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The SMART model of work design: A higher order structure to help see the wood from the trees

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Abstract

We propose a new work design model, SMART work design, that identifies five higher order categories of work characteristics, including stimulating work characteristics (task variety, skill variety, information processing requirements, and problem-solving requirements), mastery work characteristics (job feedback, feedback from others, and role clarity), autonomous work characteristics (decision-making autonomy, timing autonomy, and method autonomy), relational work characteristics (social support, task significance, and beneficiary contact), and tolerable work characteristics (low levels of: role overload, work–home conflict, and role conflict). Higher order confirmatory factor analysis of working participants provided initial evidence of this structure (Study 1, $N = 1107$), which was replicated in an additional dataset (Study 2, time 1, $N = 709$). To provide further evidence, we examined Study 2 data across three waves ($N = 573$) to show that each higher order factor at time 1 predicted time 3 job satisfaction either directly or via the theorized time 2 mediators (challenge appraisals, work meaningfulness, fulfillment of relatedness needs, and activated negative affect). In Study 3 ($N = 108$), employees' scores on specific higher order variables correlated with leader ratings of performance in the expected ways. The SMART work design model provides a unique integrating and multidimensional theory of work design that extends beyond existing models. The model can be used to facilitate the synthesis of research knowledge and guide scholars and practitioners to diagnose and address contemporary work design challenges.

KEYWORDS
higher order work characteristics, job satisfaction, performance, SMART work design, work design

1 | INTRODUCTION

The world of work is changing dramatically, with mega-trends creating significant disruption. Human resource (HR) scholars have identified an urgent need to expand theory and practice to accommodate this change (Cascio, 2019; Meister & Brown, 2020). Example challenges requiring navigation include hybrid working in a post-pandemic world, the rapidly accelerating use of digital technologies with profound implications for how work is carried out, rising levels of burnout, an aging workforce, global talent shortages, and climate change. In the words of Harney and Collings (2021), human resource management (HRM) theory and research needs to "effectively engage with and address 21st Century challenges."

We suggest understanding and applying work design models is a key capability for HR, which will help to future proof the field. Work design, or "the content and organization of one's work tasks, activities, relationships, and responsibilities" (Parker, 2014, p. 662), has long been understood as an important topic. But it is also vital for addressing many of the contemporary challenges noted above. For example, scholars have argued that—because technology mostly replaces tasks and not whole jobs—work design is a critical lens for understanding how people can work collaboratively alongside AI and automation (Parker & Grote, 2022). As a further example, scholars and practitioners alike are calling for a stronger focus on designing quality work as a strategy to prevent poor mental health and burnout (Brower, 2022), as well as ways to enable more effective remote and hybrid working (Wang et al., 2021; Xie et al., 2019). Similar arguments have been made for the importance of considering work design to facilitate the retention of older workers (de Boer et al., 2021; Truxillo et al., 2012), including how work design can mediate aging and technological change (Pak et al., 2023). A work design focus aligns with Wright's (2021) arguments that the field of strategic human capital should move beyond an economics-based logic to fully consider human aspects such as free will, identity, and purpose. Altogether, therefore, work design is a critical topic for helping to address contemporary HR challenges, suggesting the time is right to reinvigorate theory on this topic.

In this article, we develop a new integrative model of work design. Although work design is a well-established topic that extends back decades (Miner, 2003), with more than 5000 articles on the topic in the management and applied psychology field alone (Parker et al., 2017), we argue that it is time for consolidation. In particular, one way the field has flourished is that, since the early demonstration of the relevance for performance and job satisfaction of five core work characteristics in the job characteristics model (JCM; Hackman & Oldham, 1975, 1976), many additional important work characteristics have been identified; as many as 30 (Schaufeli & Taris, 2014). While this diversity of work characteristics has advanced our understanding, there is a danger that we have lost sight of the big picture, with the topic of work design being reduced to a long checklist of work characteristics. We argue there is a need to better understand the underpinning structure of work characteristics: to lift our view up from the trees to see the woods. Specifically, we propose and assess the SMART work design model involving five overarching factors of work characteristics (stimulating, mastery, autonomous, relational, and tolerable). We test this structure through higher order confirmatory factor analysis, followed by validity tests linking the factors to the theoretically relevant outcomes of job satisfaction and performance.

Our new model of work design extends beyond the current dominant models of work characteristics in important ways. First, the JCM, which still dominates much of the work design literature today, focuses on just five core motivational work characteristics, which is overly restrictive. For example, the JCM excludes job demands and relational aspects of work design. The model also emphasizes motivational psychological outcomes only. In contrast, our model is integrative, capturing 16 work characteristics, and includes not just work characteristics that are important for motivation but also those relevant to job strain, learning, and relational outcomes. A further limitation of the JCM is that each work characteristic is unidimensional (e.g., assessing only one type of job autonomy). In contrast, we adopt a higher order, multidimensional approach that enables both nuance (e.g., we include as subdimensions three types of job autonomy) and synthesis (e.g., these three subdimensions form one higher order factor of autonomous work characteristics). Nuance is important as it allows for fine-grained understanding, such as identifying when autonomy over work methods is more important than, say, autonomy over work timing. Synthesis is important because high levels of covariation among work characteristics have been observed in several studies (e.g., the meta-analysis by Humphrey et al., 2007), calling into question whether individual dimensions of work characteristics are meaningfully distinct or in fact interchangeable, or even redundant, from each other, or whether they are part of a broader multidimensional concept (Credé & Harms, 2015). As Credé and Harms (2015) discussed, "aggregating constructs that share common elements comes with the considerable benefit of tidying up our occasionally cluttered construct landscape" (p. 265).

Second, our model also extends beyond the popular job demand–resources model (JD-R; Bakker et al., 2023; Demerouti et al., 2001). The JD-R model usefully categorizes work characteristics into job demands and job resources, providing synthesis. However, this broad categorization structure fails to make important theoretical distinctions among various types of work design. With five higher order categories of work characteristics, four of which fit within the broad category of job resources, our model offers a stronger foundation for understanding different elements of work design. We also observe that several of the job demands and job resources covered in the JD-R model extend beyond work characteristics (e.g., leadership, safety climate). In contrast, our model focuses squarely on work characteristics, with each mapping onto key organizing conditions at the same time as being psychologically important, consistent with early scholarly definitions of work design.

Third, our model extends beyond Morgeson and Humphrey's (2006) identification of four overarching categories of work characteristics: motivational, knowledge, social, and contextual. This multidimensional approach helpfully recognizes many diverse work characteristics with more nuanced categories than the JD-R model. However, the researchers did not empirically test the accuracy of their implied higher order structure, but rather tested a lower order clustering of work characteristics, for which they found no support. This means one cannot rely on their proposed groupings as an underpinning structure of work characteristics. The Morgeson and Humphrey model also excludes job and role demands, whereas we—like others before us (Demerouti et al., 2001; Karasek, 1979)—argue this is an essential element of work design.

