501103

Farh, J.-L., & Scott, W. E. (1983). The experimental effects of “autonomy” on performance and self-reports of satisfaction. *Organizational Behavior and Human Performance*, *31*(2), 203-222. https://doi.org/10.1016/0030-5073(83)90121-6

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175-191. https://doi.org/10.3758/bf03193146

Fischer, R., & Boer, D. (2011). What is more important for national well-being: Money or autonomy? A meta-analysis of well-being, burnout, and anxiety across 63 societies. *Journal of Personality and Social Psychology*, *101*(1), 164-184. https://doi.org/10.1037/a0023663

Fletcher, B., & Jones, F. (1993). A refutation of Karasek's demand - discretion model of occupational stress with a range of dependent measures. *Journal of Organizational Behavior*, *14*(4), 319. https://doi.org/10.1002/job.4030140404

Fock, H., Hui, M. K., & Au, K. (2004). Empowerment effects across cultures. *Journal of International Business Studies*, *35*(1), 46-60. https://doi.org/10.1057/palgrave.jibs.8400067

Fried, Y. (1991). Meta-analytic comparison of the Job Diagnostic Survey and Job Characteristics Inventory as correlates of work satisfaction and performance. *Journal of Applied Psychology*, *76*(5), 690-697. https://doi.org/10.1037/0021-9010.76.5.690

Fried, Y., & Ferris, G. R. (1987). The validity of the Job Characteristics Model: A review and meta-analysis. *Personnel Psychology*, *40*(2), 287-322. https://doi.org/10.1111/j.1744-6570.1987.tb00605.x

Fried, Y., Laurence, G. A., Shirom, A., Melamed, S., Toker, S., Berliner, S., & Shapira, I. (2013). The relationship between job enrichment and abdominal obesity: A longitudinal field study of apparently healthy individuals. *Journal*

of Occupational Health Psychology, *18*(4), 458-468. https://doi.org/10.1037/a0033730

Fruhen, L. S., & Parker, S. K. (2020). *Impact of FIFO work arrangements on the mental health and wellbeing of FIFO workers* [Unpublished raw data].

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

Gardner, D. G. (1986). Activation theory and task design: An empirical test of several new predictions. *Journal of Applied Psychology*, *71*(3), 411-418. https://doi.org/10.1037/0021-9010.71.3.411

Gardner, D. G., & Cummings, L. L. (1988). Activation theory and task design: Review and reconceptualization. In B. M. Staw & L. L. Cummings (Eds.), *Research in organizational behavior* (Vol. 10). JAI Press Inc.

Gerich, J. (2019). Sickness presenteeism as coping behaviour under conditions of high job control. *German Journal of Human Resource Management, 33*(2), 96-112. https://doi.org/10.1177/2397002218794837

Gianaros, P. J., & Wager, T. D. (2015). Brain-body pathways linking psychological stress and physical health. *Current Directions in Psychological Science*, *24*(4), 313-321. https://doi.org/10.1177/0963721415581476

Gosling, P., Denizeau, M., & Oberlé, D. (2006). Denial of responsibility: A new mode of dissonance reduction. *Journal of Personality and Social Psychology*, *90*(5), 722-733. https://doi.org/10.1037/0022-3514.90.5.722

Grant, A. M., & Schwartz, B. (2011). Too much of a good thing: The challenge and opportunity of the inverted U. *Perspectives on Psychological Science*, *6*(1), 61-76. https://doi.org/10.1177/1745691610393523

Griffin, M. A., Neal, A., & Parker, S. K. (2007). A new model of work role performance: Positive behavior in uncertain and interdependent contexts. *Academy of Management Journal*, *50*(2), 327-347. https://doi.org/10.5465/AMJ.2007.24634438

Hackman, J. R., & Oldham, G. R. (1976). Motivation through the design of work: Test of a theory. *Organizational Behavior and Human Performance*, *16*(2), 250-279. https://doi.org/https://doi.org/10.1016/0030-5073(76)90016-7

Hair, J., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Pearson Educational International.

Hakanen, J. J., Schaufeli, W. B., & Ahola, K. (2008). The Job Demands-Resources model: A three-year cross-lagged study of burnout, depression, commitment, and work engagement. *Work & Stress*, *22*(3), 224-241. https://doi.org/10.1080/02678370802379432

Hansen, T., & Slagsvold, B. (2012). The age and subjective well-being paradox revisited: A multidimensional perspective. *The Norwegian Journal of Epidemiology*, *22*(2), 187-195. https://doi.org/10.5324/nje.v22i2.1565

Harnois, G., & Gabriel, P. (2000). *Mental health and work: Impact, issues and good practices*. https://www.who.int/mental_health/media/en/712.pdf?ua=1

Häusser, J. A., Mojzisch, A., Niesel, M., & Schulz-Hardt, S. (2010). Ten years on: A review of recent research on the Job Demand-Control (-Support) model and psychological well-being. *Work & Stress*, *24*(1), 1-35. https://doi.org/10.1080/02678371003683747

Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (2nd ed.). New York: Guilford Publications.

Hayes, A. F., & Krippendorff, K. (2007). Answering the call for a standard reliability measure for coding data. *Communication Methods and Measures*, *1*(1), 77-89. https://doi.org/10.1080/19312450709336664

Heinrichs, K., Angerer, P., Li, J., Loerbroks, A., Weigl, M., & Müller, A. (2020). Changes in the association between job decision latitude and work engagement at different levels of work experience: A 10-year longitudinal study. *Work & Stress, 34*(2), 111-126. https://doi.org/10.1080/02678373.2019.1577310

Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist*, *52*(12), 1280-1300. https://doi.org/10.1037/0003-066X.52.12.1280

Higgins, J. P. T., Altman, D. G., Gøtzsche, P. C., Jüni, P., Moher, D., Oxman, A. D., Savović, J., Schulz, K. F., Weeks, L., & Sterne, J. A. C. (2011). The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *British Medical Journal*, *343*(7829), 889-893. https://doi.org/https://doi.org/10.1136/bmj.d5928

Higgins, J. P. T., & Green, S. (2008). *Cochrane handbook for systematic reviews of interventions: Cochrane book series*. https://doi.org/10.1002/9780470712184

Higgins, J. P. T., & Thompson, S. G. (2002). Quantifying heterogeneity in a meta-analysis. *Statistics in Medicine*, *21*(11), 1539-1558. https://doi.org/10.1002/sim.1186

Higgins, J. P. T., Thompson, S., Deeks, J., & Altman, D. (2003). Measuring inconsistency in meta-analyses. *British Medical Journal*, *327*(7414), 557-560. https://doi.org/https://doi.org/10.1136/bmj.327.7414.557

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

Hobfoll, S. E., Halbesleben, J., Neveu, J.-P., & Westman, M. (2018). Conservation of resources in the organizational context: The reality of resources and their consequences. *Annual Review of Organizational Psychology and Organizational Behavior, 5*(1), 103-128. https://doi.org/10.1146/annurev-orgpsych-032117-104640

Hobfoll, S. E., & Shirom, A. (2001). Conservation of resources theory: Applications to stress and management in the workplace. In R. T. Golembiewski (Ed.), *Handbook of organization behavior* (2nd ed.). Dekker.

Hofstede, G. (1980). *Culture's consequences: International differences in work-related values*. SAGE Publications.

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions, and organizations across nations.* SAGE Publications.

