

# School principals' mental health and well-being under threat: A longitudinal analysis of workplace demands, resources, burnout, and well-being

Herbert W. Marsh<sup>1</sup>  | Theresa Dicke<sup>1</sup> | Phil Riley<sup>2</sup> |  
Philip D. Parker<sup>1</sup>  | Jiesi Guo<sup>1</sup> | Geetanjali Basarkod<sup>1</sup> |  
Andrew J. Martin<sup>3</sup>

<sup>1</sup>Institute for Positive Psychology and Education (IPPE), Australian Catholic University, North Sydney 2060, Australia

<sup>2</sup>Research Centre for Educational Impact, Faculty of Arts and Education, Deakin University, Geelong, Victoria, Australia

<sup>3</sup>School of Education, University of New South Wales, Sydney, Australia

## Correspondence

Herbert W. Marsh, Institute for Positive Psychology and Education (IPPE), Australian Catholic University, North Sydney 2060 Australia.  
Email: [herbmarsh@acu.edu.au](mailto:herbmarsh@acu.edu.au)

## Funding information

Australian Research Council, Grant/Award Number: LP160101056

## Abstract

Schools are critical organisational settings, and school principals face extreme stress levels. However, there are few large-scale, longitudinal studies of demands and resources that drive principals' health and well-being. Using the Job Demands-Resources (JD-R) framework, we evaluated longitudinal reciprocal effects over 3 years relating to job demands, job resources (resilience), job-related outcomes (burnout and job satisfaction), and personal outcomes (happiness and physical health) for a nationally representative sample of 3683 Australian school principals. Prior demands and resources led to small changes in subsequent outcomes, beneficial effects of resources, and adverse effects of demands, particularly for job-related outcomes. Furthermore, we also found reverse-reciprocal effects, prior outcomes (burnout and job satisfaction) influencing subsequent job characteristics. However, in response to substantively and theoretically important research questions, we found no support for Yerkes–Dodson Law (nonlinear

This is an open access article under the terms of the [Creative Commons Attribution](https://creativecommons.org/licenses/by/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2022 The Authors. Applied Psychology: Health and Well-Being published by John Wiley & Sons Ltd on behalf of International Association of Applied Psychology.

effects of demands) or Nietzsche effects and inoculation effects (that which does not kill you, makes you stronger; manageable levels of demands build resilience). Relating our study to new and evolving issues in JD-R research, we offer limitations of our research—and JD-R theory and research more generally—and directions for further research in this essentially unstudied application of JD-R to school principals' mental health and well-being.

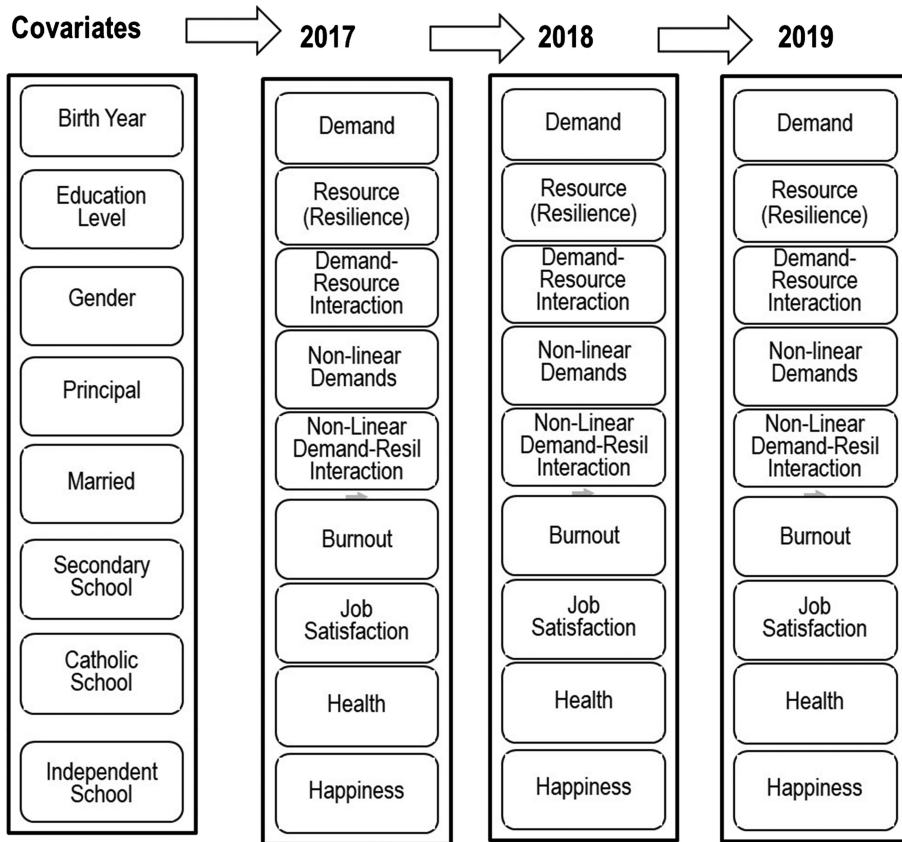
#### KEYWORDS

burnout, health and happiness, job demand-resources model, job satisfaction, resilience, school principals

## INTRODUCTION

Schools are a critical organisational setting in modern society, and school principals play crucial leadership roles in these organisational settings. The demands faced by school principals overlap with those faced by leaders in other occupational settings. Still, they are also quite distinct regarding educational focus; working with children; dealing with parents; focusing on student achievement as a primary product; declining enrollments; building the well-being of staff, students, parents, and the community; and the political pressures they face (Dicke, Marsh, et al., 2018; Dicke et al., 2020, 2022; Hallinger, 2011; Riley et al., 2021; Skaalvik, 2020; also see Supporting Information S1). Although there is limited research on the effects of school principals on key stakeholders, there is surprisingly little research on the antecedents of school principals' health and well-being. Indeed, (Barling & Cloutier, 2017; also see Lesener et al., 2019) note a dearth of research on how demands and resources influence organisational leaders' health and well-being in any setting. In this respect, in our study, we begin with an advanced organiser (Figure 1) to describe the central issues, rationale, and study objectives. We then review relevant literature, placing our study in a broader context, supporting its originality and contribution to the field. Finally, we evaluate school principals' perceptions of demands, resources (resilience), and job-related and personal outcomes longitudinally over three annual waves. Our approach combined the Job Demands-Resources (JD-R) framework (Bakker et al., 2005; Bakker & Demerouti, 2007; Schaufeli & Taris, 2014) with a cross-lag panel design. Indeed, Lesener et al. (2019) argued that such a design is the minimum requirement to test JD-R's basic assumptions. However, Lesener et al. (2019) reported only 29 good longitudinal cross-lag panel studies among the many 1000s of JD-R studies. Moreover, none were specific to school principals or organisational leaders more generally.

As in traditional JD-R studies, we are interested in the effects of job demands and resources on subsequent outcomes. However, in response to substantively and theoretically important research questions, we also address unresolved issues and directions for further research, such as those identified by Bakker and Demerouti (2017). As outlined below, these include tests of reciprocal effects (e.g. whether outcomes affect subsequent perceptions of demands and resources—so-called reverse causation), the possible nonlinear effect of demands (based on the Yerkes–



**FIGURE 1** Conceptual diagram of longitudinal cross-lag panel design relating job demands, resources, job-related outcomes (burnout and job satisfaction), and personal outcomes (health and happiness), controlling for covariates

*Note:* In the longitudinal design, each of the six outcomes are assessed once each year over 3 consecutive years. Demands are a composite of demands that are specific to school principals. Resources are represented by resilience. There are three multiplicative predictor terms based on demands and resources: demands-by-resources interaction, nonlinear effects of resilience, and the nonlinear-by-demands interaction. There are two job-related outcomes (burnout and job satisfaction) and two personal outcomes (health and happiness). In the actual longitudinal structural equation model, all variables (the ovals) in each of the rectangular boxes have paths leading to all variables in the immediately adjacent rectangular box. Paths from prior demands and resources to subsequent outcomes test basic Job Demands-Resources (JD-R) assumptions (Hypothesis 1). All paths from each prior outcome to all nonmatching subsequent outcomes test reciprocal effects (Research Question 2), but of particular interest are those from prior outcomes to subsequent demands and resources (so-called reverse-reciprocal effects). Paths from nonlinear effects of demands test the Yerkes–Dodson law (Research Question 2). The interaction effects test for the demand-resource interactions (Research Question 3) consistent with JD-R proposals that the effects of demands on subsequent outcomes are moderated by resources.

Dodson law), and alternative conceptualizations of the effects of resilience (e.g. Nietzsche effects and inoculation effects). Based on this review of theoretical and empirical research, we offer research hypotheses and questions (see Section 3.4) to guide our research.

## SCHOOL PRINCIPALS

Wanted: A miracle worker who can do more with less, pacify rival groups, endure chronic second-guessing, tolerate low levels of support, process large volumes of paper and work double shifts (75 nights a year). He or she will have carte blanche to innovate, but cannot spend much money, replace any personnel, or upset any constituency

(R. Evans, Education Week, 1995).

School principals are vital to the life of schools and communities. A good school leader can create a supportive school ethos that facilitates positive motivation of teachers and students and lifts academic success (Day, 2011; Dicke et al., 2020; Grissom et al., 2019; Leithwood & Louis, 2012; Riley et al., 2021; Walsh & Dotter, 2018). School leaders recognize, promote, and build the leadership capacity of staff, students, parents, and the community by providing support, guidance, direction, and vision. However, significant changes to school principals' work, regularly introduced by federal and state governments, add demands to the job (e.g. introducing a national curriculum tied to national testing, public accountability, and decentralization). Moreover, school principals have increasingly greater responsibility for critical budget and personnel decisions without parallel increases in resources for their implementation (Riley et al., 2021). Thus, job demands increase alongside a decrease in principals' job control. High job demand and low job control result in burnout and adverse health outcomes (Kuper & Marmot, 2003). In addition, school principals suffer from high levels of occupational stress (Maslach & Leiter, 2008; Riley et al., 2021), resulting in a myriad of harmful outcomes, attrition, and a shortage of qualified school principals (Darmody & Smyth, 2016; Dewa et al., 2009; Grissom et al., 2015; Riley et al., 2021).

Schools are increasingly facing a crisis as aging school leaders retire early due to burnout, with suitable candidates reluctant to take their place (Riley et al., 2021). Tran et al. (2018) note that school principal shortages are an international crisis (also see Kruger et al., 2005; National Association of Elementary and Secondary Principals, 2008). Contributing to this crisis, Wahlstrom et al. (2010) note that as many as half of all new principals leave their position within 3 years, whereas Goldring and Taie (2018) estimate that school principal turnover in the US is approximately 18%. Following this, Bartanen et al. (2019) (also see Grissom & Bartanen, 2019; Rangel, 2018) note that principal turnover harms student achievement the year following the turnover.