Altogether, our article contributes to research by developing a new model of work design that is *integrative*; identifying and synthesizing the key higher order categories of work characteristics that theoretically derive from core organizational design decisions as well as core psychological outcomes. Our model with its *multidimensional*

structure also provides nuance, allowing for not just broad constructs, but also specific constructs, or subdimensions, with theorized interrelationships among them. Finally, our model is supported by *empirical evidence*, meaning we can be confident in the theorized structure.

As well as contributing to work design theory, our model helps to guide practice. For example, one consequence of many work characteristics is that there is little basis for selecting from the set for a particular study or diagnosis. Our model provides a theoretical and evidence-based approach for choosing which work characteristics to focus on, rather than a cherry-picking or idiosyncratic approach. Altogether, the model can guide HR practitioners who are seeking to design better quality work against the backdrop of rising employee burnout and disengagement (Brower, 2022), among other such challenges.

We shortly outline the proposed model and the theorized links to outcomes. However, so that we can establish the added value of our model, we next briefly outline key developments in the field of work design to date.

1.1 | About work design research: A brief overview

Early interest in the topic of work design arose out of observations of the impact of Taylorised work systems. Post-industrial revolution jobs were excessively simplified, with tasks and decision-making divided and allocated so that workers could be quickly trained and easily substituted, creating repetitive and low autonomy jobs. In the face of workers' experience of alienation and other negative outcomes of Tayolistic work designs, work "redesign" experiments, such as job enlargement to increase task variety, showed positive impacts on workers' attitudes and behaviors (Hulin & Blood, 1968). From this strong practical focus on understanding and changing objective work conditions, work design emerged as an important research topic.

As the field of enquiry progressed, scholars theorized about which aspects of work design most affected workers' job attitudes and why. In an early approach, Hackman and Lawler (1971) drew on expectancy theory to argue people's satisfaction with their jobs depends on the extent to which they achieve the expected valued outcomes in their work. Particular "work characteristics" were theorized to foster job satisfaction through mediating psychological processes (Turner & Lawrence, 1965). Thus, job autonomy was theorized to link to people's sense of personal responsibility; job feedback was presumed to create the feeling that one has accomplished something; and task variety, task identity, and task significance were argued to engender a sense of work meaningfulness. This theorizing was codified into the JCM (Hackman & Oldham, 1976), which continues to dominate work design research today. In this model, and in most work design research conducted subsequently, perceptions are the focus: "for all the job characteristics…, it is not their objective state which affects employee attitudes and behavior, but rather how they are experienced by the employees" (Hackman & Lawler, 1971; p. 264).

Much research has tested the JCM, with meta-analyses and reviews concluding the key work characteristics predict an array of individual-level outcomes, including work stress, job satisfaction, performance, creativity, absenteeism, turnover, and even accidents (Fried & Ferris, 1987; Humphrey et al., 2007; Knight & Parker, 2019; Morgeson & Humphrey, 2006; Parker, 2014). In some cases, the model has been consolidated. For instance, of the three theorized mediators, work meaningfulness has been consistently shown to be the most important psychological state linking each of the core work characteristics to outcomes like job satisfaction (Humphrey et al., 2007; Johns et al., 1992). In other cases, the model has been expanded, especially via the addition of new job characteristics. In a key development, Morgeson and Humphrey (2006) categorized more than 20 work characteristics into four categories: task characteristics (reflecting the traditional motivation perspective focused on in the JCM), knowledge characteristics (reflecting the knowledge, skills, and abilities that a job requires), social characteristics (reflecting the degree of support from others, interdependence, and interaction with others present within a job), and contextual characteristics (reflecting physical conditions of the work environment, ergonomic aspects, physical demands, and equipment use).

Around the same time that the JCM was introduced, a different but equally seminal approach was developed with a stronger focus on psychological strain. The demand–control model (DCM; Karasek, 1979) brought into the picture the concept of job demands, as well as, in a later development (Karasek & Theorell, 1990), the work characteristic of social support; neither of which were included in the original JCM but which were argued to be important for employees' psychological strain. This model has now been expanded into the JD-R (Demerouti et al., 2001). Job resources are aspects of work that help people achieve their goals, deal with demands, and/or promote learning and growth. Job demands, in contrast, are "those physical, social, or organizational aspects of the job that require sustained physical or mental effort and are therefore associated with certain physiological or psychological costs" (p. 501). Much research has been conducted to test the JD-R, mostly supporting its key propositions (Bakker et al., 2023).

Two further developments are relevant. First, extending beyond an emphasis on how work design affects motivation (the JCM) and strain (the DCM and JD-R), Karasek and Theorell (1990) proposed that enriched work can activate and foster employee learning. For example, job autonomy facilitates workers exploring and hence learning the best ways to manage demands. Since that time, a focus on learning as a result of work design has gained traction, both theoretically (Parker et al., 2021) and empirically (Taris et al., 2003; Wielenga-Meijer et al., 2010). A second development, labeled the relational work design approach (Grant, 2007, 2008), expanded work design theory by highlighting social work characteristics beyond social support. Specifically, Grant (2008) theorized and showed that designing work so that employees connect with the beneficiaries of their work (e.g., clients, end users) enables people to meet their needs for connection to others (Ryan & Deci, 2000), thus highlighting a further relational process by which work design enables satisfying work.

Altogether, from across these diverse perspectives, there is now a wide range of work characteristics that are understood to create high quality work through creating a sense of meaningfulness, reducing

strain, fostering learning, and meeting people's relational needs. Nevertheless, a challenge remains. Questions have long existed regarding the structure of perceived work characteristics, such as whether any work characteristics overlap, what else is important beyond the initial five characteristics in the JCM, how different work characteristics fit together, and which work characteristics of the many one should focus on (Dunham, 1976; Parker et al., 2001). To address these questions, we propose the SMART work design model, involving five higher order categories of work characteristics: stimulating, mastery, autonomous, relational, and tolerable.

1.2 | SMART work design model: Integrative, multidimensional, and empirically testable

We argue that a new model of work design should address three key criteria: it should be integrative, multidimensional, and empirically testable. In this section, we discuss how the SMART model meets these criteria relative to existing models. Thereafter, we describe the model in detail along with the associated validation hypotheses.

The first criteria for a new model of work design is that it should be integrative, *by* which we mean it should capture the key theoretical elements of work design. From its early days, work design research has focused on how organizing conditions enable employees to achieve psychologically important states, with these states argued to stimulate not only job satisfaction but also job performance because of employees' willingness to work hard to meet organizational goals (Hackman & Lawler, 1971). As such, consistent with this early theorizing, we identify five key higher order categories of work characteristics that link to both organizing conditions and psychologically important outcomes.