Humborstad, S. I. W., Humborstad, B., Whitfield, R., & Perry, C. (2008). Implementation of empowerment in Chinese high power-distance organizations. *The International Journal of Human Resource Management*, *19*(7), 1349-1364. https://doi.org/10.1080/09585190802110224

Humphrey, S. E., Nahrgang, J. D., & Morgeson, F. P. (2007). Integrating motivational, social, and contextual work design features: A meta-analytic summary and theoretical extension of the work design literature. *Journal of Applied Psychology*, *92*(5), 1332-1356. https://doi.org/10.1037/0021-9010.92.5.1332

Isaacs, A. N., Enticott, J., Meadows, G., & Inder, B. (2018). Lower income levels in Australia are strongly associated with elevated psychological distress: Implications for healthcare and other policy areas. *Frontiers in Psychiatry*, *9*, 536-536. https://doi.org/10.3389/fpsyt.2018.00536

Iyengar, S. S., & Lepper, M. R. (2000). When choice is demotivating: Can one desire too much of a good thing? *Journal of Personality and Social Psychology*, *79*(6), 995-1006. https://doi.org/10.1037/0022-3514.79.6.995

Jackson, J. J., Bogg, T., Walton, K. E., Wood, D., Harms, P. D., Lodi-Smith, J., Edmonds, G. W., & Roberts, B. W. (2009). Not all conscientiousness scales change alike: A multimethod, multisample study of age differences in the facets of conscientiousness. *Journal of Personality and Social Psychology*, *96*(2), 446-459. https://doi.org/10.1037/a0014156

Järvelin-Pasanen, S., Sinikallio, S., & Tarvainen, M. P. (2018). Heart rate variability and occupational stress - Systematic review. *Industrial Health*, *56*(6), 500-511. https://doi.org/10.2486/indhealth.2017-0190

John, O. (2012). Diminishing returns, diminishing awareness. *Professional Safety*, *57*(12), 18.

John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative Big Five trait taxonomy: History, measurement, and conceptual issues. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of Personality* (pp. 114-158). Guilford Publications.

Johns, G., Xie, J. L., & Fang, Y. (1992). Mediating and moderating effects in job design. *Journal of Management*, *18*(4), 657-676. https://doi.org/10.1177/014920639201800404

Jones, F., & Fletcher, B. (2002). Job control, physical health and psychological well-being. In M. J. Schabracq, J. A. M. Winnubst, & C. L. Cooper (Eds.), *The handbook of work and health psychology* (pp. 121-142). John Wiley & Sons Ltd.

Juillerat, T. L. (2010). Friends, not foes?: Work design and formalization in the modern work context. *Journal of Organizational Behavior*, *31*(2-3), 216-239. https://doi.org/10.1002/job.654

Jung, J., Nam, C., Lee, E., & Kim, S. (2016). Professional autonomy, group cohesion, and job complexity affect researchers' organizational commitment. *Social Behavior and Personality*, *44*(8), 1349-1358. https://doi.org/10.2224/sbp.2016.44.8.1349

Kahneman, D., Diener, E., & Scharz, N. (Eds.). (1999). *Well-being: The foundations of hedonic psychology*. Russel Sage Foundation.

Kaiser, R. B., & Kaplan, R. E. (2005). Overlooking overkill? Beyond the 1-to-5 rating scale. *Human Resource Planning*, *28*(3), 7.

Kanfer, R., & Ackerman, P. L. (1989). Motivation and cognitive abilities: An integrative/aptitude-treatment interaction approach to skill acquisition. *Journal of Applied Psychology*, *74*(4), 657-690. https://doi.org/10.1037//0021-9010.74.4.657

Karasek, R. A., Jr., Brisson, C., Kawakami, N., Houtman, I., Bongers, P., & Amick, B. (1998). The job content questionnaire (JCQ): An instrument for internationally comparative assessments of psychosocial job characteristics. *Journal of Occupational Health Psychology*, *3*(4), 322-355. https://doi.org/10.1037/1076-8998.3.4.322

Karasek, R. A., Jr. (1979). Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly*, *24*(2), 285-308. https://doi.org/https://doi.org/10.2307/2392498

Keller, H. (2016). Psychological autonomy and hierarchical relatedness as organizers of developmental pathways. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*, *371*(1686), Article 20150070. https://doi.org/10.1098/rstb.2015.0070

Kessler, R. C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S. L. T., Walters, E. E., & Zaslavsky, A. M. (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine*, *32*(6), 959-976. https://doi.org/10.1017/S0033291702006074

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

Keyes C. L. M. (2007). Promoting and protecting mental health as flourishing: A complementary strategy for improving national mental health. *The American Psychologist, 62*(2), 95–108. https://doi.org/10.1037/0003-066X.62.2.95

Klonek, F., Gerpott, F. H., & Parker, S. K. (2020). A conceptual replication of ambidextrous leadership theory: An experimental approach. *The Leadership Quarterly*. Advance online publication. https://doi.org/10.1016/jleaqua.2020.101473

Knight, C., Patterson, M., & Dawson, J. (2016). Building work engagement: A systematic review and meta-analysis investigating the effectiveness of work

engagement interventions. *Journal of Organizational Behavior*, *38*(6), 792-812. https://doi.org/https://doi.org/10.1002/job.2167

Konze, A.-K., Rivkin, W., & Schmidt, K.-H. (2017). Is job control a double-edged sword? A cross-lagged panel study on the interplay of quantitative workload, emotional dissonance, and job control on emotional exhaustion. *International Journal of Environmental Research and Public Health*, *14*(12), 1608. https://doi.org/10.3390/ijerph14121608

Krippendorff, K. (2013). *Content analysis: An introduction to its methodology* (3rd ed.). SAGE Publications.

Kristof-Brown, A. L., Zimmerman, R. D., & Johnson, E. C. (2005). Consequences of individuals' fit at work: A meta-analysis of person-job, person-organization, person-group, and person-supervisor fit. *Personnel Psychology*, *58*(2), 281-342. https://doi.org/10.1111/j.1744-6570.2005.00672.x

Kubicek, B., Korunka, C., & Tement, S. (2014). Too much job control? Two studies on curvilinear relations between job control and eldercare workers' well-being. *International Journal of Nursing Studies*, *51*(12), 1644-1653. https://doi.org/10.1016/j.ijnurstu.2014.05.005

Kühler, M., & Jelinek, N. (2013). *Autonomy and the self*. SpringerLink.

Landeweerd, J. A., & Boumans, N. P. G. (1994). The effect of work dimensions and need for autonomy on nurses' work satisfaction and health. *Journal of Occupational and Organizational Psychology*, *67*(3), 207-217. https://doi.org/10.1111/j.2044-8325.1994.tb00563.x

Landsbergis, P. A., Schnall, P. L., Deitz, D. K., Warren, K., Pickering, T. G., & Schwartz, J. E. (1998). Job strain and health behaviors: Results of a

prospective study. *American Journal of Health Promotion*, *12*(4), 237-245. https://doi.org/10.4278/0890-1171-12.4.237

Langfred, C. W., & Moye, N. A. (2004). Effects of task autonomy on performance: An extended model considering motivational, informational, and structural mechanisms. *Journal of Applied Psychology*, *89*(6), 934-945. https://doi.org/10.1037/0021-9010.89.6.934

Latham, G. P., & Locke, E. A. (1979). Goal setting - A motivational technique that works. *Organizational Dynamics*, *8*(2), 68-80. https://doi.org/10.1016/0090-2616(79)90032-9

Latham, G. P., & Locke, E. A. (1991). Self-regulation through goal setting. *Organizational Behavior and Human Decision Processes*, *50*(2), 212-247. https://doi.org/10.1016/0749-5978(91)90021-K

Latham, G. P., & Locke, E. A. (2006). Enhancing the benefits and overcoming the pitfalls of goal setting. *Organizational Dynamics*, *35*(4), 332-340. https://doi.org/10.1016/j.orgdyn.2006.08.008

Lazarus, R. S. (1991). *Emotion and adaptation*. Oxford University Press.