## THE RELATION OF PRINCIPALS' DEMANDS AND RESOURCES AND THEIR EFFECTS ON BURNOUT AND WELL-BEING BASED ON THE JD-R MODEL

Our study's primary constructs (resources, demands, burnout, and occupational well-being outcomes) are central to the JD-R Model (Bakker et al., 2005; Bakker & Demerouti, 2007; Schaufeli & Taris, 2014). Burnout, a syndrome of chronic exhaustion; a cynical, negative attitude regarding work; and reduced professional efficacy (Maslach et al., 2001), was an early focus of JD-R research (Bakker et al., 2002). Many job demands and resources formed two clusters with differential relations to burnout that evolved into the first complete version of the JD-R model (Demerouti et al., 2001).

## Essential elements and dual processes of the JD-R

### Job demands and resources

In the JD-R framework, job characteristics are classified as job demands and resources (Demerouti et al., 2001). Job demands (e.g. workplace adversity and demands) and job resources (e.g. resilience) predict a variety of positive and negative outcomes that are job-related (e.g. burnout and job satisfaction) and personal (e.g. health and well-being). JD-R theory (Demerouti et al., 2001) posits that demands and resources operate through largely independent health impairment and motivation processes. Job demands are the workplace's pressure and emotional demands that deplete employee energy, impair mental health, and lead to burnout (the health impairment process). Typical demands in the workplace include working conditions, work overload, time pressures, the nature of the role in the organisation, career development issues, relationships at work, and organisational climate. Concerning school principals specifically, causes of strain are general role overload, the sheer quantity of demands and administrative constraints, and interpersonal demands sources (including interactions with staff and parents), which all increase burnout and mental illness (Dicke, Marsh, et al., 2018; Dicke et al., 2022; Friedman, 2002; Poirel et al., 2012). Based on our previous qualitative research, we surveyed principals about the main sources of stress in being a school principal. In the present investigation, we included each of the most frequently mentioned job demands as a separate item and treated the total score as a formative index (for further discussion, see Supporting Information S1, a formative index).

Job resources are functional aspects of the work setting in achieving work goals, motivating growth, and job satisfaction (the motivation process). However, JD-R theory also posits that job resources can buffer or moderate the impact of job demands such that resources are especially motivational when demands are high (Demerouti et al., 2001; Dicke, Stebner, et al., 2018; Schaufeli & Bakker, 2004). In the present investigation, we posited resilience as a job resource. Broadly, resilience is the capacity and dynamic process of adaptively overcoming demands while maintaining normal psychological and physical functioning (Russo et al., 2012; Rutter, 2013; Southwick & Charney, 2012).

### Principal outcomes: Burnout, job satisfaction, general health, and happiness

In the present investigation, we focus on school principals' job demands and resources as predictors of principals' outcomes. Here we distinguish between job-related outcomes (burnout and job satisfaction) and personal outcomes (general health and happiness). Principal burnout is a major issue in desperate need of solutions (Dicke et al., 2022; Wells & Klocko, 2018) and a primary focus of most JD-R studies. Job satisfaction is one of applied psychology's most widely studied outcomes (Judge et al., 2017). Although principals report high levels of job demands, sources of stress, and burnout, there are seemingly paradoxical findings of school principals reporting high levels of job satisfaction (compared to the general population; Horwood et al., 2021). Job satisfaction is among the most important predictors of high educator commitment and retention (Skaalvik & Skaalvik, 2015). Moreover, research has demonstrated that principals' job satisfaction is positively related to teacher job satisfaction and student achievement (Dicke et al., 2020). More broadly, JD-R research (Bakker & Demerouti, 2017) has demonstrated that demands from the job context contribute to burnout and well-being (happiness, health, and job satisfaction).

## Directional ordering, reciprocal relationships, and interaction effects in the JD-R

### Directional ordering

Historically, JD-R theory has focused on the causal flow from job demands and resources to outcomes (Demerouti et al., 2001; Schaufeli & Bakker, 2004). However, Lesener et al. (2019) note that most of the many 1000s of empirical studies on the JD-R model only support the conclusion that the variables are correlated. Cross-sectional studies support neither the causal impact of job characteristics on employee outcomes nor the directional ordering of these variables. To address this issue, they sought JD-R studies that used a longitudinal cross-lag panel design in which the same variables are measured repeatedly on multiple occasions. They included all longitudinal studies based on at least two waves of data with at least one job characteristic (demand or resource) and at least one well-being outcome. Even using these minimal criteria, they identified 74 studies; only 29 were high-quality (e.g. measured all constructs at each wave). Although a few of these studies were from an educational setting (e.g. Dicke, Stebner, et al., 2018), none involved school principals. Several studies referred to leadership, leadership styles, and employees' perceptions of leaders. Still, none was a cross-lag-panel design of senior organisational leaders' (e.g. CEOs) demands, resources, and outcomes.

### Reciprocal relationships

The JD-R framework assumes that the causal ordering flows from demands and resources to outcomes. However, more recent versions of the model have acknowledged possible reciprocal relationships where occupational outcomes could also influence resources and demands (for an extended discussion and overview, see Bakker & Demerouti, 2014). Schaufeli and Taris (2014) (also see Lesener et al., 2019) cite Bandura's (1997) social cognitive theory as a theoretical basis for positing the reciprocal relations among job resources (self-efficacy, a personal resource) and outcomes (e.g. job performance).

Elaborating on this issue concerning extensions of the JD-R model, Bakker and Demerouti (2017) note reversed causal effects or feedback loops such that well-being outcomes influence subsequent job demands and resources. These reciprocal effects relating outcomes to job characteristics can thus result in positive (or negative) spirals. For example, a possible explanation for burnout predicting higher demands is a negative spiral (e.g. exhausted employees *perceive* their demands as even more demanding irrespective of their actual level and severity). Furthermore, other studies indicate that work engagement may increase resources (Dicke, Stebner, et al., 2018). Bakker and Demerouti (2014) offer a possible explanation that engaged employees can create resources directly and are also able to fulfill their goals. This, in turn, leads to enhanced social support and positive feedback, which are both important job resources. More broadly, Bakker and Demerouti (2017) propose that these reverse causal spirals can result in both positive spirals in the motivation processes and negative spirals in the health impairment process.

JD-R theory has been extended to include reciprocal relations between job characteristics and outcomes or so-called reverse causation (Bakker & Demerouti, 2007). However, based primarily on cross-sectional designs, job resources and demand are typically posited as merely correlated (i.e. having no directional ordering). Similarly, when multiple outcomes are considered,

they are typically posited as merely correlated. However, in cross-lag panel designs, it is essential to consider the possibility of reciprocal relations among all variables. More specifically (see Figure 1), cross-lag panel designs provide tests of reciprocal effects between job demands and resources and multiple outcome measures. Because of the nature of the cross-lag panel design, relations from variables in one wave to the next must be posited as a directional path rather than a correlation. Consider, for example, the reciprocal effects between two outcome variables (e.g. burnout and job satisfaction) over multiple waves. It would be possible to posit these paths as zero (akin to leaving them out). However, this would be an extreme a priori hypothesis, which would be difficult to justify based on prior research or theory. Because there is no basis for a priori predictions, we have left these reciprocal relations as a research question. Having said this, we note that the pattern of directional ordering among outcomes is important. For example, does happiness lead to higher levels of job satisfaction, or does job satisfaction lead to higher happiness, or is change in one unrelated to changes in the other? Questions like these are of interest and have potential implications for workplace research. Unfortunately, JD-R predictions are rarely conceptualized in relation to longitudinal data (e.g. cross-lag panel data), so reciprocal links are seldom considered. However, this does not mean that they are not relevant. Indeed, one of the goals of our paper is to pose questions that extend the traditional JD-R framework.

## Interaction effects

In addition to the main effects of demands and resources, their interactions have important consequences in that job resources can buffer the negative impacts of job demands (Demerouti et al., 2001; Schaufeli & Bakker, 2004). In particular, demands have especially negative consequences when demands are high and resources are low. This implies an interaction effect such that job resources can buffer or moderate the impact of job demands, and resources are especially motivational when demands are high. These interaction effects then predict subsequent outcomes in addition to the main (first-order) effects of demands and resources. Thus, a school principal with high resources, such as resilience, is better protected against the potential adverse effects of high job demands (a buffering effect). Nevertheless, according to Hu et al. (2013) (also see Martin & Marsh, 2019), evidence for these interactions is still weak and inconsistent. Indeed, Martin and Marsh (2019) found that the interaction between resilience and demands was nonsignificant when predicting student motivation. However, in a longitudinal JD-R study of beginning classroom teachers, Dicke, Stebner, et al. (2018) reported demand-resource interactions for both engagement (a mental health process) and burnout (a health impairment process). More specifically, they found the positive effects of resources (self-efficacy) on changes in engagement, particularly when demands (classroom disturbances) were high. These unresolved issues are the basis of our research question.

## Extending JD-R theory: The complex role of resilience as a resource

Broadly, resilience is the capacity and dynamic process of adaptively overcoming demands while maintaining normal psychological and physical functioning (Russo et al., 2012; Rutter, 2013; Southwick & Charney, 2012). The American Psychological Association (2020a) defines resilience as “the process of adapting well in the face of adversity, trauma, tragedy, threats or even significant sources of stress.” Whereas there is a scarcity of research on school principals' resilience,

we can draw parallels from those few studies on leaders in other organisational settings (Barling & Cloutier, 2017). For instance, Kermott et al. (2019) argue that resilience is a protective factor against workplace demands, burnout, job dissatisfaction, ill-being, and mental health problems. Nevertheless, Barling and Cloutier (2017) argue that despite a considerable focus on employees' mental health, longitudinal studies of leaders' occupational mental health and well-being are largely absent.