With respect to organizing conditions, we propose a higher order structure of work characteristics that closely map onto key organizational decisions about how to structure work. An organization is a multi-agent system with identifiable boundaries and system-level goals in which each constituent agent's efforts are expected to contribute (Puranam et al., 2014). All organizations need to consider work design because, to achieve the system-level goals, there needs to be a way to divide and allocate labor to multiple agents, and then to integrate the resulting efforts (Lawrence & Lorsch, 1967; March & Simon, 1958). How these key problems of dividing labor and then integrating efforts are resolved creates an organizational design (e.g., a departmental structure), which manifests, at the job and task level, as work design. Specifically, we argue that the division and allocation of tasks influence employees' *stimulating work characteristics*; the division and allocation of authority shapes employees' *autonomous work characteristics*; the integration of effort via information influences employees' *mastery work characteristics*; the integration of effort via social processes influences employees' *relational work characteristics*; and the degree of effort that needs to be expended to achieve system goals influences employees' *tolerable work characteristics*.

With respect to their psychological importance, we argue each of the higher order categories links to job satisfaction through at least one of four key theorized processes highlighted in work design research. First, drawing on traditional theory and its emphasis on intrinsic motivation, especially the JCM, we argue that some categories of work design drive job satisfaction because of their positive effect on *work meaningfulness*. Work meaningfulness, or work that is experienced as "meaningful, valuable, and worthwhile" (Hackman & Oldham, 1976, p. 256), has been shown to be the most important theorized motivational mechanism (Humphrey et al., 2007). Although defined in multiple ways (Martela & Pessi, 2018), work meaningfulness is fundamentally about the psychological sense that one's work has value. A quest for meaning is argued to be a universal human motive such that, for most people, if lots of time is spent on activities that have no apparent purpose, they will find themselves asking "what for?" (Klinger, 1998; Lips-Wiersma & Morris, 2009). On the other hand, when people experience a sense that their work has value and purpose, they are more likely to experience job satisfaction (Hackman & Oldham, 1976).

Second, drawing on the demand–control and demand–resources theories that identify work characteristics as causing psychological strain and work stress, we propose that work design can also affect job satisfaction through activated negative affect; a type of well-being that is both unpleasant and high in arousal, and is measured by mood states such as anxiety and worry (Daniels, 2000). Affect and cognition are closely related, so it is hard for a person to positively evaluate their job when they are experiencing high negative affect, leading to lower job satisfaction (Judge et al., 2017).

Third, we incorporate the expanded emphasis on social processes (Grant, 2007) to propose that work design can also affect job satisfaction via meeting individuals' belongingness needs. Meeting one's need for connection and belonging is considered core to human experience (Ryan & Deci, 2000). When these needs are met, individuals are likely to report positive job attitudes such as job satisfaction (van den Broeck et al., 2016).

Finally, linking to work design research on learning, we focus on how work design can influence workers' challenge appraisals, or their momentary judgments that a situation is taxing yet also provides an opportunity for personal growth, thereby enabling satisfying work (Ohly & Fritz, 2010). For example, a complex work problem is experienced as challenging, rather than overwhelming, if an individual perceives that with the necessary job resources (e.g., colleague support), the problem is soluble.

Altogether, our model captures the key categories of work characteristics that reflect how work is structured in organizations and that have psychological importance. Our model is more integrative than the JCM, the DCM, the JD-R model, and Morgeson and Humphrey's (2006) model, all of which exclude key work characteristics. At the same time, our model also excludes JD-R resources that go beyond work design, such as safety climate.

The second criteria for a new model is that it should be multidimensional, allowing for broad as well as specific constructs, with theorized relationships among them. This approach is important because Roznowski and Hanisch (1990) argued that holistic and heterogenous constructs provide a more complete understanding than narrow ones, and thereby facilitate theory development. Broader constructs (such

as the "big five" personality constructs) also predict increased variance, reliability, and validity (Edwards et al., 2000; Hulin, 1991; Ones & Viswesvaran, 1996; Roznowski & Hanisch, 1990). We propose that each of the higher order constructs is super-ordinate rather than aggregate constructs, meaning that specific work characteristic dimensions are manifestations of the higher order construct (Johnson et al., 2012). Thus, we assume that causality flows from the higher order category to the work characteristic, rather than work characteristics combining to "create" the construct (Bollen & Lennox, 1991; MacKenzie et al., 2005). A super-ordinate construct has implications for how interdependent the indicators are from each other and the uniqueness of their antecedents and outcomes (Edwards, 2001). For super-ordinate work design constructs, excluding one work characteristic should not substantially change the meaning of the construct because each characteristic indicates the higher order construct. Empirically, this means the work characteristics within each super-ordinate construct should positively interrelate and function similarly in their relationships to other variables within that factor.

To date there are no higher order or multidimensional models of work design. The closest is the JD-R model, which identifies job resources and job demands as broad clusters of variables (Demerouti et al., 2001), but there is little theorizing as to the possible interrelationships among the many resources (see Schaufeli & Taris, 2014, for other challenges to this model). Morgeson and Humphrey's (2006) approach aligns with a multidimensional model but, as we elaborate next, there is no evidence for such a structure.

A third criteria for a structure of work design to be of value is that it should be supported by empirical evidence, and therefore needs to be empirically testable. While Morgeson and Humphrey (2006)'s structuring of many work characteristics into four categories implies a multidimensional model, this structure was not tested. The authors investigated whether the 21-work characteristics could be collapsed into four factors, but found the 21-factor model to be best-fitting in accordance with their predictions. They concluded that reducing the work characteristics to four conceptual categories is a reductionist approach. Importantly, however, the authors omitted to consider or test a higher order structure. In another theorized higher category model of work design, Campion and Thayer (1985) identified distinct disciplinary approaches to the topic: mechanistic, motivational, biological, and perceptual/motor. This approach is broader than our focus here as we concentrate primarily on what these authors refer to as the motivational and mechanistic perspectives, but it is worth noting that, empirically, no clear structure was identified (Edwards et al., 2000). In addition, key work characteristics, such as job autonomy and job demands, are not included in the Campion and Thayer model. To date, there is therefore no empirical support for any multidimensional model of work characteristics.

1.2.1 | Proposed higher order dimensions, subdimensions, and links to outcomes

To unpack how our model is an integrative approach to work design, we next describe how each of the higher order categories of work characteristics links to key organizational design decisions while also capturing aspects of work that are psychologically important. To meet the criteria of multidimensionality, we theorize the specific dimensions within each higher order category, focusing on those work characteristics that have been commonly considered in the literature.[1] To meet the criteria of empirical evidence, we not only hypothesize the structure but also how each higher order category links to job satisfaction. Thus we propose each higher order category affects job satisfaction via the mechanisms of motivation (work meaningfulness), strain (activated negative affect), learning (challenge appraisals), and social processes (meeting relational needs). We also test some narrower pathways between the higher order categories and job performance.