Le, H., Oh, I.-S., Robbins, S. B., Ilies, R., Holland, E., & Westrick, P. (2011). Too much of a good thing: Curvilinear relationships between personality traits and job performance. *Journal of Applied Psychology*, *96*(1), 113-133. https://doi.org/10.1037/a0021016

Lepisto, D. A., & Pratt, M. G. (2017). Meaningful work as realization and justification: Toward a dual conceptualization. *Organizational Psychology Review*, *7*(2), 99-121. https://doi.org/10.1177/2041386616630039

Li, G., Liu, H., & Luo, Y. (2018). Directive versus participative leadership: Dispositional antecedents and team consequences. *Journal of Occupational*

and Organizational Psychology, 91(3), 645-664. https://doi.org/10.1111/joop.12213

Locke, E. A., & Latham, G. P. (2006). New directions in goal-setting theory. *Current Directions in Psychological Science*, *15*(5), 265-268. https://doi.org/10.1111/j.1467-8721.2006.00449.x

Locke, E. A., & Latham, G. P. (2013). Goal setting theory. In E. A. Locke & G. P. Latham (Eds.), *New developments in goal setting and task performance* (pp. 3-15). Routledge. https://doi.org/10.4324/9780203082744

Lopes, H., Lagoa, S., & Calapez, T. (2014). Work autonomy, work pressure, and job satisfaction: An analysis of European Union countries. *The Economic and Labour Relations Review*, *25*(2), 306-326. https://doi.org/10.1177/1035304614533868

Mäkikangas, A., Feldt, T., & Kinnunen, U. (2007). Warr's scale of job-related affective well-being: A longitudinal examination of its structure and relationships with work characteristics. *Work & Stress*, *21*(3), 197-219. https://doi.org/10.1080/02678370701662151

Mansell, A., & Brough, P. (2005). A comprehensive test of the job demands-control interaction: Comparing two measures of job characteristics. *Australian Journal of Psychology, 57*(2), 103-114. https://doi.org/10.1080/10519990500048579

Masino, C., & Lam, T. C. M. (2014). Choice of rating scale labels: Implication for minimizing patient satisfaction response ceiling effect in telemedicine surveys. *Telemedicine and e-Health*, *20*(12), 115-1155. https://doi.org/10.1089/tmj.2013.0350

Matuschek, H., & Kliegl, R. (2018). On the ambiguity of interaction and nonlinear main effects in a regime of dependent covariates. *Behavior Research Methods*, *50*(5), 1882-1894. https://doi.org/10.3758/s13428-017-0956-9

May, D. R., Gilson, R. L., & Harter, L. M. (2004). The psychological conditions of meaningfulness, safety and availability and the engagement of the human spirit at work. *Journal of Occupational and Organizational Psychology*, *77*(1), 11-37. https://doi.org/10.1348/096317904322915892

Mayring, P. (2000). Qualitative content analysis. *Forum: Qualitative Social Research*, *1*(2), Article 20. https://doi.org/10.17169/fqs-1.2.1089

Mazmanian, M., Orlikowski, W., & Yates, J. (2013). The autonomy paradox: The implications of mobile email devices for knowledge professionals. *Organization Science*, *24*(5), 1337-1357. https://doi.org/10.1287/orsc.1120.0806

McCrae, R. R. (2002). The maturation of personality psychology: Adult personality development and psychological well-being. *Journal of Research in Personality*, *36*(4), 307-317. https://doi.org/10.1016/S0092-6566(02)00011-9

Meade, A., & Craig, B. (2012). Identifying careless responses in survey data. *Psychological Methods*, *17*, 437-455. https://doi.org/10.1037/a0028085

Menard, S. W. (2002). *Applied logistic regression analysis* (2nd ed.). SAGE Publications.

Mental Health America. (2019). *The state of mental health in America*. https://www.mhanational.org/sites/default/files/2019%20MH%20in%20America%20Final_0.pdf

Mishra, V., Nielsen, I., & Smyth, R. (2014). How does relative income and variations in short-run wellbeing affect wellbeing in the long run? Empirical

evidence from China's Korean minority. *Social Indicators Research*, *115*(1), 67-91. https://doi.org/10.1007/s11205-012-0209-3

Mitchell, T. R., & James, L. R. (2001). Building better theory: Time and the specification of when things happen. *The Academy of Management Review*, *26*(4), 530-547. https://doi.org/10.5465/AMR.2001.5393889

Monnot, M. J., & Beehr, T. A. (2014). Subjective well-being at work: Disentangling source effects of stress and support on enthusiasm, contentment, and meaningfulness. *Journal of Vocational Behavior*, *85*(2), 204-218. https://doi.org/10.1016/j.jvb.2014.07.005

Moret, L., Nguyen, J.-M., Pillet, N., Falissard, B., Lombrail, P., & Gasquet, I. (2007). Improvement of psychometric properties of a scale measuring inpatient satisfaction with care: A better response rate and a reduction of the ceiling effect. *BMC Health Services Research*, *7*(1), 197-197. https://doi.org/10.1186/1472-6963-7-197

Morgeson, F. P., & Humphrey, S. E. (2006). The work design questionnaire (WDQ): Developing and validating a comprehensive measure for assessing job design and the nature of work. *Journal of Applied Psychology*, *91*(6), 1321-1339. https://doi.org/10.1037/0021-9010.91.6.1321

Muecke, S., & Iseke, A. (2019). *How does job autonomy influence job performance? A meta-analytic test of theoretical mechanisms.* [Paper presentation]. The 79th Annual Meeting of the Academy of Management, Boston, Massachusetts, United States.

Muldoon, J., Kisamore, J. L., Liguori, E. W., Jawahar, I. M., & Bendickson, J. (2017). Moderators of the personality-performance relationship: An

investigation of job meaning and autonomy. *Personnel Review*, *46*(3), 474-489. https://doi.org/10.1108/PR-02-2016-0040

Nauta, M. M., Liu, C., & Li, C. (2010). A cross-national examination of self-efficacy as a moderator of autonomy/job strain relationships. *Applied Psychology: An International Review*, *59*(1), 159-179. https://doi.org/10.1111/j.1464-0597.2008.00375.x

Ng, T. W. H., & Feldman, D. C. (2008). The relationship of age to ten dimensions of job performance. *Journal of Applied Psychology*, *93*(2), 392-423. https://doi.org/10.1037/0021-9010.93.2.392

Ng, T. W. H., & Feldman, D. C. (2015). The moderating effects of age in the relationships of job autonomy to work outcomes. *Work, Aging and Retirement*, *1*(1), 64-78. https://doi.org/10.1093/workar/wau003

Nixon, A. E., Mazzola, J. J., Bauer, J., Krueger, J. R., & Spector, P. E. (2011). Can work make you sick? A meta-analysis of the relationships between job stressors and physical symptoms. *Work & Stress*, *25*(1), 1-22. https://doi.org/10.1080/02678373.2011.569175

Noonan, A. E. (2005). “At this point now”: Older workers' reflections on their current employment experiences. *The International Journal of Aging and Human Development*, *61*(3), 211-241. https://doi.org/10.2190/38CX-C90V-0K37-VLJA

Orth, M., & Volmer, J. (2017). Daily within-person effects of job autonomy and work engagement on innovative behaviour: The cross-level moderating role of creative self-efficacy. *European Journal of Work and Organizational Psychology*, *26*(4), 601-612. https://doi.org/10.1080/1359432X.2017.1332042

Pahuja, R., & Kotchen, T. A. (2011). Salivary cortisol predicts cardiovascular mortality. *Current Hypertension Reports*, *13*(6), 404-405. https://doi.org/10.1007/s11906-011-0220-0

Parasuraman, S., & Purohit, Y. S. (2000). Distress and boredom among orchestra musicians: The two faces of stress. *Journal of Occupational Health Psychology*, *5*(1), 74-83. https://doi.org/10.1037/1076-8998.5.1.74

Parker, S. K. (2003). *Lean production* [Unpublished raw data].

Parker, S. K. (2014). Beyond motivation: Job and work design for development, health, ambidexterity, and more. *Annual Review of Psychology*, *65*(1), 661-691. https://doi.org/10.1146/annurev-psych-010213-115208

Parker, S. K., Van den Broeck, A., & Holman, D. (2017). Work design influences: A synthesis of multilevel factors that affect the design of jobs. *The Academy of Management Annals*, *11*(1), 267-308. https://doi.org/10.5465/annals.2014.0054

Paulhus, D. L., & Trapnell, P. D. (2008). Self-presentation of personality: An agency-communion framework. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (pp. 492-517). Guildford Press.