Critical models of resilience (a resource) and adversity (a demand) note that the two factors are closely related, such that building resilience involves reducing demands and enhancing resilience (Catterall, 1998; Rutter, 2013). High demands and adversity over time lead to adverse outcomes. Still, there is also a belief that the presence of demands may be necessary to develop resilience (see discussion by Martin & Marsh, 2019). However, Shpancer (2010) questioned the underlying logic of *Nietzsche's* adage, "That which does not kill us, makes us stronger," whereas Martin and Marsh (2006) suggested that the relation might be reciprocal. Nevertheless, at least for students in school settings, Martin and Marsh et al. (2019) found that academic adversity did not lead to higher levels of academic resilience. However, when adversity was experienced, its negative consequences were buffered to some extent by academic resilience. Relatedly, Dodge et al. (2012) proposed that if resilience is sufficient to meet the risk of adversity, the potentially harmful effects of adversity are buffered. However, if adversity levels exceed resilience, well-being and related outcomes are likely to suffer. Furthermore, they suggested that a lack of adversity can lead to stagnation that detracts from well-being. These theoretical models of resilience typically are not couched within a JD-R framework. Nevertheless, as noted above, these notions of demand-resource balances, interactions, and reciprocal effects are also highlighted in the Bakker and Demerouti's (2017) review of evolving issues in extending JD-R theory and research.

## Nonlinear effects of resilience

Also relevant is controversy surrounding the classic Yerkes and Dodson (1908) law, which dictates that positive outcomes and performance increase with escalating demands and arousal levels but only up to a point. When demands levels become too high, performance and other outcomes are likely to suffer. Hence, the Yerkes–Dodson law predicts that the effect of demands and adversity is nonlinear. However, even though this law continues to be widely cited, this 100-year-old scientific law based on animal behavior has been criticized—particularly in managerial and organisational psychology. For example, Corbert's (2015) review concluded that Yerkes–Dodson law has "no basis in empirical fact but continues to inform managerial practices which seek to increase or maintain, rather than minimise, levels of demands in the workplace as a means to enhance employee performance" (p. 741). Corbert argued that even support based on animal research was weak; its transformation to human behavior was mostly unsupported by subsequent empirical research showing that increasing demands are increasingly detrimental to performance. This led Cobert to call for a more critical evaluation of this law's validity and its implications for managerial practice. However, consistent with the Yerkes–Dodson law, Bakker and Demerouti (2017) suggested that demands can have a positive effect in the form of overcoming a challenge. Because the same variable can sometimes be both a hindrance and a challenge, they called for further research on when job demands act as hindrances or challenges. However, translating the Yerkes–Dodson law into a JD-R framework, increasing demands at low levels might be challenging but transform into a hindrance at high levels of demand.

Alternatively, resilience might only be evident in the face of demands; it might be enhanced by limited exposure to demands in situations that allow the person to cope effectively with the



experience (Rutter, 2013). Based on the logic of building immunity with medical inoculation, training programs designed to simulate gradually increasing levels of real-life demands (inoculation training) have been proposed to build resilience (Cornum et al., 2011; Meichenbaum & Deffenbacher, 1988; Robson & Manacapilli, 2014).

In summary, results regarding the interplay of demands and resources are inconclusive and largely unexplored with school principals. There seems to be an agreement that a higher level of resilience predicts less demands and resilience can buffer the negative effect of demands on well-being. However, it is unclear whether the experience of demands at manageable levels leads to increased resilience. These unresolved issues are the basis of our research questions.

## The present investigation

Our study is one of the most extensive longitudinal studies ever undertaken of school principals' demands, resources, health, and well-being, based on a nationally representative sample of 3683 Australian school principals over three annual waves. Within the JD-R framework (Bakker & Demerouti, 2007; Bakker et al., 2005; Schaufeli & Taris, 2014; see Figure 1), we evaluated longitudinal reciprocal effects over 3 years relating to demands, resources (resilience), job-related outcomes (burnout and job satisfaction), and personal outcomes (happiness and physical health). Following Lesener et al. (2019), we argue that JD-R's basic assumptions about the directional ordering cannot be tested in the typical JD-R cross-sectional study. Instead, a cross-lag panel design like that used here (Figure 1) is necessary. Consistent with JD-R theory (Demerouti et al., 2001; Schaufeli & Bakker, 2004), we expect job demands and resources to influence subsequent outcomes, controlling for prior measures of these outcomes. However, we also evaluate so-called reverse-reciprocal effects of prior outcomes (e.g. job satisfaction and burnout) on subsequent job demands and resources. These suppositions have important substantive and theoretical (JD-R) implications.

In response to substantively and theoretically important research questions, we extended our cross-lag panel design and the JD-R model to test the Yerkes–Dodson law, Nietzsche effects, and inoculation effects associated with demands (see earlier discussion). We pursue these issues within the well-established theoretical framework of the JD-R model (Bakker et al., 2005; Bakker & Demerouti, 2007; Schaufeli & Taris, 2014). However, we also address unresolved issues and directions for further research identified in Bakker and Demerouti's (2007) review of JD-R theory. More specifically, to guide our research, we posit one research hypothesis (an a priori directional prediction with a clear basis in theory and/or prior empirical research) and three research questions (a potentially important issue with insufficient theoretical or empirical research to make an a priori prediction about the direction of effect).

### Hypothesis 1: Effects of prior demands/resources on subsequent outcomes

Prior job resources (resilience) have beneficial effects on subsequent outcomes (burnout, job satisfaction, health, and happiness), whereas prior job demands adversely affect these subsequent outcomes. This is JD-R's basic theoretical assumption (Bakker & Demerouti, 2017) and is supported by empirical research (e.g. Lesener et al., 2019).

### Research Question 1: Reciprocal effects

Based on our longitudinal cross-lag panel design (Figure 1), we ask whether there are reciprocal effects relating to job demands, resources, and outcomes over time. Of particular interest are tests

(Bakker & Demerouti, 2017; also see Lesener et al., 2019) referred to as reversed causal effects or feedback loops such that well-being outcomes influence subsequent job demands and resources. There is also theoretical support for such positive and negative spirals based on Hobfoll's (2001) conservation of resources theory, Fredrickson and Joiner's (2002) theoretical model of well-being, and Bandura's (1997) social cognitive theory.

Possible reciprocal effects relating to demands and resources over time (i.e. the impact of prior demands on subsequent resources and prior resilience on subsequent demands) are also of interest. These are assumed to be merely correlated in JD-R cross-sectional studies, but their directional ordering is testable in cross-lag panel designs (Lesener et al., 2019). Moreover, such effects would be consistent with JD-R suggestions (Bakker & Demerouti, 2017) that perceptions of job demands are influenced by personal resources and vice-versa. Finally, possible reciprocal effects among outcomes address potentially interesting questions (does happiness lead to higher levels of job satisfaction, or does job satisfaction lead to higher happiness, or are changes in one unrelated to changes in the other). However, because of the speculative nature, limited research, and inconsistent finding on reciprocal effects in JD-R studies (but see Lesener et al., 2019), we leave this issue as a research question.

## Research Question 2: Nonlinear effects of resilience

In addition to the linear effects of demands, consistent with the Yerkes and Dodson (1908) law (also see Martin & Marsh, 2019), there might also be nonlinear effects of prior demands on subsequent outcomes at low-demand levels such that demands are not detrimental and may even be beneficial. However, the effects of demands become increasingly negative with moderate and high levels of demand. Nevertheless, because research on this issue is inconsistent, we leave it as a research question.

## Research Question 3: Moderated effects of job demands/resources

Resources might moderate the effect of demands (linear and nonlinear) on subsequent outcomes (e.g. the benefits of resilience are greater when demands are high). Demands-resources interactions are consistent with JD-R proposals that job resources can moderate the negative impacts of job demands (Demerouti et al., 2001; Schaufeli & Bakker, 2004), but support for this suggestion is weak and inconsistent (Hu et al., 2013; also see Martin & Marsh, 2019). Hence, we leave this issue as a research question.

## METHOD

### Sample

Participants were a large ( $N = 4230$ ) sample of Australian school leaders (72% principals, 28% deputy principals, and other school leaders) surveyed at the end of the third term (September and October) in 2017, 2018, and 2019 (44% male; mean year of birth = 1963,  $SD = 8.1$  years; 74% married); 64% of leaders worked in primary schools, 22% in secondary schools, and 14% in other settings (e.g. Kindergarten-Year 12 schools and special education schools). The average tenure in the current position was 5.2 years ( $SD = 4.3$ ) and 12.5 years in leadership roles generally ( $SD = 7.3$ ).

Participants are school principals and school leaders who responded to invitations from national and state-based school principal organisations. Participants in our study include nearly one-half of the school principals in Australia. This self-selected sample is not a true random sample. However, as outlined in more detail in annual reports (<https://www.healthandwellbeing.org/principal-reports>), the respondents and schools broadly represent the population of Australian school principals. Thus, for example, the Australian Bureau of Statistics reports that in 2019, 66% of Australian schools were primary schools, approximately the same as we report in our study (There are more primary schools because they tend to be smaller than high schools, which is also likely to be the case in other countries such as the US, where 75% of its schools are elementary schools; Duffin, 2020). Hence, the breakdown is consistent with the population of interest.

## Measures

We briefly describe the major measures used here (see Figure 1). We assessed these measures in all three data waves. In the [Supporting Information](#), we present the wording of the items (S1) and factor analysis in support of a well-defined factors structure (S2) for responses to all items and all constructs over the three waves of data.

### Job resources: Resilience

We measured resilience with a six-item scale adapted (e.g. “I tend to bounce back quickly after hard times”) from Smith et al. (2008, p. 195) (also see Marsh & Martin, 2006). This scale assesses an individual's ability to recover from setbacks and provides information about the resources needed to support this recovery. Alpha estimates of reliability were .89, .89, and .89 at 2017–2019, respectively.

### Demands

We treated demands as a formative variable based on 19 discrete demands based on school principals' qualitative responses about the most common sources of stress (e.g. sheer quantity of work, parent relations, financial management, and union/industrial disputes). We measured each of the 19 potential demands on a response scale of 1 = *a minor source* to 10 = *a major source*. As is appropriate for this formative index of job demands, we computed the average measure and treated it as a manifest variable (see Supporting Information S1). Internal consistency reliability is not necessarily appropriate for formative measures. Nevertheless, alpha reliability estimates for the multiple items were substantial (.94, .94, and .88 in 2017–2019, respectively).

### Job satisfaction

We used the job satisfaction scale from the Copenhagen Psychosocial Questionnaire that has been validated with school principals (e.g. Dicke, Marsh, et al., 2018; Lavigne et al., 2012). The 4-item measure includes specific (the physical working conditions) and global (job as a whole with everything taken into consideration) items. Alpha estimates of reliability were .83, .84, and .83 at 2017–2019, respectively.

## Burnout

We used the burnout scale from the Copenhagen Psychosocial Questionnaire that has been validated with school principals (e.g. Dicke, Marsh, et al., 2018; Lavigne et al., 2012). The 4-item measure includes items about the degree of physical (e.g. “how often have you been physically exhausted”) and emotional (e.g. “how often have you been emotionally exhausted”) fatigue/exhaustion during the last 4 weeks. Alpha estimates of reliability were .92, .92, and .93 at 2017–2019, respectively.