Stimulating work characteristics

A key problem that an organizational design needs to solve is how to divide labor among multiple agents. The organization's goals need to be broken down into smaller tasks and responsibilities that are then allocated to individuals and/or groups (or indeed to machines and technology). The problem of horizontal division of labor refers to task allocation, and whether similar, repeatable tasks are allocated to a single agent, creating a high degree of specialization and repetition, as advocated by Adam Smith (1776), or whether tasks are allocated in such a way as to increase diversity and assign responsibility for outputs rather than specific steps, as advocated by Hackman and Oldham (1976). The former approach to the division of labor is typical in mechanistic organizational designs characterized by Taylorised work, whereas the latter is more common in organic organizations (Hage, 1965). Which approach is adopted shapes the variety and complexity of the work. *Stimulating work characteristics* refer to work having a high degree of mental complexity and variety as a result of the nature and organization of one's work tasks, responsibilities, and relationships. Stimulating work is usually reduced when an individual is assigned similar, repeatable low-level tasks.

We propose four work characteristics as indicators of this dimension. First, *perceived task variety* refers to the extent to which the job is perceived by the incumbent to require a range of different tasks (Hackman & Oldham, 1976). Second, *perceived skill variety* refers to the extent to which the job is perceived by the incumbent to use a variety of their skills (Morgeson & Humphrey, 2006). Third, *perceived problem-solving requirements* concern the degree to which the job is perceived to require novel ideas and solutions, as well as active cognitive processing (Jackson et al., 1993; Wall & Jackson, 1995). Fourth, *perceived information processing requirements*, also cognitive in nature, concern the extent to which the job is perceived to require attending to or processing data and information (Jackson et al., 1993; Martin & Wall, 1989; Wall & Jackson, 1995). Each of these work characteristics taps into the perceived complexity and variety of the work, and hence should be inter-correlated.

Importantly, the category of stimulating work characteristics is distinct from any grouping of work characteristics advocated by Morgeson and Humphrey (2006). These researchers identified skill variety as a "knowledge characteristic," defined as a characteristic that reflects the "knowledge, skill and ability demands that are placed on

an individual as a function of what is done on the job" (p. 1323), yet they classified task variety as a "task characteristic" concerned with "how the work itself is accomplished." Conceptually, rather than the "task versus knowledge" distinction, we theorize that task variety and skill variety have a common focus on variety and novelty that renders them part of stimulating work:

> **Hypothesis 1a.** Perceived task variety, perceived skill variety, perceived problem-solving demands, and perceived information processing demands are indicators of a higher order factor, which we refer to as stimulating work characteristics.

To test the validity of this category, we propose that stimulating work generates both work meaningfulness and challenge appraisals, and therefore predicts employee job satisfaction. With regard to work meaningfulness, it is important to observe that meaningfulness is usually considered to be eudemonic in emphasis, focused on growth and purpose, rather than being purely hedonic or pleasure oriented (Steger et al., 2012). As such, it is unsurprising that several scholars have theorized that meaningfulness arises when individuals have the chance to stretch themselves at work (Hackman & Oldham, 1976; Lips-Wiersma & Morris, 2009). For instance, Kahn (1990) defined meaningfulness as "a sense of return on investments of self in role performances" (p. 705) and argued this return of investment of self is greater if an individual perceives they are using their skills while executing their role. Several studies have linked the opportunities in one's job for variety and stimulation with a sense of meaning (Arnoux-Nicolas et al., 2016). Further, when an employee perceives the job has varied tasks, uses many skills, and requires engaging in complex problems, s/he is likely to appraise their job as challenging (Ohly & Fritz, 2010). A sense of challenge suggests people are meeting their needs for competence which is one of the three fundamental needs identified in self-determination theory (Deci & Ryan, 1985; Ryan & Deci, 2017). For these reasons, challenge appraisals predict a variety of positive outcomes, including job satisfaction (Skinner & Brewer, 2002). We hypothesize:

> **Hypothesis 1b–d.** The higher order factor of stimulating work characteristics is positively associated with job satisfaction (1b), and this relationship is mediated through higher work meaningfulness (1c) and higher challenge appraisals (1d).

Autonomous work characteristics

Whereas stimulating work is about the horizontal division of labor (which tasks are assigned to whom), autonomy at work is shaped by the decision-making structure in the organization, or the vertical division of labor. Thus, as well as mapping tasks to agents or groups of agents as referred to above, the authority over decisions is allocated to individuals or groups at different levels of an organization's hierarchy (Puranam et al., 2014). When work is redesigned so that lower level agents have greater autonomy, this is referred to as job enrichment and, when authority is assigned to the whole group, this is referred to as autonomous work groups (Cordery et al., 1991). Autonomous work characteristics often occur within organic organizational designs that have decentralized decision-making structures, lower levels of formalized processes, and fewer layers of hierarchy (Burns & Stalker, 1961).

Autonomous work characteristics, therefore, refer to perceiving a high degree of autonomy, control, and influence over one's work tasks, activities, relationships, and responsibilities. Autonomous work captures the fundamental notion of job autonomy referred to in the JCM (Hackman & Oldham, 1976), defined as having the freedom and the chance for independent decision-making in carrying out one's job, and also captures the core idea of "decision-latitude," defined as the worker's ability to control his/her own tasks and activities, that is a key variable in the classic DCM (Karasek, 1979). Altogether, job autonomy is a central work design concept.

Nevertheless, theoretical advances have recognized that autonomy is too broad to be fully captured by one aspect (Wall et al., 1992). We therefore go beyond the unidimensional attribute of job autonomy identified in the JCM to propose a multidimensional concept including positively interrelated yet distinct subdimensions of autonomy. First, we include autonomy over the timing aspects of one's work (*timing autonomy*), such as the latitude to choose the order in which you complete tasks (Wall et al., 1992). Second, we include autonomy over one's work methods (*method autonomy*), such as the freedom to change how tasks are carried out (Wall et al., 1992). Morgeson and Humphrey (2006) similarly distinguished these two central aspects of autonomy, but also identified a third, more general concept of *decision-making autonomy* that covers, for example, workers' opportunity to use their personal initiative, which we also include. We focus on these three types of autonomy as they have been the most extensively studied. Our hypothesis is:

> **Hypothesis 2a.** Perceived timing autonomy, perceived method autonomy, and perceived decision-making autonomy are indicators of a higher order factor, which we label as autonomous work characteristics.