Payne, G., & Payne, J. (2004). Longitudinal and cross-sectional studies. In *Key concepts in social research*. SAGE Publications. https://doi.org/10.4135/9781849209397

Payne, N., Jones, F., & Harris, P. (2002). The impact of working life on health behavior: The effect of job strain on the cognitive predictors of exercise. *Journal of Occupational Health Psychology*, *7*(4), 342-353. https://doi.org/10.1037/1076-8998.7.4.342

Petticrew, M., & Roberts, H. (2006). *Systematic reviews in the social sciences: A practical guide*. Blackwell Publishing. https://doi.org/10.1002/9780470754887

Pierce, J. R., & Aguinis, H. (2013). The too-much-of-a-good-thing effect in management. *Journal of Management*, *39*(2), 313-338. https://doi.org/10.1177/0149206311410060

Pisanti, R., Gagliardi, M. P., Razzino, S., & Bertini, M. (2003). Occupational stress and wellness among Italian secondary school teachers. *Psychology and Health, 18*(4), 523-536. https://doi.org/10.1080/0887044031000147247

Podsakoff, N. P., LePine, J. A., & LePine, M. A. (2007). Differential challenge stressor-hindrance stressor relationships with job attitudes, turnover intentions, turnover, and withdrawal behavior: A meta-analysis. *Journal of Applied Psychology*, *92*(2), 438-454. https://doi.org/10.1037/0021-9010.92.2.438

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879-903. https://doi.org/10.1037/0021-9010.88.5.879

Pransky, G., Finkelstein, S., Berndt, E., Kyle, M., Mackell, J., & Tortorice, D. (2006). Objective and self-report work performance measures: A comparative analysis. *International Journal of Productivity and Performance Management*, *55*(5), 390-399. https://doi.org/10.1108/17410400610671426

Pratt, M. G., & Asforth, B. E. (2003). Fostering meaningfulness in working and at work. In K. Cameron, J. Dutton, & R. Quinn (Eds.), *Positive organizational scholarship* (pp. 309-327). Berrett-Koehler.

Preston, M. S. (2013). Advancing case manager motivation in child welfare: Job control's curvilinear relationship and instrumental feedback's moderating influence. *Children and Youth Services Review*, *35*(12), 2003-2012. https://doi.org/10.1016/j.childyouth.2013.09.018

Prümper, J., Hartmannsgruber, K., & Frese, M. (1995). KFZA. Kurz-Fragebogen zur Arbeitsanalyse. *European Economic Review*, *39*, 125-131.

Putnam, L. L., Myers, K. K., & Gailliard, B. M. (2014). Examining the tensions in workplace flexibility and exploring options for new directions. *Human Relations*, *67*(4), 413-440. https://doi.org/10.1177/0018726713495704

Qi, M., Gao, H., Guan, L., Liu, G., & Yang, J. (2016). Subjective stress, salivary cortisol, and electrophysiological responses to psychological stress. *Frontiers in Psychology*, *7*, 229-229. https://doi.org/10.3389/fpsyg.2016.00229

Richardson, H. A., Simmering, M. J., & Sturman, M. C. (2009). A tale of three perspectives: Examining post hoc statistical techniques for detection and correction of common method variance. *Organizational Research Methods*, *12*(4), 762-800. https://doi.org/10.1177/1094428109332834

Richardson, K. M., & Rothstein, H. R. (2008). Effects of occupational stress management intervention programs: A meta-analysis. *Journal of Occupational Health Psychology*, *13*(1), 69-93. https://doi.org/10.1037/1076-8998.13.1.69

Roberts, B. W., Walton, K. E., & Viechtbauer, W. (2006). Patterns of mean-level change in personality traits across the life course: A meta-analysis of longitudinal studies. *Psychological Bulletin*, *132*(1), 1-25. https://doi.org/10.1037/0033-2909.132.1.1

Rosengren, A., & Manhem, K. (2015). Epidemiology and standard risk factors in relation to psychosocial risk factors for coronary heart disease. In K. Orth-Gomér, N. Schneiderman, V. Vaccarino, & H.-C. Deter (Eds.), *Psychosocial stress and cardiovascular disease in women* (pp. 89-105). SpringerLink.

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

Roth, P. L., Le, H., Oh, I.-S., Van Iddekinge, C. H., & Bobko, P. (2018). Using beta coefficients to impute missing correlatons in meta-analysis research: Reasons for caution. *Journal of Applied Psychology*, *103*(6), 644-658. https://doi.org/10.1037/apl0000293

Rubin, R. S., Dierdorff, E. C., & Bachrach, D. G. (2013). Boundaries of citizenship behavior: Curvilinearity and context in the citizenship and task performance relationship. *Personnel Psychology, 66*(2), 377-406. https://doi.org/10.1111/peps.12018

Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annual Review of Psychology*, *52*(1), 141-166. https://doi.org/10.1146/annurev.psych.52.1.141

Rydstedt, L. W., Ferrie, J., & Head, J. (2006). Is there support for curvilinear relationships between psychosocial work characteristics and mental well-being? Cross-sectional and long-term data from the Whitehall II study. *Work & Stress*, *20*(1), 6-20. https://doi.org/10.1080/02678370600668119

Sadler-Smith, E., El-Kot, G., & Leat, M. (2003). Differentiating work autonomy facets in a non-Western context. *Journal of Organizational Behavior*, *24*(6), 709-731. https://doi.org/10.1002/job.200

Safe Work Australia. (2014). *Preventing psychological injury under work health and safety laws fact sheet*. https://www.safeworkaustralia.gov.au/system/files/documents/1702/preventing-psychological-injury-under-whs-laws.pdf

Schmidt, F. L., & Hunter, J. E. (2015). *Methods of meta-analysis: Correcting error and bias in research findings* (3rd ed.). SAGE Publications. https://doi.org/10.4135/9781483398105

Schwartz, B. (2005). *The paradox of choice: Why more is less*. HarperCollins.

Schwartz, B., Ward, A., Monterosso, J., Lyubomirsky, S., White, K., & Lehman, D. R. (2002). Maximizing versus satisficing: Happiness is a matter of choice. *Journal of Personality and Social Psychology*, *83*(5), 1178-1197. https://doi.org/10.1037//0022-3514.83.5.1178

Selenko, E., & Warr, P. (2015). *Variation in non-linear associations between job autonomy and its consequences*. European Association of Work and Organizational Psychology, Oslo, Norway.

Semmer, N., Zapf, D., & Dunckel, H. (1995). Assessing stress at work: A framework and an instrument. In O. Swane & C. Johansen (Eds.), *Work and health: Scientific basis of progress in the working environment* (pp. 105-113). Office for Official Publications of the European Communities.

Shevchuk, A., Strebkov, D., & Tyulyupo, A. (2021). Always on across time zones: Invisible schedules in the online gig economy. *New Technology, Work, and Employment*, *36*(1), 94-113. https://doi.org/10.1111/ntwe.12191

Sia, S. K., & Appu, A. V. (2015). Work autonomy and workplace creativity: Moderating role of task complexity. *Global Business Review*, *16*(5), 772-784. https://doi.org/10.1177/0972150915591435

Sims, H. P., Szilagyi, A. D., & Keller, R. T. (1976). The measurement of job characteristics. *The Academy of Management Journal*, *19*(2), 195-212. https://doi.org/10.2307/255772

Singh, J. (1993). Boundary role ambiguity - Facets, determinants, and impacts. *Journal of Marketing*, *57*(2), 11-31. https://doi.org/10.2307/1252024

Sirgy, M. J. (2012). *The psychology of quality of life: Hedonic well-being, life satisfaction, and eudaimonia* (2nd ed.). Springer.