## General health

We measured general health with one global item (“In general, would you say your health is?”) using a 5-point response scale (1=*poor*, ... 5=*excellent*). This measure has been used in numerous questionnaires and predicts many different outcomes, including mortality, cardiovascular disease, hospitalization, use of medicine, absence from work, and early retirement (Idler & Benyamini, 1997).

## Happiness

We measured happiness with a single global item (“How often do you feel happy?”) using a 5-point response scale (1=*never*, ... 5=*all the time*). This single item has been used in numerous questionnaires and is highly predictive of many multi-item measures of well-being, life satisfaction, and other indices of positive affect (Marsh et al., 2019).

## Background/demographics/covariates

We consider an extensive set of covariates (see Figure 1 and Table 1) consisting of relatively continuous variables (year of birth and education level), dichotomous categorical variables represented by dummy variables (gender, leadership role, and marital status), and dummy variables for categorical variables with more than two categories (school level, primary or secondary with “other” as the left-out category, and school-type, Catholic and Independent, with “public/government” as the left-out category). We included covariates to control preexisting differences and the substantive interest in the relation between these variables and the variables described above.

## Statistical analyses

We conducted all analyses with Mplus 8 (Muthén & Muthén, 2018). For present purposes, we included all participants who responded in 2017 ( $n = 2,565$ ), 2018 ( $n = 2364$ ), or 2019 ( $n = 1952$ )—a total of 3683 unique participants who responded in at least one of the 3 years. As emphasized by the American Psychological Association (2020b, p. 87), the critical issue for missing data is the assumption of “missing at random (as when the probability of missing a value on a variable is not related to the missing value itself but may be related to other completely observable variables in the data set), or not missing at random (as when the probability of missing a value on a variable

TABLE 1 Latent factor correlation matrix of relations among the key variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 <sup>a</sup>	16	17	17
2017																		
1. Resilience	1.00																	
2. Demands	-.30	1.00																
3. Happy	.46	-.25	1.00															
4. Health	.31	-.22	.38	1.00														
5. Burnout	-.40	.42	-.45	-.47	1.00													
6. Job.Satis	.39	-.34	.44	.35	-.42	1.00												
2018																		
7. Resilience	.69	-.26	.35	.28	-.34	.32	1.00											
8. Demands	-.24	.64	-.21	-.21	.37	-.29	-.33	1.00										
9. Happy	.34	-.17	.52	.29	-.32	.34	.42	-.25	1.00									
10. Health	.26	-.18	.31	.71	-.38	.28	.32	-.25	.35	1.00								
11. Burnout	-.32	.34	-.32	-.37	.68	-.30	-.41	.47	-.42	-.47	1.00							
12. Job.Satis	.30	-.26	.34	.29	-.28	.60	.39	-.34	.46	.35	-.39	1.00						
2019																		
13. Resilience	.69	-.27	.33	.27	-.35	.30	.75	-.30	.38	.29	-.37	.33	1.00					
14. Demands	-.20	.61	-.18	-.20	.35	-.26	-.26	.68	-.21	-.22	.39	-.26	-.33	1.00				
15. Happy	.32	-.19	.47	.26	-.31	.30	.32	-.22	.49	.30	-.37	.35	.42	-.26	1.00			
16. Health	.25	-.15	.28	.66	-.34	.24	.29	-.19	.30	.71	-.41	.28	.34	-.21	.36	1.00		
17. Burnout	-.29	.30	-.28	-.34	.62	-.26	-.33	.38	-.32	-.36	.71	-.27	-.43	.44	-.45	1.00		
18. Job.Satis	.31	-.28	.35	.30	-.35	.58	.34	-.32	.39	.32	-.39	.65	.40	-.40	.45	.35	1.00	
Covariates																		
Gender (male)	.08	.01	.03	.03	.09	.04	.08	-.01	.06	.05	.05	.02	.06	-.01	.05	.04	.07	.03
YoB (young)	.03	-.10	.09	.11	-.23	.15	.04	-.18	.09	.15	-.26	.12	.04	-.15	.11	.14	-.28	.15

(Continues)

TABLE 1 (Continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 <sup>a</sup>	16	17	17
Principal	.03	-.07	-.04	.02	.01	-.09	.00	-.07	-.03	.01	.03	-.09	.04	-.08	-.04	.03	.01	-.07
Married	.00	.03	-.07	-.06	.03	-.04	.00	-.01	-.06	-.05	.01	-.03	.02	.02	-.04	-.06	.04	-.02
Secondary	-.08	-.04	.02	-.02	.03	.03	-.07	-.05	.03	-.01	.01	.03	-.04	-.05	.04	-.02	.02	-.01
Catholic	.03	-.01	-.04	-.03	.04	-.05	.02	.00	-.07	-.03	.06	-.06	-.02	.02	-.08	-.05	.06	-.09
Independent	-.03	.13	.01	-.08	.05	-.09	-.03	.12	-.04	-.07	.03	-.09	-.03	.11	.01	-.04	.02	-.09
Education	-.06	.01	-.04	-.07	.06	-.05	-.06	.05	-.04	-.07	.07	-.05	-.07	.03	-.02	-.06	.04	-.01

Note: Factor correlations for six factors: job demands and resources (resilience) and four outcomes: happiness, health, burnout, and job satisfaction collection on each of the three occasions (2017, 2018, and 2019). Shaded factors are the test-retest stability coefficients that are the basis of testing Hypothesis 1 and a multitrait-multimethod analysis of the discriminant validity of the six constructs. Also included are correlations among each of the  $6 \times 3 = 18$  constructs and selected covariates. Coefficients in light gray are not statistically significant ( $p > .05$ ).

is related to the missing value itself). It is also important to describe methods for addressing missing data, if any were used (e.g., multiple imputation).” Consistent with these guidelines, we addressed the issue of missing data and potential biases in interpreting the results in three ways (see Supporting Information S2 for more detail). First, we computed the total number of missing values for each participant and correlated this with responses to each item across the three waves. All correlations were less than .1 in absolute value ( $M_n r = -.05$ ,  $SD = .03$ ). Hence, the number of missing cases was relatively unrelated to any items for demands, resources, or outcomes in any of the three waves. Secondly, we used multiple imputations to estimate 10 replicates of the data, including an extensive set of covariates. Relatedly, we also note that any missing data mechanism associated with our demographic variables would not contribute to violating the MAR assumption or bias the interpretation of the results, because they were included as auxiliary variables and included in the final model. Third, we showed that the results were invariant over time. That is, the factor structure was the same for each of the three waves. Furthermore, the paths leading from Wave 1 variables to Wave 2 variables were consistent with those from the paths leading from Wave 2 variables to Wave 3 variables.

Latent interactions and quadratic effects were estimated using the latent moderated structural equation modeling (LMS) approach as operationalized in Mplus (Klein & Muthén, 2007; also see Marsh et al., 2012).

We based tests of our research hypothesis and questions on the values of parameter estimates from our overarching model. Thus, for example, Research Hypothesis 1 posited that there would be effects of demands and resources in one wave on the four outcomes in the subsequent wave, controlling for covariates and outcomes from the previous wave (see Figure 1). Research Hypothesis 1 resulted in eight ( $2 \times 4 = 8$ ) paths leading from prior demands and resources to subsequent outcomes. Our omnibus test provided a statistical test of the null hypothesis that all these coefficients were zero. All estimates in this set of parameter estimates were constrained to be zero. We applied a Wald test to test whether the difference was statistically significant compared to a model where these parameters were freely estimated (using the model constraint procedure in Mplus, Muthén & Muthén, 2018). We then evaluated in more detail the results of each of the eight paths separately that contribute to Research Hypothesis 1. Using this approach, we constructed omnibus tests to represent each of the research questions (i.e. the reciprocal effects, the nonlinear effects of resilience, and the demands-resilience interactions; see subsequent discussion of Table 2).

## Preliminary analyses: Factor structure and its invariance over time

We briefly summarize preliminary analyses supporting the factor structure and psychometric properties of responses to resources, demands, outcomes over time, and their relations with the set of covariates (see Table 1 and Figure 1; also see Supporting Information S2 and Mplus syntax, Supporting Information S3). In pursuit of the most appropriate measurement model to represent our data, we tested a set of increasingly stringent constraints over time. This culminated in our choice of the highly parsimonious, well-fitting confirmatory factor analysis (CFA) model that imposed invariance over the three waves of factor loadings, item intercepts, residual variances, and correlated uniquenesses (see Supporting Information S2 and S3). The goodness of fit for this a priori model was excellent in relation to current standards (e.g. the comparative fit index = .979, see Model 6 in Supporting Information Table S1). These results provide very strong support for the a priori factor structure and its invariance over the three measurement waves. In subsequent

TABLE 2 Tests of model constraints to test a priori hypotheses and research questions

Model Constraints	Chi-sq	Df	p-value
Effects of job demands and resources on subsequent outcomes (Hypothesis 1)			
Two job demands and resources → four outcomes (Hypothesis 1a)	26.02	8.00	.001
Reciprocal effects (Research Question 1)			
Two demands and resources → demands and resources (Research Question 1a)	6.07	2.00	.048
Four outcomes → demands and resources (Research Question 1b)	55.14	8.00	.000
Four outcomes → four outcomes (Research Question 1c)	96.39	12.00	.000
Nonlinear effects of demands (Research Question 2)			
Nonlinear demands → four outcomes	7.22	4.00	.125
Nonlinear demands → demands and resources + four outcomes	8.19	6.00	.225
Nonlinear demands → demands and resources	0.46	2.00	.795
Demands-linear × resilience interactions (Research Question 3)			
Demands-linear × resilience interaction → demands and resources + four outcomes	10.41	6.00	.108
Demands-linear × resilience interaction → four outcomes	5.94	4.00	.204
Demands-linear × resilience interaction → job demands and resources	3.78	2.00	.151
Demands-quad × resilience interactions (Research Question 3)			
Demands-quad × resilience interaction → demands and resources + Four outcomes	10.26	6.00	.114
Demands-quad × resilience interaction → four outcomes	6.49	4.00	.166
Demands-quad × resilience interaction → two job characteristics	3.04	2.00	.219

Note: Job resources are resilience. The four outcomes are job burnout, job satisfaction, general happiness, and general health. In each of the model constraints, each of the parameters in a set of parameter estimates was constrained to be zero, and a Wald test was used to determine if the difference was statistically significant in relation to the model where these parameters were not constrained to be zero (using the model constraint procedure in Mplus, Muthén & Muthén, 2018).