From a psychological perspective, and to test the validity of the higher order construct, we propose that autonomous work generates job satisfaction especially through fostering work meaningfulness. Meaningfulness is fueled because autonomy helps to fulfill individuals' core need for control over their environment (de Charms, 1968; Deci & Ryan, 2000). Through autonomy, individuals own their actions, can express their values and beliefs, and can develop and use their capabilities; all of which make the role more meaningful (Ryan & Deci, 2017; Shamir, 1991). Indeed, some humanistic scholars argue that meaning is impossible without the authenticity enabled by autonomy: "the mark of true meaningfulness is that it is based on personal discovery and free choice rather than prescription and domination" (p. 494, Lips-Wiersma & Morris, 2009). Our hypotheses are:

> **Hypothesis 2b,c.** The higher order factor of autonomous work characteristics is positively associated with job satisfaction (2b), and this relationship is mediated via higher work meaningfulness (2c).

Mastery work characteristics

Once labor has been divided with respect to tasks (stimulating work characteristics) and decision-making (autonomous work characteristics), a further key organizational design problem that needs to be solved is how to integrate the divided efforts. Multiple agents' contributions need to be coordinated to meet system-level goals. Such integration can occur via different processes, such as information, rules, culture, hierarchy, or goal setting (Galbraith, 1974). From an organizational design perspective, *mastery work characteristics* reflects the coordination and integration of effort via information. That is, once tasks and decisions are divided and allocated to different people or groups of machines, it is necessary to coordinate this effort, requiring that individuals know what to do and can accurately anticipate each other's needs (Lawrence & Lorsch, 1967; Schelling, 1960). Information about what to do, what others are doing, and how well one is doing comes from, for example, written communication (e.g., detailed standards, protocols, KPIs) and oral communication (e.g., feedback from the supervisor, conveying goals), and is vital for ensuring the integration of multiple agents' efforts to meet organizational goals (Puranam et al., 2014).

Mastery work characteristics capture the extent to which work is organized in a way that the job incumbent can understand what one's tasks, activities, relationships, and responsibilities are; how one's role fits in the wider system; and how well one's tasks are being executed. This higher order category is indicated by perceived job feedback, perceived feedback from others, and role clarity. *Job feedback*, one of the JCM work characteristics, is defined as the extent to which the job provides clear and direct information about the effectiveness of task performance (Hackman & Oldham, 1976). Job feedback enables employees to learn the consequences of their actions and informs them as to how they are doing relative to expectations. *Feedback from others*, including from the supervisor or coworkers, facilitates coordination by giving employees information about how they are effectively meeting their goals. A further work characteristic that supports the integration of effort is *role clarity*, defined as the perception of having as much information relevant to one's role as the person would like to have (Lyons, 1971) or "knowing what to do" (Bliese & Castro, 2000) as well as "how to do it" (Sawyer, 1992). Our hypothesis is:

> **Hypothesis 3a.** Perceived job feedback, perceived feedback from others, and role clarity are indicators of a higher order factor of work characteristics, which we label as mastery work characteristics.

Theoretically, what binds these work characteristics together is the function they serve. Thus, these job features provide individuals with the information they need to coordinate with others to master their work role requirements. This information, in turn, supports individuals appraising their work as challenging rather than anxiety-provoking. Specifically, role clarity and feedback help individuals achieve their goals and function effectively in their environment, which in turn means they are able to take on new tasks and engage in more complex decision-making, boosting their sense that their work is challenging (Deci & Ryan, 2000). However, if workers lack these work characteristics and do not know what they are meant to be doing or how well they are meeting their requirements, this state of uncertainty will generate aversive feelings such as anxiety and worry (Kahn et al., 1964). Uncertainty can be psychologically threatening because it hampers individuals' capability to perform their core tasks, affecting performance appraisals and, in the longer term, job security and career success (Tubre & Collins, 2000). We therefore expect mastery work characteristics to predict workers' job satisfaction through enhancing challenge appraisals and reducing activated negative affect. Our hypotheses are:

> **Hypothesis 3b,c.** The higher order factor of mastery work characteristics is positively associated with job satisfaction (3b), and this relationship is mediated via higher challenge appraisals (3c) and lower activated negative affect (3d).

Relational work characteristics

From an organizational design perspective, whereas mastery work characteristics support integration via information, *relational work characteristics* capture the social processes that facilitate the integration of people's efforts. Thus, relational work is about the social aspects of work, or "the interpersonal interactions and relationships that are embedded in and influenced by the jobs, roles, and tasks that employees perform and enact" (Grant & Parker, 2009, p. 9). These aspects are important since individuals do not operate at work in a silo but are embedded within a social environment involving many agents.

Specifically, *relational work characteristics* capture the degree to which, as a result of the nature and organization of one's tasks, one experiences support, connection, and an opportunity to positively impact others. This dimension is indicated in this research by perceived task significance, perceived beneficiary contact, and perceived social support. *Perceived task significance*, defined as how much the individual believes their work has a large impact on others' lives, was one of the original five core work characteristics in the JCM (Hackman & Oldham, 1976). In the relational theory of work design, Grant et al. (2007) extended the concept of task significance to include specific ways people experience prosocial impact, notably via *perceived beneficiary contact*, or how much contact individuals perceive they have with the end users of the work, such as their customers (Grant, 2008). In a series of studies, Grant theorized, and demonstrated, that beneficiary contact increased people's job satisfaction and performance (Grant, 2008; Grant et al., 2007). A further type of relational work characteristic, included in an extended version of the DCM of strain (Karasek & Theorell, 1990) and in most contemporary work design models (Bakker & Demerouti, 2007; Morgeson & Humphrey, 2006), is *perceived social support*. Social support in a job means that individuals feel able to obtain advice and assistance from others (Karasek, 1979; Karasek et al., 1998; Sims et al., 1976). In this higher order factor, we propose that the traditional support work characteristics (e.g., from Karasek & Theorell's, 1990 demand–

control–support model) serve the same function as the prosocially oriented work characteristics of task significance and beneficiary contact focused on by Grant et al. (2007); Grant (2008), which is to create positive social and relational work. Our hypothesis is:

> **Hypothesis 4a.** Perceived task significance, perceived beneficiary contact, and perceived social support are indicators of a higher order factor, which we label relational work characteristics.

This higher order category drives job satisfaction because these work characteristics bolster people's sense of meaningfulness and meet their relational needs. First, these work characteristics enable a positive impact on, and connection with, others, including those who benefit from the work, which increases work meaningfulness. Indeed, scholars argue that contributing to a broader cause is fundamental to achieving real meaning because it transcends beyond the boundaries of one's self-interests (Tillich, 1946). Research supports this idea. For example, contact with beneficiaries of one's work increases people's sense of appreciation, value, and impact (Grant, 2007, 2008), which makes work more meaningful (Lips-Wiersma & Morris, 2009). Second, relational work characteristics means that workers are more likely to have warm, close, and positive connections with others at work (Baumeister & Leary, 1995), which fulfills the need for relatedness, which self-determination theorists have argued is a fundamental need that evolved to help people survive through fostering collective action (Deci & Ryan, 2000). Our hypotheses are:

> **Hypotheses 4b–d.** The higher order factor of relational work characteristics is positively associated with job satisfaction (4b), and this relationship is mediated via experienced meaningfulness (4c) and fulfillment of relatedness needs (4d).