Snitker, T. V. (2010). The impact of culture on user research. In R. M. Schumacher (Ed.), *Handbook of global user research* (pp. 257-277). Elsevier Inc. https://doi.org/https://doi.org/10.1016/C2009-0-19828-8

Sørensen, O. H., & Holman, D. (2014). A participative intervention to improve employee well-being in knowledge work jobs: A mixed-methods evaluation study. *Work & Stress*, *28*(1), 67-86. https://doi.org/10.1080/02678373.2013.876124

Spector, P. E. (1986). Perceived control by employees: A meta-analysis of studies concerning autonomy and participation at work. *Human Relations*, *39*(11), 1005-1016. https://doi.org/10.1177/001872678603901104

Spector, P. E. (1994). Using self-report questionnaires in OB research: A comment on the use of a controversial method. *Journal of Organizational Behavior*, *15*(5), 385-392. https://doi.org/10.1002/job.4030150503

Spector, P. E. (2019). Do not cross me: Optimizing the use of cross-sectional designs. *Journal of Business and Psychology*, *34*(2), 125-137. https://doi.org/10.1007/s10869-018-09613-8

Spector, P. E., & Meier, L. L. (2014). Methodologies for the study of organizational behavior processes: How to find your keys in the dark. *Journal of Oganizational Behavior*, *35*(8), 1109-1119. https://doi.org/10.1002/job.1966

Stiglbauer, B., & Kovacs, C. (2018). The more, the better? Curvilinear effects of job autonomy on well-being from vitamin model and PE-fit theory perspectives. *Journal of Occupational Health Psychology*, *23*(4), 520-536. https://doi.org/10.1037/ocp0000107

Streit, J. M. K., Swanson, N. G., Chosewood, L. C., Pana-Cryan, R., & Reeves, K. (2019). *Healthy work design and well-being program*. Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. https://www.cdc.gov/niosh/docs/2019-171/

Sturman, M. C., (2003). Searching for the inverted U-shaped relationship between time and performance: Meta-analysis of the experience/performance, tenure/performance, and age/performance relationships. *Journal of Management, 29*(5), 609-640. https://doi.org/10.1016/S0149-2063_03_00028-X

Syed, M., & Nelson, S. C. (2015). Guidelines for establishing reliability when coding narrative data. *Emerging Adulthood*, *3*(6), 375-387. https://doi.org/10.1177/2167696815587648

Tanskanen, J., Taipale, S., & Anttila, T. (2016). Revealing hidden curvilinear relations between work engagement and its predictors: Demonstrating the added value of generalized additive model (GAM). *Journal of Happiness Studies, 17*(1), 367-387. https://psycnet.apa.org/doi/10.1007/s10902-014-9599-z

Teuchmann, K., Totterdell, P., & Parker, S. K. (1999). Rushed, unhappy, and drained: An experience sampling study of relations between time pressure, perceived control, mood, and emotional exhaustion in a group of accountants. *Journal of Occupational Health Psychology*, *4*(1), 37-54. https://doi.org/10.1037/1076-8998.4.1.37

Todd, S. (2018). A former Google engineer explains how creative freedom can turn people into entitled jerks. *Quartz at Work*. https://qz.com/work/1226761/a-former-google-engineer-explains-how-creative-freedom-can-turn-people-into-entitled-jerks/

Toker, S., Shirom, A., Melamed, S., & Armon, G. (2012). Work characteristics as predictors of diabetes incidence among apparently healthy employees. *Journal of Occupational Health Psychology*, *17*(3), 259-267. https://doi.org/10.1037/a0028401

Treville, S. d., & Antonakis, J. (2006). Could lean production job design be intrinsically motivating? Contextual, configurational, and levels-of-analysis issues. *Journal of Operations Management*, *24*(2), 99-123. https://doi.org/10.1016/j.jom.2005.04.001

Trujillo, L. T. (2019). Mental effort and information-processing costs are inversely related to global brain free energy during visual categorization. *Frontiers in Neuroscience*, *13*, Article 1292. https://doi.org/10.3389/fnins.2019.01292

Van den Broeck, A., De Cuyper, N., De Witte, H., & Vansteenkiste, M. (2010). Not all job demands are equal: Differentiating job hindrances and job challenges in the job demands-resources model. *European Journal of Work and Organizational Psychology*, *19*(6), 735-759. https://doi.org/10.1080/13594320903223839

Vander Elst, T., Van den Broeck, A., De Cuyper, N., & De Witte, H. (2014). On the reciprocal relationship between job insecurity and employee well-being: Mediation by perceived control? *Journal of Occupational and Organizational Psychology*, *87*(4), 671-693. https://doi.org/10.1111/joop.12068

Vander Elst, T., Verhoogen, R., Sercu, M., Van den Broeck, A., Baillien, E., & Godderis, L. (2017). Not extent of telecommuting, but job characteristics as proximal predictors of work-related well-being. *Journal of Occupational and Environmental Medicine, 59*(10), e180-e186. https://doi.org/10.1097/JOM.0000000000001132

Vergauwe, J., Wille, B., Hofmans, J., Kaiser, R. B., & De Fruyt, F. (2018). The double-edged sword of leader charisma: Understanding the curvilinear relationship between charismatic personality and leader effectiveness. *Journal of Personality and Social Psychology*, *114*(1), 110-130. https://doi.org/10.1037/pspp0000147

Vergauwe, J., Wille, B., Hofmans, J., Kaiser, R. B., & Fruyt, F. D. (2017). The too little/too much scale: A new rating format for detecting curvilinear effects. *Organizational Research Methods*, *20*(3), 518-544. https://doi.org/10.1177/1094428117706534

Verhoeven, C., Kraaij, V., Joekes, K., & Maes, S. (2003). Job conditions and wellness/health outcomes in Dutch secondary school teachers. *Psychology and Health, 18*(4), 473-487. https://doi.org/10.1080/0887044031000147201

Viertiö, S., Kiviruusu, O., Piirtola, M., Kaprio, J., Korhonen, T., Marttunen, M., & Suvisaari, J. (2021). Factors contributing to psychological distress in the working population, with a special reference to gender difference. *BMC Public Health*, *21*(1), 611. https://doi.org/10.1186/s12889-021-10560-y

Vogel, R. M., Rodell, J. B., & Sabey, T. B. (2020). Meaningfulness misfit: Consequences of daily meaningful work needs-supplies incongruence for daily engagement. *Journal of Applied Psychology*, *105*(7), 760-770. https://doi.org/10.1037/apl0000464

Wall, T. D., Jackson, P. R., & Davids, K. (1992). Operator work design and robotics system performance: A serendipitous field study. *Journal of Applied Psychology*, *77*(3), 353-362. https://doi.org/10.1037/0021-9010.77.3.353

Wallace, J. E. (1995). Organizational and professional commitment in professional and nonprofessional organizations. *Administrative Science Quarterly*, *40*(2), 228-255. https://doi.org/10.2307/2393637

Warr, P. (1987). *Work, unemployment, and mental health*. Oxford.

Warr, P. (1994). A conceptual framework for the study of work and mental health. *Work & Stress*, *8*(2), 84-97. https://doi.org/10.1080/02678379408259982

Warr, P. (2002). The study of well-being, behaviour and attitudes. In P. Warr (Ed.), *Psychology at work* (5th ed.). Penguin.

Warr, P. (2016). Happiness and mental health: A framework of vitamins in the environment and mental processes in the person. In J. C. Quick & C. L. Cooper (Eds.), *Handbook of stress and health: A guide to research and practice.* Wiley.

Warr, P., Bindl, U. K., Parker, S. K., & Inceoglu, I. (2014). Four-quadrant investigation of job-related affects and behaviours. *European Journal of Work and Organizational Psychology*, *23*(3), 342-363. https://doi.org/10.1080/1359432X.2012.744449

Warr, P., & Clapperton, G. (2010). *The joy of work? Jobs, happiness, and you.* Routledge/Taylor & Francis Group.

Weidner, G., Boughal, T., Connor, S. L., Pieper, C., & Mendell, N. R. (1997). Relationship of job strain to standard coronary risk factors and psychological characteristics in women and men of the family heart study. *Health Psychology*, *16*(3), 239-247. https://doi.org/10.1037/0278-6133.16.3.239

Weisberg, S. (2014). *Applied linear regression* (4th ed.). Wiley.