SEM analyses, this same measurement model (based on multiple indicators) was the basis of SEM models in which we constrained parameters to be invariant over time.

## RESULTS

As a preliminary advanced organiser, we begin with a brief evaluation of the latent correlations resulting from the CFA model (Supporting Information S2) that demonstrate the expected pattern of relations among the 18 variables (six variables × three waves). Within and across waves, job resources (resilience) are negatively related to demands and burnout but positively related to happiness, health, and job satisfaction. Job demands are negatively related to resources, job satisfaction, happiness, and health but positively related to burnout. These six constructs are relatively uncorrelated with background/demographic variables; most correlations are nonsignificant (Table 1). Demands are modestly higher for all three waves for principals in independent schools (compared to those in government and Catholic schools). In at least two of three waves, older principals had higher burnout and demands and lower health and job satisfaction.

### Hypothesis 1 *Effects of demands/resources on outcomes.*

Next, we present the results for Research Hypothesis 1 (also see Figure 1). Because all the critical paths are invariant over time, we only present paths from 2017 to 2018 (as the paths from



2018 to 2019 are constrained to be the same). We also used the model constraint option to provide omnibus tests of the statistical significance for groups of effects related to our research hypotheses and questions. We then evaluated support concerning each path.

Demands and resources are moderately correlated with the four outcomes within a wave (absolute values of  $r = .22$  to  $.46$  in Wave 1), and these correlations were highly consistent across the three waves. Hypothesis 1 predicts that job demands and resources in one wave significantly impact the set of four outcomes in the immediately subsequent wave (Tables 2 and 3; also see Figure 1).

An omnibus test of Hypothesis 1 showed that the combined effect of job demands and resources on the four outcomes was statistically significant (Wald test  $[8] = 26.02$ ,  $p = .001$ ; Table 2). However, the individual effects were not substantial (Table 3). Prior resources had statistically significant effects, positive for happiness (.05), but no significant effects on burnout, job satisfaction, or health. Prior demands had statistically significant effects on burnout (.05) and job satisfaction ( $-.06$ ), but no significant effects on happiness or health. In this respect, there was only partial support for Hypothesis 1.

## Research Question 1: Reciprocal effects

### Reciprocal effects of demands and resources (Research Question 1a)

In evaluating the effects of job demands and resources, we left as a research question as to whether there would be any reciprocal effects for demands and resources (i.e. demands  $\rightarrow$ resources or resources  $\rightarrow$ demands). We note that these two constructs correlated negatively within each of the three waves ( $r = -.33$  to  $-.30$ ; Table 1). However, the omnibus test of paths relating prior measures of one construct to subsequent measures of the other was only marginally significant (Wald test  $[2] = 6.07$ ,  $p = .048$ ; Table 2). Consistent with this result, path coefficients associated with this omnibus test were small. Prior demands had a significant effect on subsequent resources ( $-.04$ ), but the effect of prior resources on subsequent demands was nonsignificant.

### Effects of outcomes on job demands and resources (Research Question 1b)

As already noted, the four outcomes correlated moderately with job demands and resources within a wave (absolute value of  $r = .22$  to  $.46$  in Wave 1). These correlations were highly consistent across the three waves. In partial support of Hypothesis 1, we found that prior job demands and resources affected subsequent outcomes. In Research Question 1B, we asked whether the four outcomes in one wave would significantly affect the two drives in the subsequent wave, sometimes referred to as reverse causation (Tables 2 and 3; also see Figure 1).

An omnibus test showed that the combined effect of the four outcomes was statistically significant on job demands and resources (Wald test  $[8] = 55.14$ ,  $p < .001$ ; Table 2). In terms of changes in demands, there were positive effects of prior burnout (.11) and negative effects of prior job satisfaction ( $-.05$ ; Table 3). Changes in resources were significantly impacted by prior burnout ( $-.04$ ) and prior demands ( $-.04$ ). Hence, the two job-related outcomes affected three of the job-related characteristics. However, the two personal outcomes had no effects on either demands or resources.

**TABLE 3** Path coefficients used to evaluate hypotheses and research questions

		2017 predictor constructs (independent variables)															
		First-order (main effect) predictors						Interaction/nonlinear predictors									
		Job characteristics		Four outcomes				Demands x resource		Quadratic Resource		Quad resource x demands					
2018 constructs (dependent variables)		Resources	Demands	Happy	Health	Burnout	Satisfaction	Demands x resource	Quadratic Resource	Quad resource x demands	Resources	Demands	Happy	Health	Burnout	Satisfaction	
1. Job resources (Resources)	Est	0.57	-0.04	0.01	0.03	-0.04	0.03	-0.03	0.01	0.01	0.03	-0.03	0.01	0.01	0.03	0.02	0.01
	SE	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.01	0.01	0.02	0.01	0.01
2. Job demands (Demands)	Est	0.01	0.55	0.01	0.00	0.11	-0.05	-0.01	0.01	-0.01	-0.05	0.02	0.01	0.00	0.11	-0.05	-0.01
	SE	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.01
3. General happiness (Happy)	Est	0.05	0.02	0.34	0.04	-0.10	0.10	0.01	0.02	0.01	0.10	0.01	0.02	0.02	-0.10	0.10	0.02
	SE	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
4. General health (Health)	Est	0.03	0.03	0.03	0.61	-0.05	0.00	0.04	0.01	0.01	0.00	0.04	0.01	0.01	-0.05	0.00	-0.01
	SE	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.01
5. Job burnout (Burnout)	Est	-0.03	0.05	-0.02	-0.05	0.59	0.01	-0.01	0.02	0.02	0.01	-0.01	0.02	0.02	0.59	0.01	0.01
	SE	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.01
6. Job satisfaction (Satisfaction)	Est	-0.01	-0.04	0.05	0.05	-0.02	0.48	0.00	0.00	0.00	0.48	0.00	0.00	0.00	-0.02	0.48	0.03
	SE	0.03	0.02	0.02	0.02	0.02	0.04	0.02	0.02	0.02	0.04	0.02	0.02	0.02	0.02	0.04	0.02

Note: Standardised path coefficients (Est, and standard errors, SE) relating the 2017 constructs (two job characteristics, four outcomes, and three interaction/nonlinear predictors) to the six 2018 constructs.

This model is based on Model 6 (Table 1) in which parameter estimates are constrained to be equal across the three waves.

Path coefficients are constrained to be invariant over time so that paths relating 2018 predictors to 2019 predictors are the same as those shown here.

## Reciprocal effects among the four outcomes (Research Question 1c)

We also left as a research question whether there would be reciprocal effects between the four outcomes. The four constructs correlated moderately within each wave (e.g. the absolute value of  $r = .36$  to  $.47$  in Wave 1), and these correlations were highly consistent across the three waves. The omnibus test of paths relating prior measures of one outcome to changes in a subsequent (nonmatching) outcome was statistically significant (Wald test  $[12] = 96.39$ ,  $p < .001$ ; Table 2). Consistent with this result, a number of the corresponding path coefficients were statistically significant, although modest in size (see Table 3): Prior health had significant effects on subsequent changes in happiness, burnout, and job satisfaction; prior happiness had a significant impact on subsequent changes in job satisfaction; prior burnout had significant effects on subsequent changes in happiness and health; prior job satisfaction had a significant effect on subsequent changes in happiness.

## Research Question 2: Nonlinear effects of demands

Concerning Research Question 2, prior demands nonlinear effects were not significant for subsequent changes in any of the six constructs. An omnibus test showed that the combined effect of the quadratic effects of prior demands on the six constructs (demands, resources, and four outcomes) was nonsignificant (Wald test  $[6] = 8.19$ ,  $p = .225$ ; Table 2), as were the nonlinear effects considered separately for job demands and resources. Consistent with these results, the corresponding parameter estimates in Table 3 are all small and nonsignificant. In summary, contrary to the Yerkes–Dodson law, there were no significant nonlinear effects of demands (also see Simonsohn, 2018).

## Research Question 3: Interactions between demands and resources

In relation to Research Question 3, there were no significant effects of resources interacting with demands (either linear or nonlinear components) impacting changes in any of the six constructs in a subsequent wave. An omnibus test showed the combined effect of these interactions on the six constructs (job demands, resources, and four outcomes) were statistically nonsignificant; Wald test  $[6] = 10.26$ ,  $p = .114$ ; Table 2) as were the effects considered separately. In summary, there are no significant demands-resources interaction effects on subsequent changes in job characteristics or outcomes.

## DISCUSSION

School principals face increasing levels of demands and adversity associated with increasing regulatory pressures, competition between schools, and externally imposed metrics of effectiveness and expectations to create a positive ethos that supports teachers, students, and whole communities (Day, 2011; Leithwood & Louis, 2012). Within the JD-R framework, we evaluated the longitudinal effects of job demands and resources on job-related (burnout and job satisfaction) and personal (happiness and health) outcomes. In support of our measures' psychometric validity, we demonstrated that these six constructs over 3 consecutive years were well-defined,

highly stable over time, and highly differentiated and showed predictable patterns of correlations. Broadly consistent with expectations, our results suggested the beneficial effects of resources and adverse effects of demands, particularly for job-related outcomes. In partial support of a priori predictions (Hypothesis 1), demands negatively affected changes in job satisfaction and positively affected changes in burnout. However, contrary to predictions, prior resources had no significant effects on job-related outcomes.

In Research Question 1, we evaluated reciprocal effects over time for the different sets of measures. Demands and resources were negatively correlated within each time wave. Prior demands negatively affected subsequent job resources but not vice-versa (Research Question 1a). In tests of so-called reverse causality (outcomes  $\rightarrow$  job demands and resources; Research Question 1b), subsequent levels of demands were associated with prior levels of burnout (positively) and job satisfaction (negatively). Prior burnout also affected subsequent resources. There was also evidence of effects of prior outcomes on changes in subsequent outcomes (Research Question 1c) beyond those explained by job demands and resources. Prior health had significant effects on subsequent happiness, burnout, and job satisfaction; happiness on job satisfaction; burnout on happiness and health; and job satisfaction on happiness.

We evaluated the nonlinear effects of demands (Research Question 2) and resource-demand interactions (Research Question 3). In response to substantively and theoretically important issues underpinning these research questions, there were neither nonlinear effects of demands on subsequent outcomes nor interaction effects. In summary, contrary to the Yerkes–Dodson law, there were no significant nonlinear effects of demands (also see Simonsohn, 2018). Contrary to inoculation theories of demands and Nietzsche effects, not even low-demands levels led to increased resources.