Tolerable work characteristics

A defining feature of an organization is that "the constituent agent's efforts are expected to make a contribution" to the system-level goals of the organization (Puranam et al., 2014, p. 4). In other words, organizations exist in order to achieve a shared goal (Stinchcombe, 1965), and the agents within that organization need to contribute effort towards that goal. Whether the effort allocated actually contributes to a shared system-level goal is a separate issue; but the effort is always expected, with the exact level and type of effort depending on the tasks that make up a person's job and role. These efforts create demands, or aspects of work that require effort with some psychological cost (Demerouti et al., 2001) and comprise our fifth higher order category.

More specifically, while there can be many sorts of demands in work, we focus especially on those quantitative demands that reflect working in a highly intensified way (rather than, say, emotional or surveillance demands). We adopt this focus because such demands are possible in all work, and because extensive research links excess quantitative demands to important work outcomes (Jackson & Schuler, 1985). We use the label tolerable work characteristics to convey our focus, which we operationalize as having low scores on *role overload*, *role conflict*, *and work–home conflict*. *Role overload* refers to employees perceiving that they have excess responsibilities given their time and capability constraints, whereas *role conflict* refers to employees' perceptions that they have incompatible or inconsistent expectations in their work roles (Rizzo et al., 1970). For example, if individuals have more than one supervisor who is allocating tasks, this can create role conflict in the form of confused priorities. As well as conflict among work roles, individuals can also experience conflict between their work and outside work roles. *Work–home conflict* refers to "a form of inter-role conflict in which the general demands of time devoted to, and strain created by the job interfere with performing family-related responsibilities" (Netemeyer et al., 1996, p. 401). These demands share an emphasis on an intense degree of effort with high psychological costs, with evidence that each affects outcomes such as strain and burnout (Van den Broeck et al., 2008). Each could potentially be considered as a hindrance demand that thwarts goal achievement (Cavanaugh et al., 2000; Crawford et al., 2010), although ambiguities with the challenge–hindrance model of categorizing demands (Li et al., 2020) mean we do not use this labelling. Our hypothesis is:

> **Hypothesis 5a.** Low levels of perceived role overload, perceived role conflict, and perceived work–home conflict are indicators of a higher order factor, which we label as tolerable work characteristics.

We expect tolerable work characteristics are associated with higher job satisfaction because of reduced aversive feelings such as anxiety and worry. Individuals have a fundamental desire to be protected from threats in the environment (Maslow, 1943), yet excessive role overload, role conflict and work–home conflict all pose the threat of harm, which will generate higher levels of activated negative affect. For example, Rizzo et al. (1970) argued that role conflict generates anxiety and uncertainty because it creates confused accountabilities that interfere with workers' performance and the positive evaluation of that performance. Our hypotheses are:

> **Hypothesis 5b, c.** The higher order factor of tolerable work characteristics is positively associated with job satisfaction (5b), and this relationship is mediated via lower activated negative affect (5c).

A summary of the higher order factors, their definition, their links to organizational design, and the perceived work characteristics they are indicated by is shown in Table 1.

A final point is that, consistent with Johnson et al.'s (2012) recommendation that "it is necessary to demonstrate that higher-order constructs predict criteria equally well as their dimensions," we propose the following hypothesis:

> **Hypothesis 6.** Each higher order construct predicts job satisfaction and the theorized mediators at least as effectively as do the collective individual characteristics.

TABLE 1 Higher-order work design factors, including their definition, theorized links to organizational design and psychological processes, and their work characteristics.

Higher-order factor	Definition	Link to organizing conditions	Link to psychological processes	Perceived work characteristics (dimensions)
Stimulating work characteristics	High degree of mental complexity and variety due to the nature and organization of one's work tasks, activities, responsibilities, and relationships.	Horizontal division of labor	Work meaningfulness and challenge appraisal	• Task variety • Skill variety • Problem-solving requirements • Information processing requirements
Autonomous work characteristics	High degree of autonomy, control, and influence over one's work tasks, activities, responsibilities, and relationships.	Vertical division of labor	Work meaningfulness	• Timing autonomy • Method autonomy • Decision-making autonomy
Mastery work characteristics	Work is organized in a way that one can understand what one's tasks, activities, and responsibilities are, how they fit in the system, and how well they are being executed.	Co-ordination and integration via information	Challenge appraisal and lower activated negative affect	• Job feedback • Feedback from others • Role clarity
Relational work characteristics	High degree of support, connection, and the opportunity to positively impact others arising from one's work tasks, activities, responsibilities, and relationships.	Co-ordination and integration via social processes	Work meaningfulness and meeting relational needs	• Task significance • Beneficiary contact • Social support
Tolerable work characteristics	Low degree of costly quantitative demands arising from one's work tasks, activities, responsibilities, and relationships.	Effort required to achieve shared org. goals	Lower activated negative affect	• Low role overload • Low role conflict • Low work–home conflict

1.3 | Additional validity check: Relationships with job performance

To provide further evidence as to the validity of the higher order structure, we examine the associations of the categories with leader ratings of job performance. Unlike job satisfaction, which we theorized to link to all the higher order categories of work design, we propose that three categories relate to leader ratings of job performance. We focus on those associations for which there is strong theory and evidence linking the work design category and performance. Our approach does not preclude other aspects from being important but reflects the idea that validity is demonstrated when well-established links are shown.

Following Griffin et al. (2007), we focused on three types of performance: core task performance (also referred to as core task proficiency), proactive performance, and adaptive performance. *Core job performance*, the traditional focus of performance research, refers to the worker effectively carrying out his/her known work role expectations and requirements (Griffin et al., 2007). By virtue of our above arguments that more satisfied workers put in more effort and engage in high-quality work (supported by considerable evidence linking job satisfaction to core job performance, e.g., Judge & Bono, 2001), each of the higher order categories of work design theoretically should be associated with overall job performance. However, the empirical evidence is only clear for three of the categories: autonomous, mastery, and relational. First, with respect to autonomous work characteristics, prior research has established that job autonomy predicts objective performance, likely because of its effect on job satisfaction, but also its effect on other important states driving performance, such as flexible role orientation, ownership, and commitment (Parker, 2007). In their meta-analysis, Humphrey et al. (2007) found a significant association between job autonomy and objective performance. Second, with respect to mastery work characteristics, studies show a link between role clarity and performance (Anderson & Stritch, 2016). Although the literature linking feedback and performance are mixed and complex (including whether the feedback is accurate, positive, negative, etc.), when the operationalization of feedback is focused on giving people an overall sense of their progress as is the case here, evidence consistently shows that feedback is motivating for performance (Parker et al., 2021). Third, with respect to relational work characteristics, based on the idea that understanding the impact of one's work is motivating, Grant and colleagues showed that contact with beneficiaries and task significance predict objective performance (Grant, 2008). Studies also show positive effects of support on job performance (Parker et al., 2013).