Wheatley, D. (2017). Autonomy in paid work and employee subjective well-being. *Work and Occupations*, *44*(3), 296-328. https://doi.org/10.1177/0730888417697232

Williams, C. R., & Livingstone, L. P. (1994). Another look at the relationship between performance and voluntary turnover. *The Academy of Management Journal, 37*(2), 269-298. https://doi.org/10.2307/256830

Wood, S., Stride, C., Threapleton, K., Wearn, E., Nolan, F., Osborn, D., Paul, M., & Johnson, S. (2011). Demands, control, supportive relationships and well-being amongst British mental health workers. *Social Psychiatry and Psychiatric Epidemiology, 46*(10), 1055-1068. https://doi.org/10.1007/s00127-010-0263-6

World Health Organisation. (2018). *Fact sheets on sustainable development goals: Health targets*. http://www.euro.who.int/__data/assets/pdf_file/0017/348011/Fact-sheet-SDG-Mental-health-UPDATE-02-05-2018.pdf

World Health Organization. (2019). *Mental health in the workplace*. https://www.who.int/mental_health/in_the_workplace/en/

Yerkes, R. M., & Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit-formation. *Journal of Comparative Neurology and Psychology*, *18*(5), 459-482. https://doi.org/10.1002/cne.920180503

Yik, M., Russell, J. A., & Steiger, J. H. (2011). A 12-point circumplex structure of core affect. *Emotion*, *11*(4), 705-731. https://doi.org/10.1037/a0023980

Zacher, H. (2016). Within-person relationships between daily individual and job characteristics and daily manifestations of career adaptability. *Journal of Vocational Behavior*, *92*, 105-115. https://doi.org/10.1016/j.jvb.2015.11.013

Zapf, D., Dormann, C., & Frese, M. (1996). Longitudinal studies in organizational stress research: A review of the literature with reference to methodological issues. *Journal of Occupational Health Psychology*, *1*(2), 145-169. https://doi.org/10.1037/1076-8998.1.2.145

Zhang, P., & Liu, W. (2009, November). The Impact of Performance Management Orientations and Appraisal Justices on Employee's Knowledge Sharing Behaviors. In *2009 Fourth International Conference on Computer Sciences and Convergence Information Technology* (pp. 213-217). IEEE.

Zhou, E. (2020). The "too-much-of-a-good-thing" effect of job autonomy and its explanation mechanism. *Psychology*, *11*, 299-313. https://doi.org/10.4236/psych.2020.112019

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Appendices

Appendix A

Example search strategy for systematic literature search developed for the SCOPUS database

"occupational" OR "organi$ation" OR "industrial" OR "employ*" OR "work*"

AND

"Job autonomy" OR "work autonomy" OR "autonomy" OR "work scheduling autonomy" OR "scheduling autonomy" OR "work method autonomy" OR "method autonomy" OR "decision making autonomy" OR "decision-making autonomy" OR "control" OR "decision-making latitude" OR "decision making latitude" OR "job discretion"

AND

"curvilinear" OR "non-linear" OR "inverted-U" OR "U-shaped"

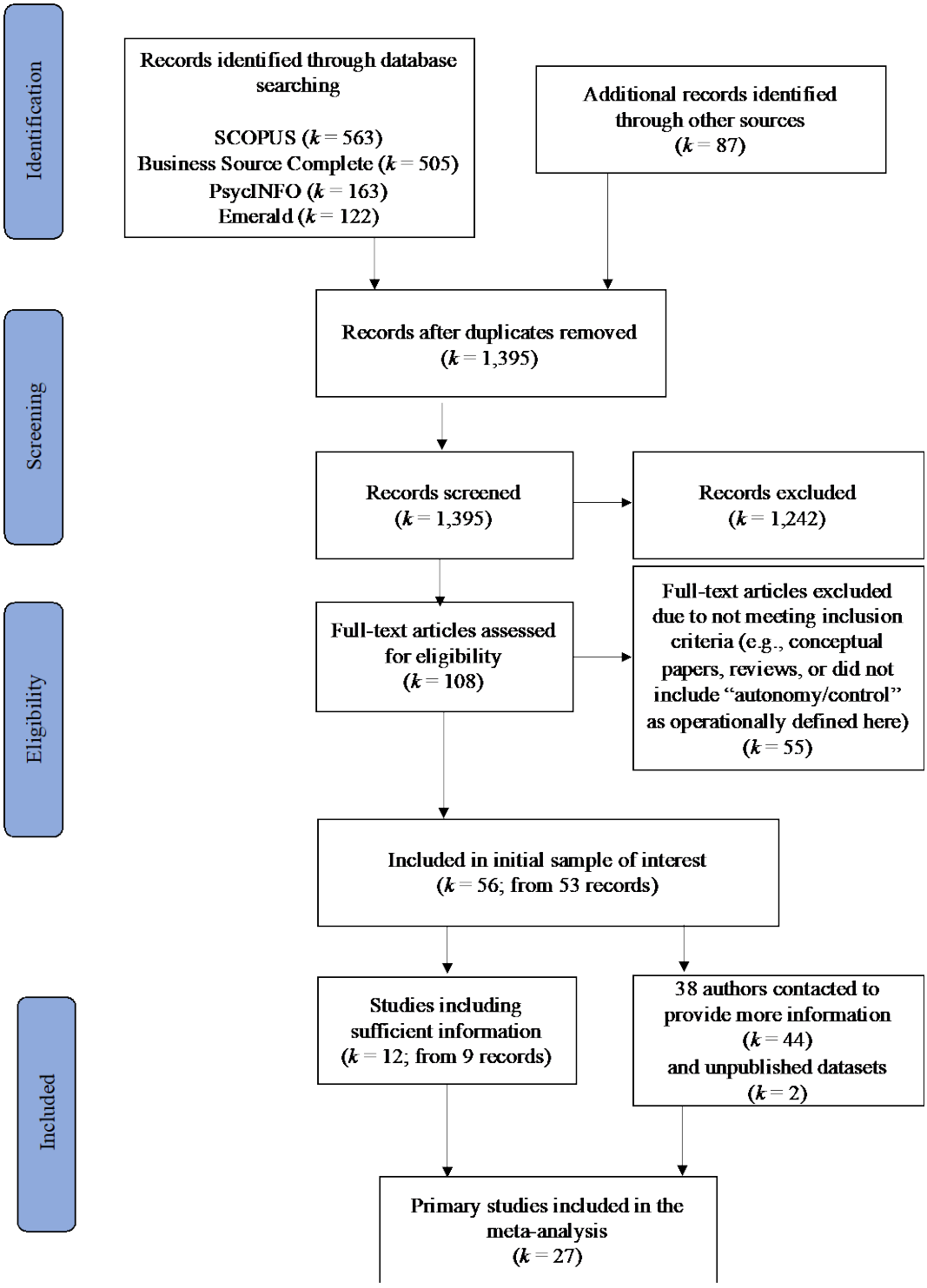
AND

"work performance" OR "performance" OR "profit*" OR "revenue" OR "financial performance" OR "financial outcomes" OR "return on investment" OR "return on assets" OR "job performance" OR "task performance" OR "Organi$ational performance" OR "Organi$ational effectiveness" OR "Work effectiveness" OR "Team effectiveness" OR "firm performance" OR "Productivity" OR "efficiency" OR "wellbeing" OR "well-being" OR "psychological wellbeing" OR "psychological well-being" OR "stress" OR "engagement" OR "burnout"

Note. ($) replaces single characters anywhere in a word, for example "organi$ation" includes "organization" and "organisation"; (*) replaces multiple characters anywhere in a word, for example "employ*" includes "employment" and "employee".

Appendix B

A PRISMA flow diagram of the systematic literature search, indicating databases searched, number of returns and reasons for exclusion at each stage



Note. Records include journal articles and conference papers. Single records could include multiple studies with separate samples. In addition, multiple records could have a single corresponding author.