## Juxtaposing our findings with prior research

Although no comparable studies of school principals or organisational leaders exist, Lesener et al. (2019) reviewed longitudinal JD-R cross-lag panel studies of employees in general. Their meta-analysis SEM evaluated the effects of four primary JD-R variables (demands, resources, burnout, and well-being/engagement) from Wave 1 to Wave 2 for 74 studies. They reported test–retest stability correlations (.62 to .66) slightly lower than ours (.60 to .75; Table 1). They focused primarily on the 12 paths relating their four JD-R variables from Wave 1 to Wave 2 (excluding stability coefficients); 6 of their 12 paths were significant (.06 to .20 in absolute value), whereas only 5 of our corresponding 12 paths were significant (.04 to .11; Table 3).

The pattern and direction of significant paths were similar in the Lesener et al. (2019) meta-analysis and our study (see Supporting Information S4 for more detail). However, paths in our study were slightly smaller, partly due to differences in the stability of effects and particularly the variables included. Lesener et al. included only their primary four JD-R variables. In contrast, we included 17 variables (Figure 1): their four JD-R variables (demands, resources, and two job-related outcomes) but also two personal outcomes (health and happiness), three multiplicative effects of resources, and eight covariates. Had their meta-analysis been able to include these additional variables, paths in their SEM would likely have been smaller. However, because of these differences in the models, it is more relevant to compare the corresponding six correlations relating these four variables from one wave to the next. Excluding test–retest correlations, the mean absolute value of the six correlations in our study (.29; Table 1) is slightly larger than in their meta-analysis (.27). We compared the pattern of correlations with a profile similarity

index (PSI = .97), showing that the pattern was almost exactly the same. In summary, the correlations among the four JD-R variables in the two studies are remarkably similar.

## Strengths and weaknesses of our study

Our study is one of the largest longitudinal studies of school principals' demands, resources, burnout, and well-being. Furthermore, it addresses a gap in organisational leadership research (see Barling & Cloutier, 2017; Lesener et al., 2019). Our study has many strengths, including psychometrically strong measures; sophisticated latent variable models; a large, nationally representative longitudinal sample of school principals covering 3 consecutive years; and good control for covariates and missing data. There are, of course, important limitations and directions for further research. Our large, broadly representative sample of Australian school principals is both a strength and a limitation. In particular, there is a need to test the generalizability of our results to school principals in other countries, teachers, organisational leaders in other occupational groups, and other employee groups. In addition, our measures were based on self-reports that might introduce method effects that distort relations among demands, resources, and outcomes (Podsakoff & Organ, 1986). The well-defined factor structure and relatively modest corrections among constructs provide some protection concerning this limitation. Nevertheless, although it can be argued that school principals are best suited to evaluate the constructs considered here, it would be useful to cross-validate the results with ratings by colleagues and supervisors and by objective measures. We also note the construct correspondence as a potential limitation that might have affected the interpretation of the results (De Jonge et al., 2008; Dicke, Stebner, et al., 2018). Thus, for example, our measure of resources (resilience) is operationalized at a general level (but in the context of a school workplace setting), whereas demands were specific to situations actually experienced by school principals.

## Evolving issues in JD-R theory: Directions for further research

We positioned our study within the broad JD-R framework. Hence, it is useful to situate our study in relation to further research and evolving issues in JD-R research raised in Bakker and Demerouti's (2017) (also see Lesener et al., 2019) review.

### Positive (gain) and negative (loss) spirals

Noting that most JD-R studies are cross-sectional, Bakker and Demerouti (2017) and Lesener et al. (2019) highlighted longitudinal studies demonstrating what they referred to as reversed causal effects (effects of prior outcomes on subsequent demands or resources). These reverse causality effects can result in feedback loops between job characteristics and outcomes that create positive or negative spirals. Bakker and Demerouti (2017) noted this, particularly for the motivational process in JD-R theory. Our study found evidence of reverse causality for the effects of prior burnout and job satisfaction on subsequent job characteristics. However, there is a need for more theoretical work on the nature of positive/negative spirals within the context of JD-R and the psychological mechanisms explaining them (Bakker & Demerouti, 2017; but also see Fredrickson & Joiner, 2002; Hobfoll, 2001). Complementing this theoretical development requires stronger longitudinal designs and statistical models of change over time.

## Dual processes: Independence of health impairment and motivational processes

According to JD-R theory (Bakker & Demerouti, 2017), the health impairment process (demands → burnout) is largely independent of the motivational process (resources → job satisfaction). Nevertheless, some studies show direct links between job resources and burnout. Bakker and Demerouti (2017) suggested that these were due to weak designs (e.g. cross-sectional rather than longitudinal) but recognized this as an unresolved issue. However, our results do not support the independence of these two processes. In particular, we found:

- Positive effect of prior burnout (outcome) on subsequent demands (demand), consistent with a reverse health impairment process, but also an effect of burnout on resources
- Negative effect of prior job satisfaction (outcome) on subsequent burnout (a reverse cross-over process) but also a negative effect of prior demands on subsequent job satisfaction

However, as a possible resolution to the unresolved issue, Bakker and Demerouti (2017) suggested that diminished health and motivation are reciprocally related. Their suggestion is consistent with our finding of negative effects from prior burnout to subsequent happiness and health, as well as positive effects on subsequent levels of perceived demands.

## Hindrance and challenge demands

JD-R theory distinguishes between what Bakker and Demerouti (2017) refer to as hindrance demands that negatively affect outcomes and challenge demands that positively affect motivation. Challenge demands such as workload, time pressure, and responsibility are posited to be sufficiently rewarding to offset the costs, resulting in positive effects. Bakker and Demerouti noted that research was needed to determine when job demands are hindrances versus challenges. This also follows from the classic Yerkes and Dodson (1908) law positing non-linear relations between demands and outcomes. Our study addressed this issue, testing nonlinear effects of demands; that increasing demands at low levels might have positive effects (a challenge demand) and adverse effects when demands are high (a hindrance demand). However, we found no support for the nonlinear effects of demands. Nevertheless, we speculate that this was due to the very high demands faced by school principals; we had no tests of the potentially positive effects when demands were low. However, this issue warrants further research. Indeed, the optimal value of when a good demand turns into a hindrance (the inflection point of a U-shaped function; also see Simonsohn, 2018) is likely to vary from individual to individual, so stronger theory and statistical models are needed.

## Interaction effects

JD-R posits that resources are most beneficial when demands are high. However, Bakker and Demerouti (2017) note that much of this research is based on cross-sectional studies, so more longitudinal research is needed. We addressed this issue by evaluating demand-resource interactions. However, none of these interactions was statistically significant. Although inconsistent with JD-R theory, support for these interactions is based largely on cross-sectional studies.

This led Bakker and Demerouti (2017, p. 278) to note: “We still miss evidence on whether the same constellation of working conditions will have favorable effects on employee well-being and outcomes over time.”

Furthermore, we note that resources and demands were not explicitly matched in relation to domain specificity. Our measure of resources (resilience) is a general measure of a personal outcome, whereas demands were specific to sources of stress experienced by principals. However, other research (e.g. Dicke, Marsh, et al., 2018) has supported the proposed interaction when there is a triple-match correspondence between demands, resources, and outcomes. In this respect, there is a need for further research with a broader range of demands, resources, and outcomes that provide more robust tests of the matching principle (e.g. De Jonge et al., 2008).

## Underlying mechanisms

An important limitation in JD-R research and our study are failures to provide explanatory underlying mechanisms and processes that mediate the effects of job demands and resources on subsequent changes in outcomes (Bakker & Demerouti, 2017; Trépanier et al., 2015). For example, Bakker and Demerouti (2017) cited early research by Hackman and Oldham (1980), suggesting that psychological states such as experienced meaningfulness of the work, experienced responsibility for the outcomes of work, and knowledge of actual results might be critical mediators. They also noted that self-determination theory (Ryan & Deci, 2017) proposes that the satisfaction (and non-frustration) of basic psychological needs for relatedness, competence, and autonomy might mediate the effects of job demands and resources on outcomes. Thus, for example, previous research found that a lack of autonomy is associated with burnout (see Maslach et al., 2001).

Relatedly, Trépanier et al. (2015) integrated research on obsessive and harmonious passion into the JD-R framework, positing these two components of passion as mediating variables. Consistent with their predictions, job demands and resources were predictive of passion, and the two components of passion partially mediated paths from job demands/resources to burnout and engagement. However, their cross-sectional study provided only a weak test of the implicit assumption of directional ordering underpinning the proposed mediation. Recognizing this as a limitation of existing research, Bakker and Demerouti (2017) (also see Parker et al., 2012) noted that further research was needed to explore mediating psychological processes and integrate them into the JD-R framework theories underpinning these processes (e.g. self-determination theory).

We note, however, that this further research should be longitudinal. Critical issues in this subsequent longitudinal research include clarification of the role of mediators in the JD-R model (e.g. are job passion, autonomy, and meaningfulness mediating mechanisms or simply additional personal resources like self-efficacy and optimism); juxtaposition with competing psychological mechanisms that mediate relations between job demands/resources and outcomes (e.g. need satisfaction/frustration posited in self-determination theory); tests of the assumed causal ordering from job demands and resources to mediators and from mediators to outcomes; potential reciprocal effects (particularly so-called reverse causation); and tricky statistical issues in increasingly complex models of longitudinal panel data, multicollinearity, moderation, mediation, mediated-moderation, and moderated-mediation. Although beyond the scope of our investigation, we agree with Bakker and Demerouti (2017) that these issues are important directions for further research.

## Occupational mental health and well-being of school principals and other organisational leaders

Much of the emphasis on JD-R research and application is on improving the strategies used by organisational leaders to manage better the demands and resources integral to their leadership role. Thus, when positing future directions for JD-R theory, Bakker and Demerouti (2017) emphasized how leaders can influence the working environments that affect their employees' demands, resources, and outcomes. However, there has been a dearth of JD-R studies focusing on leaders themselves and the influences of job characteristics on leaders' mental health and well-being. Thus, Barling and Cloutier (2017) note the emotional toll of leadership and organisations' failure to address their leaders' well-being. From this perspective, our study is one of the most extensive studies of school principals' mental health issues and that of organisational leaders more generally. It provides a unique look at how job demands and resources influence leaders' occupational mental health and well-being in the education sector. It also provides a potentially important link between educational, organisational, occupational health, and psychological research within JD-R's broad framework.