As identified in Humphrey et al.'s (2007) meta-analysis, few studies have examined how stimulating work characteristics affect job

performance, with the exception of job variety, for which studies show a non-significant association. Likewise, the evidence linking job demands to job performance is inconsistent (Spector et al., 1988). For example, Bakker et al. (2008) showed no relationship between job demands and objective performance, whereas Lang et al. (2007) reported an indirect effect but no zero-order link between demands and performance. Theoretically, although tolerable work characteristics should predict core job performance by virtue of its satisfying effect (above), a reverse causal explanation can apply because lower performing workers tend to take on fewer tasks, creating fewer demands (e.g., Beehr et al., 2000 showed that role overload is associated with higher objective performance). Altogether, the existing literature is insufficiently clear to predict the effect of Stimulating or tolerable work characteristics on core job performance.

We further propose that autonomous work characteristics will be associated with proactive job performance. Proactive job performance, which refers to individuals actively taking control of themselves or their work environment to initiate change (Griffin et al., 2007), is especially important in dynamic and unpredictable environments. Research shows that job autonomy is an especially important characteristic for fostering the sort of motivation needed to be proactive. For example, through the expanded opportunities for decision-making, job autonomy stimulates workers' role breadth self-efficacy (their sense of confidence that they can execute tasks beyond their core technical ones; Parker, 1998), which in turn helps to foster the psychologically risky behavior of proactivity (Parker et al., 2010).

Finally, we included adaptive performance from an exploratory perspective. There is relatively little clear evidence about the link between work design and this type of performance (Andrei & Parker, 2018). Our hypotheses are:

> **Hypothesis 7.** There will be a positive association between each of the higher order categories of autonomous work characteristics, mastery work characteristics, and relational work characteristics with leader ratings of core job performance.

> **Hypothesis 8.** There will be a positive association between autonomous work characteristics and leader ratings of proactive job performance.

We conducted three studies to test the proposed higher order structure and its validity. In Study 1, we assess the fit of the proposed higher order structure in a sample of $N = 1107$ mostly professionals and managers who self-enrolled in an online university course. In Study 2, we replicate the structure and provide validity data by examining associations of the higher order factors with job satisfaction via the proposed pathways using three waves. The sample is $N = 709$ participants, mostly managers and professionals and working at least 10 h per week, from Amazon Mechanical Turk (MTurk). In Study 3, we provide further validity data by linking employee ratings of relevant higher order factors to leader ratings of job performance in a sample of $N = 108$ participants in a part-time MBA program.

2 | STUDY 1: ASSESSING THE FIT OF THE FIVE-FACTOR HIGHER ORDER STRUCTURE OF WORK DESIGN

As our goal is to theorize and assess the underlying structure of existing work characteristic, we focus on established and frequently assessed work characteristics.

2.1 | Materials and methods

The participants were working professionals (47%) and managers (29.6%) who self-enrolled in a 6-week university online module on work psychology ($N = 1107$). We pooled the responses from cohorts across 2 years. Participants came from all over the world, although mostly from the United States. Sixty-two percent were female; 79% worked full time; the mean age was 36.88 years (SD = 10.39); the average job tenure was 6.34 years (SD = 7.0); and the average hours worked per week was 41.33 (SD = 11.85). Example industries include education, management, finance, art, design, construction, and farming. For all measures, responses were recorded on 5-point Likert scales (1 = strongly disagree; 5 = strongly agree), unless stated otherwise. Cronbach's reliability alphas are in Table 2.

2.1.1 | Indicators of stimulating work characteristics

Skill variety (4 items, e.g., "The job requires a variety of skills"), problem-solving demands (4 items, e.g., "The job requires unique ideas or solutions to problems"), and information processing demands (4 items, e.g., "The job requires that I engage in a large amount of thinking") were measured using the Work Design Questionnaire (WDQ; Morgeson & Humphrey, 2006).

2.1.2 | Indicators of autonomous work characteristics

The WDQ (Morgeson & Humphrey, 2006) was used to measure timing (or work scheduling) autonomy (3 items, e.g., "The job allows me to plan how I do my work"), decision-making autonomy (3 items, e.g., "The job allows me to make a lot of decisions on my own"), and work method autonomy (3 items, e.g., "The job allows me to decide on my own how to go about doing my work").

2.1.3 | Indicators of mastery work characteristics

The WDQ (Morgeson & Humphrey, 2006) was used to measure job feedback (3 items, e.g., "The job itself provides me with information about my performance") and feedback from others (3 items, e.g., "I receive a great deal of information from my

TABLE 2 Study 1 means, standard deviations, and bivariate correlations between the demographics, each of the first-order work design variables, and the higher-order work design constructs derived from the working sample of online education participants.

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Gender	1.62	0.49	-										
2. Age	36.88	10.39	−0.17	-									
3. Job tenure	6.34	6.98	−0.18	0.57	-								
4. Hours worked	41.33	11.85	−0.11	0.07	0.09	-							
5. Skill variety	4.14	0.83	−0.10	0.20	0.12	0.09	(0.92)						
6. Problem-solving	3.86	0.94	−0.06	0.07	0.04	0.06	0.62	(0.84)					
7. Information processing	4.17	0.79	−0.03	0.13	0.09	0.15	0.65	0.66	(0.84)				
8. Scheduling autonomy	3.96	0.92	−0.07	0.18	0.09	0.01	0.36	0.36	0.31	(0.88)			
9. Decision-making autonomy	3.78	0.98	−0.13	0.15	0.08	−0.01	0.44	0.45	0.35	0.73	(0.90)		
10. Method autonomy	3.87	0.93	−0.08	0.13	0.09	0.00	0.44	0.42	0.33	0.77	0.81	(0.90)	
11. Job feedback	3.39	0.98	−0.07	−0.02	0.05	0.00	0.16	0.21	0.17	0.20	0.29	0.25	(0.92)
12. Feedback from others	3.11	1.05	−0.02	−0.05	0.00	−0.02	0.16	0.22	0.14	0.19	0.30	0.23	0.46
13. Role clarity	3.50	0.59	−0.04	0.12	0.10	0.10	0.20	0.21	0.27	0.01	0.07	0.06	0.21
14. Task significance	3.42	1.18	−0.07	0.10	0.10	−0.01	0.29	0.28	0.22	0.14	0.27	0.21	0.31
15. Social support	3.93	0.79	−0.06	0.02	0.01	0.09	0.30	0.28	0.28	0.27	0.32	0.33	0.26
16. Low role overload	2.75	0.98	−0.00	−0.04	−0.02	−0.21	−0.12	−0.19	−0.30	0.16	0.12	0.16	−0.01
17. Low work–home conflict	3.22	1.08	−0.04	0.02	0.01	−0.24	−0.03	−0.10	−0.15	0.19	0.16	0.19	0.07
18. Low role conflict	2.91	1.01	−0.02	−0.03	−0.02	−0.13	−0.01	−0.06	−0.12	0.23	0.26	0.23	0.13
19. Stimulating WCs	4.04	0.72	−0.07	0.16	0.10	0.12	0.86	0.86	0.88	0.39	0.46	0.44	0.21
20. Autonomous WCs	3.44	0.62	−0.07	0.04	0.09	0.05	0.22	0.26	0.27	0.17	0.26	0.22	0.89
21. Mastery WCs	3.87	0.87	−0.10	0.16	0.09	0.00	0.45	0.45	0.36	0.90	0.92	0.94	0.27
22. Relational work WCs	3.69	0.70	−0.07	0.10	0.09	0.04	0.46	0.40	0.35	0.34	0.46	0.44	0.38
23. Tolerable WCs	2.96	0.83	−0.03	−0.02	−0.01	−0.24	−0.06	−0.14	−0.23	0.24	0.23	0.24	0.08