Appendix C

Linear correlation coefficients between autonomy and outcomes in primary studies included in the meta-analysis

Reference	Outcomes	*r* (linear)
Baltes et al., 2002	Job satisfaction	.24**
Chung-Yan, 2010	Job satisfaction	.39*
	Turnover intentions	-.22**
	Psychological well-being	.33*
Daniels et al., 2013	Positive affect	.05[a]
	Negative affect	.58[a]
	Fatigue	.30[a]
	Cognitive failure	.43[a]
de Jonge & Schaufeli, 1998 (a)	Job satisfaction	.11*
	Anxiety	-.09*
	Emotional exhaustion	-.14*
de Jonge & Schaufeli, 1998 (b)	Job satisfaction	.15*
	Anxiety	-.05*
	Emotional exhaustion	-.10*
Dierdorff & Jensen, 2018	Affective Commitment	.36**
	Job proficiency	.27**
	Job Satisfaction	.37**
	OCB	.16**
Fried et al., 2013	Waist circumference	.13*
	Waist-hip ratio	.14*
	BMI	.10*
Fruhen et al., 2020	Emotional well-being	.33**
	Engagement (absorption)	.38**
	Engagement (dedication)	.47**
	Job Satisfaction	.52**
	Performance	.24**
	Psychological well-being	.36**
	Social well-being	.30**
Gerich, 2019	Sickness absenteeism	-.13**
	Sickness presenteeism	
	- Days	-.29**
	- Propensity	-.10*
Heinrichs et al., 2020	Engagement T1	.31**
	Engagement T2	.23**
	Engagement T3	.24**
	Engagement T4	.21**
Kubicek et al., 2014 (a)	Irritation	-.30**

Reference	Outcomes	*r* (linear)
Kubicek et al., 2014 (b)	Depersonalization	-.08
	Emotional exhaustion	-.14**
	Reduced professional efficacy	-.14**
	Absorption	.21**
	Dedication	.23**
	Vigor	.18**
Li et al., 2018	Team creativity	.26*
	Team efficiency	.14
Mansell & Brough, 2005	Job satisfaction	.57**
	Work well-being	.30**
Muldoon et al., 2017	OCB	.17*
Parker, 2003	Burnout	.12**
	General health	.00
	Job Satisfaction	.22**
	Negative well-being	.04
	Organisational Commitment	.10*
	Positive well-being	-.18**
	Substance use	-.02
	Turnover Intentions	.02
Pisanti et al., 2003	Depersonalization	-.18*
	Emotional Exhaustion	-.15
	Job satisfaction	.30**
	Personal accomplishment	.29**
	Somatic complaints	-.20*
Preston, 2013	Motivation	.31*
Rubin et al., 2013	OCB	.42**
	Task performance	-.09
Rydstedt et al., 2006	Job satisfaction	.31[b]
	Psychological well-being	-.08 [b]
Stiglbauer & Kovacs, 2018 (a)	Affective well-being	.36*
Stiglbauer & Kovacs, 2018 (b)	Flourishing	.24*
	Affective well-being	.20*
Tanskanen et al., 2016	Engagement	.46[b]
Vander Elst et al., 2017	Cognitive stress complaints	-.18**
	Cynicism	-.25**
	Emotional Exhaustion	-.24**
	Engagement	.36**
Verhoeven et al., 2003	Burnout	-.29**

Reference	Outcomes	*r* (linear)
Wood et al., 2011	Job satisfaction	.56[b]
	Depression	-.31[b]
	Anxiety	-.21[b]
	Emotional Exhaustion	-.25[b]
	Personal accomplishment	.26[b]
	Depersonalization	N/A
Zhang & Liu, 2009	Knowledge sharing behavior	N/A

* $p < .05$, ** $p < .01$

[a]Statistical significance not reported as inappropriate for event sampling methods depend on nonindependence of observations.

[b]Statistical significance not reported.

N/A Pearson correlation coefficient not available.

Appendix D

Individual items and descriptive statistics for measures included in the longitudinal field study

Construct	Item	*N*	*M*	*SD*
Autonomy (T1)	The job allows me to decide my hours of work.	679	3.02	1.39
	The job allows me to be flexible in terms of when I work.	679	3.14	1.40
	The job gives me a chance to use my personal initiative or judgment in carrying out the work.	679	3.99	0.93
	The job allows me to make a lot of decisions on my own.	679	3.80	1.01
	The job gives me considerable opportunity for independence and freedom in how I do the work.	679	3.74	1.07
Autonomy (T2)	The job allows me to decide my hours of work.	679	2.95	1.36
	The job allows me to be flexible in terms of when I work.	679	3.05	1.37
	The job gives me a chance to use my personal initiative or judgment in carrying out the work.	679	3.97	0.93
	The job allows me to make a lot of decisions on my own.	679	3.78	0.99
	The job gives me considerable opportunity for independence and freedom in how I do the work.	679	3.70	1.04
Proficiency (T1)	Carried out the core parts of my role well.	679	4.24	0.88
	Completed core tasks well using my specific expertise.	679	4.23	0.88
	Ensured that my tasks were completed properly.	679	4.41	0.84
Proficiency (T2)	Carried out the core parts of my role well.	679	4.40	0.69
	Completed core tasks well using my specific expertise.	679	4.41	0.69
	Ensured that my tasks were completed properly.	679	4.53	0.66
Meaningfulness (T1)	The work I do is very important to me.	679	3.81	0.95
	My job activities are personally meaningful to me.	679	3.79	0.93

Construct	Item	*N*	*M*	*SD*
Meaningfulness (T2)	The work I do is very important to me.	679	3.81	0.96
	My job activities are personally meaningful to me.	678	3.79	0.96
Psychological Distress [a] (T1)	In the past month, how often did you feel... – Nervous?	679	1.90	0.94
	In the past month, how often did you feel... – Hopeless?	679	1.57	0.94
	In the past month, how often did you feel... – Restless or fidgety?	679	1.78	0.94
	In the past month, how often did you feel... – So depressed that nothing could cheer you up?	679	1.36	0.76
	In the past month, how often did you feel... – That everything was an effort?	679	1.78	1.01
	In the past month, how often did you feel... – Worthless?	679	1.40	0.86
Psychological Distress [a] (T2)	In the past month, how often did you feel... – Nervous?	679	1.83	0.91
	In the past month, how often did you feel... – Hopeless?	679	1.51	0.84
	In the past month, how often did you feel... – Restless or fidgety?	679	1.73	0.88
	In the past month, how often did you feel... – So depressed that nothing could cheer you up?	679	1.31	0.69
	In the past month, how often did you feel... – That everything was an effort?	679	1.77	1.00
	In the past month, how often did you feel... – Worthless?	679	1.36	0.80

Note. No items required reverse scoring.

[a] Higher scores indicate higher levels of psychological distress.

Appendix E

Background information provided to all participants. Participants were instructed to use this information, taken from the study webpage, to create a one-page flyer for recruitment for a hypothetical study, “Working Across Life and Careers”. Typographical and grammatical errors, including hyperlinks were deliberately included in the background information.

WALC background information

Home

Working Across Life and Careers (WALC) is a large, on-going, nationally representative longitudinal population study consisting of approximately 3,000 participants ranging from early to late adulthood. The main aim of the study is to examine work and its impact on people’s lives over the life span. WALC especially focuses on capturing long-term effects (e.g., the effect of work over time on health, well-bing, identity, memory, learning and cognition) and how the nature of work and workers is changing. Our findings are intends to support the creation of good quality work for all, and contribute to organisational and governmental policy on this topic.

WALC study is a unique longitudinal study due to the following reasons:

It is the only known, large-scale longitudinal study to focus on work design, that is, how the work environments is organised and structured. This includes the characteristics of work such as autonomy, flexibility, colleague support, and ability to participate in decision-making. No other longitudinal study focuses so intensively on work and its relationships with causes and consequences.

Biological measures are obtained, including MRI, cortisol, and physical measures of health and well-being such as height, weight, and blood pressure.

Repeat assessment of participants across the lifespan allows investigation of the longitudinal, causal relationships between the nature of work, and aspects such as individual differences, identity, mental and physical health and well-being, memory, and cognition. We are thus able to study how age impact on these factors.

About Us

The WALC study is run by the Centre for Transformative Work Design (CTWD), Perth, and was set up in partnership with the Social Research Centre (SRC).

The Study

WALK is the only longitudinal study of its type in the world, following individuals across the lifespan from early to late adulthood. It examines how work and the work environment changes across adult life, and the relationship between work and health and wellbeing, cognition and memory, identity, and individual differences such as personality.

The contribution of participants is to the continuation of our study. It is greatly appreciated and allows us to continue important research around creating good quality jobs for all, which is ever salient to us as individuals as well salient in the media.

$20 for Participants

As a special thank you to each of our participants we will give each person $20. All you have to do is click on the survey below and fill it in. It should take no more than 30-40 minutes to complete.

Instant Feedback Report

We understand that individuals may be interested in results. Upon completion of the survey, we will send you an instant feedback report by email which details about you. For an example copy of this feedback report, please click here.