## CONCLUSION AND PRACTICAL IMPLICATIONS

School principals are in charge of large, multifaceted organisations and are under increasing public scrutiny from diverse stakeholders. School principals play a crucial role in our society but report increasingly high demands, burnout, and attrition. Thus, policy-makers must act to reverse this imminent crisis to ensure that our schools and society flourish rather than flounder. Nevertheless, large-scale, longitudinal studies of the demands and resources that drive principals' well-being are largely absent from occupational health, education, leadership, organisation, and psychology journals. We evaluated the longitudinal effects of demands and resources (resilience) on job-related (burnout and job satisfaction) and personal (happiness and physical health) outcomes for a large representative sample of Australian school principals. We position this study under the well-established JD-R theoretical framework in a synergy of educational and organisational/workplace psychology. In partial support of a priori predictions, our results suggest beneficial effects of resources and adverse effects of demands, particularly for job-related outcomes. However, in response to theoretically and substantively important issues, we found no nonlinear effects of demands on subsequent outcomes nor effects of resource-demand interactions. Relating our study to new and evolving issues in JD-R research, we offer limitations of our research—and JD-R theory and research more generally—and directions for further research in this essentially unstudied field of the antecedents of mental health and well-being of school principals. We also provide potentially important links between occupational health, educational, leadership, organisational, and psychological research within the broad framework of JD-R.

The reciprocal relations between burnout and job demands suggest an ongoing mutual intensification resulting in a vicious circle (Bakker & Demerouti, 2017; but also see Fredrickson & Joiner, 2002; Guthier et al., 2020; Hobfoll, 2001). Thus, successful interventions and strategies in reducing burnout are also likely to improve leaders' perceptions of demands.

School principals need credible proactive feedback about their levels of demands and sources of stress. It is also essential that participants are confident about the confidentiality of the individual responses to the survey administered by a University Research Institute that is independent of state departments of education and other regulatory bodies. A critical feature of our ongoing



research is to provide school principals immediate (within minutes of completing the survey) ongoing feedback that allows them to monitor critical constructs such as job demands and sources of stress compared to those experienced by other school principals and changes in their own levels over time. This feedback includes “red flag” warnings suggesting that school principals should consider seeking professional assistance. School principals view this feedback as the most valuable contribution of our research. Alongside this, the state and national school principal associations value the aggregate reports on their members that help them form policy within their organisation. Additionally, results from our research have resulted in policy changes by multiple Australian state departments of education to support the ongoing well-being of school principals. Thus, for example, based on the results from our survey showing the increasing levels of bullying and abusive behavior directed at principals, new Victorian state legislation empowers principals to ban abusive parents from the school grounds. Hence, school principals, professional organisations, and state and national regulatory and governmental agencies all value the annual reports from our survey that provide a collective voice for concerns faced by school principals.

### ACKNOWLEDGEMENTS

This study is based on an overarching research project entitled ‘School Principals Diminishing Wellbeing: What Makes a Positive Difference?’ that was funded by the Australian Research Council (Grant No. LP160101056) under the supervision of lead principal investigator Professor Herb Marsh.

### CONFLICT OF INTEREST

There are no conflicts of interest.

### ETHICS STATEMENT

This research project, including research presented here, was judged as low risk and approved by the Australian Catholic University Ethics Review Committee (ethics report 2018-72H) and subsequently extended through 2025.

### DATA AVAILABILITY STATEMENT

Data are available upon request, subject to limitations associated with confidentiality.

### ORCID

Herbert W. Marsh  <https://orcid.org/0000-0002-1078-9717>

Philip D. Parker  <https://orcid.org/0000-0002-4604-8566>

### REFERENCES

- American Psychological Association. (2020a). Building your resilience. <http://www.apa.org/topics/resilience>
- American Psychological Association. (2020b). *Publication manual of the American Psychological Association*.
- Bakker, A. B., & Demerouti, E. (2007). The job demands-resources model: State of the art. *Journal of Managerial Psychology*, 22, 309–328. <https://doi.org/10.1108/02683940710733115>
- Bakker, A. B., & Demerouti, E. (2014). Job demands-resources theory. Well-being, 3, 1–28. In P. Chen & C. Cooper (Eds.). *Work and wellbeing: Wellbeing: A complete reference guide* (Vol. III, pp. 1–28). Wiley. <https://doi.org/10.1002/9781118539415.wbwell019>
- Bakker, A. B., & Demerouti, E. (2017). Job demands-resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology*, 22(3), 273–285. <https://doi.org/10.1037/ocp0000056>
- Bakker, A. B., Demerouti, E., & Euwema, M. C. (2005). Job resources buffer the impact of job demands on burnout. *Journal of Occupational Health Psychology*, 10(2), 170–180. <https://doi.org/10.1037/1076-8998.10.2.170>

- Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2002). Validation of the Maslach burnout inventory—General survey: An internet study. *Anxiety, Stress, and Coping, 15*, 245–260. <https://doi.org/10.1080/1061580021000020716>
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. Freeman.
- Barling, J., & Cloutier, A. (2017). Leaders' mental health at work: Empirical, methodological, and policy directions. *Journal of Occupational Health Psychology, 22*(3), 394–406. <https://doi.org/10.1037/ocp0000055>
- Bartanen, B., Grissom, J. A., & Rogers, L. K. (2019). The impacts of principal turnover. *Educational Evaluation and Policy Analysis, 41*(3), 350–374. <https://doi.org/10.3102/0162373719855044>
- Catterall, J. S. (1998). Risk and resilience in student transitions to high school. *American Journal of Education, 106*(2), 302–333. <https://doi.org/10.1086/444184>
- Corbert, M. (2015). From law to folklore: Work stress and the Yerkes–Dodson law. *Journal of Managerial Psychology, 30*, 741–752. <https://doi.org/10.1108/JMP-03-2013-0085>
- Cornum, R., Matthews, M. D., & Seligman, M. E. P. (2011). Comprehensive soldier fitness: Building resilience in a challenging institutional context. *American Psychologist, 66*(1), 4–9. <https://doi.org/10.1037/a0021420>
- Darmody, M., & Smyth, E. (2016). Primary school principals' job satisfaction and occupational stress. *International Journal of Educational Management, 30*, 115–128. <https://doi.org/10.1108/IJEM-12-2014-0162>
- Day, D. (2011). Leadership development. In A. Byrman, D. Collinson, K. Grint, B. Jackson, & M. Uhl-Bien (Eds.), *The SAGE handbook of leadership* (pp. 37–50). SAGE.
- De Jonge, J., Dormann, C., & Van den Tooren, M. (2008). The demand-induced strain compensation model: Renewed theoretical considerations and empirical evidence. In K. Näswall, J. Hellgren, & M. Sverke (Eds.), *The individual in the changing working life* (pp. 67–88). Cambridge University Press. [10.1017/CBO9780511490064.004](https://doi.org/10.1017/CBO9780511490064.004)
- Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology, 86*, 499–512. <https://doi.org/10.1037/0021-9010.86.3.499>
- Dewa, C. S., Dermer, S. W., Chau, N., Lowrey, S., Mawson, S., & Bell, J. (2009). Examination of factors associated with the mental health status of principals. *Work, 33*(4), 439–448. <https://doi.org/10.3233/WOR-2009-0892>
- Dicke, T., Marsh, H. W., Parker, P. D., Guo, J., Riley, P., & Waldeyer, J. (2020). Job satisfaction of teachers and their principals in relation to climate and student achievement. *Journal of Educational Psychology, 112*, 1061–1073. <https://doi.org/10.1037/edu0000409>
- Dicke, T., Marsh, H. W., Riley, P., Parker, P. D., Guo, J., & Horwood, M. (2018). Validating the Copenhagen Psychosocial Questionnaire (COPSOQ-II) using set-ESEM: Identifying psychosocial risk factors in a sample of school principals. *Frontiers in Psychology, 9*, 584. <https://doi.org/10.3389/fpsyg.2018.00584>
- Dicke, T., Parker, P. D., Guo, J., Basarkod, G., Marsh, H. W., Deady, M., Harvey, S., & Riley, P. (2022). Ubiquitous emotional exhaustion in school principals: Stable trait, enduring autoregressive trend, or occasion-specific state? *Journal of Educational Psychology, 114*(2), 426–441. <https://doi.org/10.1037/edu0000582>
- Dicke, T., Stebner, F., Linninger, C., Kunter, M., & Leutner, D. (2018). A longitudinal study of teachers' occupational well-being: Applying the job demands-resources model. *Journal of Occupational Health Psychology, 23*(2), 262–277. <https://doi.org/10.1037/ocp0000070>
- Dodge, R., Daly, A., Huyton, J., & Sanders, L. (2012). The challenge of defining wellbeing. *International Journal of Wellbeing, 2*(3), 222–235. <https://doi.org/10.5502/ijw.v2i3.4>
- Duffin, E. (2020). Number of elementary and secondary schools in the United States in 2017/2018, by school type. Statista, retrieved from <https://www.statista.com/statistics/238307/number-of-uselementary-and-secondary-schools>
- Fredrickson, B. L., & Joiner, T. (2002). Positive emotions trigger upward spirals toward emotional well-being. *Psychological Science, 13*(2), 172–175. <https://doi.org/10.1111/1467-9280.00431>
- Friedman, I. A. (2002). Burnout in school principals: Role related antecedents. *Social Psychology of Education, 5*, 229–251. <https://doi.org/10.1023/A:1016321210858>
- Goldring, R., & Taie, S. (2018). Principal attrition and mobility: Results from the 2016–17 principal follow-up survey (NCES 2018–066) (Technical report). National Center for Education Statistics.
- Grissom, J. A., & Bartanen, B. (2019). Principal effectiveness and principal turnover. *Education Finance and Policy, 14*(3), 355–382. [https://doi.org/10.1162/edfp\\_a\\_00256](https://doi.org/10.1162/edfp_a_00256)
- Grissom, J. A., Bartanen, B., & Mitani, H. (2019). Principal sorting and the distribution of principal quality. *AERA Open, 5*, 2019. <https://doi.org/10.1177/2332858419850094>
- Grissom, J. A., Loeb, S., & Mitani, H. (2015). Principal time management skills. *Journal of Educational Administration, 53*(6), 773–793. <https://doi.org/10.1108/JEA-09-2014-0117>