We are running two additional studies which we would love you to participate in. These are:

Health and Well-Being. We are investigating how work impacts on mental and physical health and well-being. If you are willing to take part in this study please sign up here and one of us will be in contact with you shortly to arrange a suitable time for you to come in. All travel expenses will be paid.

Memory and Cognition. We are particularly interested in how work impacts on memory and cognition over the lifespan. If you would like to take part in this study, please sign up below and one of our team will be in contact shortly to arrange a suitable time for you to come in.

Confidentiality

It is very important to us that the information you provide is kept strictly confidential. We comply with the Privacy Act 1988, which means that your data is securely stored and protected, and only authorised people are allowed access to it. Each participant is also asked for his or her consent before taking part in the survey and retains the right to withdraw at any time and / or ask for his or her data not to be used.

Recruitment

The WALC study is a ongoing longitudinol and representative population study. Participants were recruited using dual frame Random Digit Dialling (RDD), including both landlines and mobile phone numbers.

Appendix F

Individual items and descriptive statistics for measures included in the experimental study

Construct	Item	*N*	*M*	*SD*
Autonomy	I was allowed to make decisions about what methods I use to complete the task.	137	3.69	1.12
	I had considerable opportunity for independence and freedom in how I did the task.	137	3.69	1.15
	I was allowed to decide on my own how to go about doing the task.	137	3.65	1.13
	I had a chance to use my personal initiative or judgement in carrying out the task.	136	3.79	1.09
	I was allowed to make a lot of decisions on my own.	136	3.51	1.18
	I was provided with significant autonomy in making decisions.	135	3.50	1.17
	I was allowed to make my own decisions about how to schedule my work.	135	2.84	1.39
	I was allowed to decide on the order in which things were done on the task.	135	3.27	1.46
	I was allowed to plan how I did the task.	135	3.43	1.23
Role Clarity	I was certain how to go about getting the task done.	137	3.11	1.05
	I knew what the best way was to go about getting the task done.	137	3.01	1.11
	I knew how to get the task done.	137	3.58	0.98
	I knew when I should be doing a particular aspect of the task.	137	3.57	1.02
	I was certain about the sequencing of my activities.	137	3.40	1.10
	The task was such that I knew when I should be doing a given activity.	137	3.56	1.02
	I knew what would be considered satisfactory work performance.	136	3.01	1.14
	It was clear to me what would be considered acceptable work performance.	137	3.03	1.16
	I knew what level of performance would be considered acceptable.	137	3.00	1.18

Construct	Item	*N*	*M*	*SD*
Perceived Responsibility	Do you personally feel responsible for the flyer you have just completed?	136	3.73	1.01
	Do you personally feel responsible for the information you have included in the flyer?	135	3.04	1.40
	Do you personally feel responsible for the quality of the flyer you produced?	135	3.96	0.99
Setting Vague Goals	I aspired to produce a flyer of the highest standard.[a]	116	1.9224	0.90
	I tried to make my flyer visually attractive.[a]	121	1.7934	0.82
	I tried to include all the information that was requested.[a]	134	1.5672	0.69
	I had a clear goal of what I wanted the end product (i.e., the flyer) to look like.[a]	103	2.5437	1.27
Choice Overload	I felt overwhelmed by the number of options available to me.	137	3.16	1.26
	There were so many ways of creating the flyer that I felt confused.	137	3.00	1.24
	It was difficult for me to decide how to create the flyer.	136	3.43	1.21
Proficiency	The participant carried out the core task well.	134	2.71	1.18
	The participant completed the core tasks well using the standard procedures.	134	2.52	1.03
	The participant ensured that the flyer task was completed properly.	134	2.51	1.10
HAPA	Alert	137	3.43	1.01
	Excited	137	2.29	1.12
	Energetic	137	2.58	1.14
	Enthusiastic	137	2.61	1.19
	Cheerful	137	2.41	1.20
	Elated	137	1.94	1.12
	Glad	137	2.48	1.07
	Pleased	135	2.66	1.04
LAPA	Serene	135	2.37	1.08
	Contented	137	2.69	1.07
	Comfortable	136	2.95	1.08
	Calm	137	2.97	1.16
	Relaxed	137	2.87	1.17
	Tranquil	134	2.43	1.13
	Drowsy	137	1.94	1.06
	Sluggish	137	1.81	1.00

Construct	Item	*N*	*M*	*SD*
HANA	Aroused	137	1.41	0.79
	Alarmed	137	1.61	1.00
	Afraid	137	1.38	0.73
	Tense	137	1.94	1.05
	Anxious	137	2.08	1.09
	Uneasy	137	1.85	1.05
	Upset	137	1.43	0.86
	Discouraged	137	1.72	1.01
LANA	Dejected	137	1.41	0.79
	Miserable	137	1.39	0.82
	Depressed	136	1.46	0.91
	Sad	137	1.41	0.82
	Gloomy	137	1.43	0.79
	Lethargic	137	1.63	0.93
	Bored	137	1.74	0.99
	Fatigued	137	1.72	0.95

Note. HAPA = High Activation Positive Affect; LAPA = Low Activation Positive Affect; HANA = High Activation Negative Affect; LANA = Low Activation Negative Affect.
[a] These items were reverse scored

Appendix G

All mediation analysis pathways included in the experimental study

M	Contrast	a		b		ab		c'	
		B	*SE B*	*B*	*SE B*	*B*	*SE B*	*B*	*SE B*
Y: Proficiency									
Perceived Responsibility	1	.60*	.20	-.08	.10	-.05	.06	1.40*	.20
	2	.26	.19			-.02	.03	-.58*	.19
Vague goals	1	-.48*	.13	-.13	.15	.06	.07	1.40*	.20
	2	.18	.13			-.02	.03	-.58*	.19
Overload	1	.28	.24	.04	.07	.01	.03	1.40*	.20
	2	-.03	.23			.00	.02	-.58*	.19
Y: HAPA									
Perceived Responsibility	1	.55*	.20	.18*	.08	.10*	.06	-.13	.17
	2	.25	.19			.05	.04	.03	.16
Vague goals	1	-.44*	.13	-.50**	.13	.22*	.09	-.13	.17
	2	.19	.13			-.09	.06	.03	.16
Overload	1	.28	.23	.00	.06	.00	.02	-.13	.17
	2	-.03	.23			.00	.01	.03	.16
Y: LAPA									
Perceived Responsibility	1	.55*	.20	.00	.08	.00	.05	-.03	.16
	2	.25	.19			.00	.02	.22	.15
Vague goals	1	-.44*	.13	-.15	.12	.07	.06	-.03	.16
	2	.19	.13			-.03	.03	.22	.15
Overload	1	.28	.23	-.09	.06	-.03	.03	-.03	.16
	2	-.03	.23			.00	.03	.22	.15
Y: HANA									
Perceived Responsibility	1	.55*	.20	.00	.07	.00	.04	.02	.13
	2	.25	.19			.00	.02	.03	.13
Vague goals	1	-.44*	.13	.17	.10	-.07	.05	.02	.13
	2	.19	.13			.03	.03	.03	.13
Overload	1	.28	.23	.11*	.05	.03	.03	.02	.13
	2	-.03	.23			.00	.03	.03	.13

M	Contrast	a		b		ab		c’	
		B	*SE B*	*B*	*SE B*			*B*	*SE B*
Y: LANA									
Perceived Responsibility	1	.60*	.20	-.02	.06	-.01	.04	.12	.12
	2	.23	.19			-.01	.02	-.01	.12
Vague goals	1	-.47*	.13	.22*	.09	-.10*	.05	.12	.12
	2	.20	.13			.04	.03	-.01	.12
Overload	1	.26	.23	.03	.05	.01	.02	.12	.12
	2	-.05	.23			.00	.01	-.01	.12

Note. HAPA = High Activation Positive Affect; LAPA = Low Activation Positive Affect; HANA = High Activation Negative Affect; LANA = Low Activation Negative Affect; a = effect of X on M; b = effect of M on Y; ab = indirect effect; c’ = direct effect of X on Y controlling for M; c = total effect of X on Y (Hayes, 2017)
* $p < .05$