- Guthier, C., Dormann, C., & Voelke, M. C. (2020). Reciprocal effects between job stressors and burnout: A continuous time meta-analysis of longitudinal studies. *Psychological Bulletin*, *146*(12), 1146–1173. <https://doi.org/10.1037/bul0000304>
- Hackman, J. R., & Oldham, G. R. (1980). *Work redesign*. Addison-Wesley.
- Hallinger, P. (2011). Leadership for learning: Lessons from 40 years of empirical research. *Journal of Educational Administration*, *49*(2), 125–142. <https://doi.org/10.1108/09578231111116699>
- Hobfoll, S. E. (2001). The influence of culture, community, and the nested self in the stress process: Advancing conservation of resources theory. *Applied Psychology: An International Review*, *50*, 337–370. <https://doi.org/10.1111/1464-0597.00062>
- Horwood, M., Marsh, H. W., Parker, P. D., Riley, P., Guo, J., & Dicke, T. (2021). Burning passion, burning out: The passionate school principal, burnout, job satisfaction, and extending the dualistic model of passion. *Journal of Educational Psychology*, *113*, 1668–1688. <https://doi.org/10.1037/edu0000664>
- Hu, Q., Schaufeli, W. B., & Taris, T. W. (2013). Does equity mediate the effects of job demands and job resources on work outcomes? An extension of the job demands-resources model. *Career Development International*, *18*, 357–376. <https://doi.org/10.1108/CDI-12-2012-0126>
- Idler, E. L., & Benyamini, Y. (1997). Self-rated health and mortality: A review of twenty-seven community studies. *Journal of Health and Social Behavior*, *38*(1), 21–37. <https://doi.org/10.2307/2955359>
- Judge, T. A., Weiss, H. M., Kammeyer-Mueller, J. D., & Hulin, C. L. (2017). Job attitudes, job satisfaction, and job affect: A century of continuity and of change. *Journal of Applied Psychology*, *102*(3), 356–374. <https://doi.org/10.1037/apl0000181>
- Kermott, C. A., Johnson, R. E., Sood, R., Jenkins, S. M., & Sood, A. (2019). Is higher resilience predictive of lower stress and better mental health among corporate executives? *PLoS ONE*, *14*(6), e0218092. <https://doi.org/10.1371/journal.pone.0218092>
- Klein, A. G., & Muthén, B. O. (2007). Quasi-maximum likelihood estimation of structural equation models with multiple interaction and quadratic effects. *Multivariate Behavioral Research*, *42*(4), 647–673. <https://doi.org/10.1080/00273170701710205>
- Kruger, M. L., Van Eck, E., & Vermeulen, A. (2005). Why principals leave: Risk factors for premature departure in the Netherlands compared for women and men. *School Leadership and Management*, *25*(3), 241–261. <https://doi.org/10.1080/13634230500116322>
- Kuper, H., & Marmot, M. (2003). Job strain, job demands, decision latitude, and risk of coronary heart disease within the Whitehall II study. *Journal of Epidemiology and Community Health*, *57*(2), 147–153. <https://doi.org/10.1136/jech.57.2.147>
- Lavigne, G. L., Forest, J., & Crevier-Braud, L. (2012). Passion at work and burnout: A two-study test of the mediating role of flow experiences. *European Journal of Work and Organizational Psychology*, *21*(4), 518–546. <https://doi.org/10.1080/1359432X.2011.578390>
- Leithwood, K., & Louis, K. S. (2012). *Linking leadership to student learning*. Jossey-Bass.
- Lesener, T., Gusy, B., & Wolter, C. (2019). The job demands-resources model: A meta-analytic review of longitudinal studies. *Work & Stress*, *33*, 1–103. <https://doi.org/10.1080/02678373.2018.1529065>
- Marsh, H. W., Huppert, F. A., Donald, J. N., Horwood, M. S., & Sahdra, B. K. (2019). The well-being profile (WB-pro): Creating a theoretically based multidimensional measure of well-being to advance theory, research, policy, and practice. *Psychological Assessment*. Advance online publication, *32*, 294–313. <https://doi.org/10.1037/pas0000787>
- Marsh, H. W., Wen, Z., Nagengast, B., & Hau, K. T. (2012). Structural equation models of latent interaction. In R. H. Hoyle (Ed.), *Handbook of structural equation modeling* (pp. 436–458). Guilford Press.
- Martin, A. J., & Marsh, H. W. (2006). Academic resilience and its psychological and educational correlates: A construct validity approach. *Psychology in the Schools*, *43*, 267–282. <https://doi.org/10.1002/pits.20149>
- Martin, A. J., & Marsh, H. W. (2019). Investigating the reciprocal relations between academic buoyancy and academic adversity: Evidence for the protective role of academic buoyancy in reducing academic adversity over time. *International Journal of Behavioral Development*, *44*, 301–312. <https://doi.org/10.1177/0165025419885027>
- Maslach, C., & Leiter, M. P. (2008). Early predictors of job burnout and engagement. *Journal of Applied Psychology*, *93*(3), 498–512. <https://doi.org/10.1037/0021-9010.93.3.498>
- Maslach, C., Schaufeli, W., & Leiter, M. (2001). Job burnout. *Annual Review of Psychology*, *52*(1). <https://doi.org/10.1146/annurev.psych.52.1.397>

- Meichenbaum, D. H., & Deffenbacher, J. L. (1988). Stress inoculation training. *The Counseling Psychologist*, *16*(1), 69–90. <https://doi.org/10.1177/0011000088161005>
- Muthén, L. K., & Muthén, B. O. (2018). *Mplus user's guide* (Seventh ed. Edition. (Version 8) [Computer manual]). Muthén & Muthén.
- National Association of Elementary and Secondary Principals. (2008). The K-8 principal in 2008. A 10-year study. Eighth in a Series of Research Studies Launched in 1928. Available at: [https://www.naesp.org/sites/default/files/10-year\\_study-2008.pdf](https://www.naesp.org/sites/default/files/10-year_study-2008.pdf)
- Parker, P. D., Martin, A. J., Colmar, S., & Liem, G. A. (2012). Teachers' workplace well-being: Exploring a process model of goal orientation, coping behavior, engagement, and burnout. *Teaching and Teacher Education*, *28*(4), 503–513. <https://doi.org/10.1016/j.tate.2012.01.001>
- Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management*, *12*(4), 531–544. <https://doi.org/10.1177/014920638601200408>
- Poirel, E., Lapointe, P., & Yvon, F. (2012). Coping with administrative constraints by Quebec school principals. *Canadian Journal of School Psychology*, *27*, 302–318. <https://doi.org/10.1177/0829573512461131>
- Rangel, V. S. (2018). A review of the literature on principal turnover. *Review of Educational Research*, *88*(1), 87–12. <https://doi.org/10.3102/0034654317743197>
- Riley, P., See, S.-M., Marsh, H., & Dicke, T. (2021). *The Australian principal occupational health, safety and well-being survey (IPPE report)*. Institute for Positive Psychology and Education, Australian Catholic University.
- Robson, S., & Manacapilli, T. (2014). *Enhancing performance under stress: Stress inoculation training for battlefield airmen*. RAND Corporation.
- Russo, S. J., Murrough, J. W., Han, M. H., Charney, D. S., & Nestler, E. J. (2012). Neurobiology of resilience. *Nature Neuroscience*, *15*, 1475–1484. <https://doi.org/10.1038/nn.3234>
- Rutter, M. (2013). Annual research review: Resilience—Clinical implications. *Journal of Child Psychology and Psychiatry*, *54*(4), 474–487. <https://doi.org/10.1111/j.1469-7610.2012.02615.x>
- Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Press. <https://doi.org/10.1521/978.14625/28806>
- Schaufeli, W. B., & Bakker, A. B. (2004). Job demands, job resources, and their relationship with burnout and engagement: A multi-sample study. *Journal of Organizational Behavior*, *25*, 293–315. <https://doi.org/10.1002/job.248>
- Schaufeli, W. B., & Taris, T. W. (2014). A critical review of the job demands-resources model: Implications for improving work and health. In G. Bauer & O. Hämmig (Eds.), *Bridging occupational, organizational and public health* (pp. 43–68). Springer. [https://doi.org/10.1007/978-94-007-5640-3\\_4](https://doi.org/10.1007/978-94-007-5640-3_4)
- Shpancer, N. (2010). What doesn't kill you makes you weaker: A history of hardship is not a life asset. *Psychology Today*, December, Retrieved from <https://www.psychologytoday.com/us/blog/insight-therapy/201008/what-doesnt-kill-you-makes-you-weaker?page=1,31/01/2019>
- Simonsohn, U. (2018). Two lines: A valid alternative to the invalid testing of U-shaped relationships with quadratic regressions. *Advances in Methods and Practices in Psychological Science*, *1*(4), 538–555. <https://doi.org/10.1177/2515245918805755>
- Skaalvik, C. (2020). Emotional exhaustion and job satisfaction among Norwegian school principals: Relations with perceived job demands and job resources. *International Journal of Leadership in Education*, 1–25. <https://doi.org/10.1080/13603124.2020.1791964>
- Skaalvik, E. M., & Skaalvik, S. (2015). Job satisfaction, stress and coping strategies in the teaching profession—What do teachers say? *International Education Studies*, *8*, 181–192. <https://doi.org/10.5539/ies.v8n3p181>
- Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). Brief resilience scale [database record]. *APA PsycTests*. <https://doi.org/10.1037/t51423-000>
- Southwick, S. M., & Charney, D. S. (2012). The science of resilience: Implications for the prevention and treatment of depression. *Science*, *338*, 79–82. <https://doi.org/10.1126/science.1222942>
- Tran, H., McCormick, J., & Nguyen, T. T. (2018). The cost of replacing South Carolina high school principals. *Management in Education*, *32*(3), 109–118.
- Trépanier, S.-G., Forest, J., Fernet, C., & Austin, S. (2015). On the psychological and motivational processes linking job characteristics to employee functioning: Insights from self-determination theory. *Work & Stress*, *29*(3), 286–305. <https://doi.org/10.1080/02678373.2015.1074957>

- Wahlstrom, K. L., Louis, K. S., Leithwood, K. and Anderson, S. E. (2010). Investigating the links to improved student learning: Executive summary of research findings. NY: The Wallace Foundation. Available at: <https://www.wallacefoundation.org/knowledge-center/pages/investigating-the-links-to-improved-student-learning.aspx>
- Walsh, E., & Dotter, D. (2018). The impact on student achievement of replacing principals in District of Columbia public schools. *Education Finance and Policy*, 15, 518–542. [https://doi.org/10.1162/edfp\\_a\\_00279](https://doi.org/10.1162/edfp_a_00279)
- Wells, C. M., & Klocko, B. A. (2018). Principal well-being and resilience: Mindfulness as a means to that end. *NASSP Bulletin*, 102(2), 161–173. <https://doi.org/10.1177/0192636518777813>
- 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>

## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

**How to cite this article:** Marsh, H. W., Dicke, T., Riley, P., Parker, P. D., Guo, J., Basarkod, G., & Martin, A. J. (2023). School principals' mental health and well-being under threat: A longitudinal analysis of workplace demands, resources, burnout, and well-being. *Applied Psychology: Health and Well-Being*, 15(3), 999–1027. <https://doi.org/10.1111/aphw.12423>