Variable	12	13	14	15	16	17	18	19	20	21	22
12. Feedback from others	(0.91)										
13. Role clarity	0.13	(0.90)									
14. Task significance	0.25	0.22	(0.94)								
15. Social support	0.35	0.17	0.25	(0.69)							
16. Low role overload	0.04	−0.34	−0.06	0.03	(0.84)						
17. Low work–home conflict	0.07	−0.28	−0.01	0.06	0.60	(0.95)					
18. Low role conflict	0.17	−0.69	−0.00	0.04	0.44	0.43	(0.88)				
19. Stimulating WCs	0.19	0.26	0.30	0.32	−0.25	−0.12	−0.09	-			
20. Autonomous WCs	0.42	0.64	0.35	0.29	−0.17	−0.08	−0.23	0.29	-		
21. Mastery WCs	0.26	0.05	0.23	0.33	0.16	0.20	0.26	0.47	0.24	-	
22. Relational WCs	0.43	0.25	0.81	0.63	0.01	0.07	0.09	0.45	0.42	0.45	-
23. Tolerable WCs	0.11	−0.54	−0.03	0.05	0.83	0.84	0.76	−0.19	−0.19	0.25	0.07

Note: For all $r \geq 0.09$, $p < 0.05$; for all $r \geq 0.11$, $p < 0.01$; alpha coefficients are in the diagonal; categorical variables were coded as follows: Gender, 1 = male, 2 = female; Cronbach's alpha reliability coefficients are in the diagonal.

manager and co-workers about my job performance"). Role clarity was measured with three items derived from Haynes et al. (1999), including, "Are you clear about the goals and objectives of your job?"

2.1.4 | Indicators of relational work characteristics

The WDQ (Morgeson & Humphrey, 2006) was also used to measure task significance (4 items, e.g., "The job has a large impact on people

outside the organization") and social support (6 items, e.g., "People I work with take a personal interest in me").

2.1.5 | Indicators of tolerable work characteristics

Role overload was measured with four items (Mullarkey et al., 1995), an example being: "Are you under constant pressure at work?" Role conflict was measured with three items from Haynes et al. (1999), for example, "Do you receive conflicting instructions from two or more people?" Work–home conflict was measured with five items (Netemeyer et al., 1996), for example, "The demands of my work interfere with my home and family life." Role overload, role conflict, and work–home conflict were all reversed such that low scores indicate more tolerable levels of demands.

2.1.6 | Demographic questions

The variables, gender, age, job tenure, industry, job role, employment situation (e.g., casual, full or part-time), and hours worked were collected to provide contextual information about participants in the study.

2.2 | Results

Confirmatory factor analyses (CFAs) using the maximum likelihood (ML) estimator in M*plus* (Version, 8.1) revealed items loaded well on their first-order work characteristic. We removed items with loadings under 0.70 as recommended (Byrne, 2012; see Table SA, Supplementary Material). Means, standard deviations, correlations, and internal reliabilities for each of the final first-order variables are shown in Table 2. Intercorrelations between indicators of the same higher order constructs were all moderately positive, in keeping with Edwards' (2001) criteria for such constructs: stimulating work characteristics 0.62–0.66; autonomous work characteristics 0.73–0.81; mastery work characteristics 0.13–0.46; relational work characteristics 0.25; and tolerable work characteristics 0.43–0.60.

Next, we followed Credé and Harms' (2015) recommended five step procedure to assess the higher order structure. Step 1 showed the five-factor higher order model (5FHOM) fit the data very well ($\chi^2 = 1842.14$, $df = 836$, $p = <0.001$, CFI = 0.97, TLI = 0.97, RMSEA = 0.033, SRMR = 0.05), suggesting it reproduces observed covariations in the manifest variables.

Step 2 involved comparing the 5FHOM against eight alternative models using the ML Robust (MLR) estimator.[2] Model 1 (M1) is a single factor model in which all 43 items loaded onto one factor (Table 3). Model 2 (M2) is a first order, orthogonal model in which the

TABLE 3 Study 1 fit statistics and model comparison statistics between the five-factor higher-order model (5FHOM) and the eight more parsimonious alternative models derived from the working sample of online education participants ($N = 1107$).

Model	Description	χ^2	*df*	*p*	RMSEA	CFI	TLI	SRMR	$\Delta\chi^2$	Δdf	*p*
5FHOM	Five-factor higher order model	1842.144	836	<0.001	0.03	0.97	0.96	0.05	-	-	-
M1	Single factor model	20817.44	860	<0.001	0.15	0.31	0.27	0.17	8443.43	24	<0.001
M2	16 factor orthogonal model	6715.55	862	<0.001	0.08	0.80	0.79	0.24	4575.19	22	<0.001
M3	16 factor oblique model	1557.55	769	<0.001	0.03	0.97	0.97	0.03	−283.90	−67	<0.001
M4	One higher order factor model	3687.89	846	<0.001	0.06	0.90	0.90	0.13	8443.43	24	<0.001
M5	Two higher order factor model[a]	3118.63	845	<0.001	0.05	0.92	,92	0.10	1392.04	9	<0.001
M6	Three higher order factor model[b]	3092.49	843	<0.001	0.05	0.92	0.92	0.10	1355.87	7	<0.001
M7	Four higher order factor model[c]	1885.12	840	<0.001	0.03	0.96	0.96	0.05	39.31	4	<0.001
M8	M&H four factor higher order model[d]	2167.84	840	<0.001	0.03	0.95	0.95	0.07	315.12	4	<0.001

Abbreviations: CFI, comparative factor index; *df*, χ^2 degrees of freedom; *p*-value, statistical significance (<0.05) associated with χ^2 or $\Delta\chi^2$; RMSEA, root mean square residual; SRMR, standardized root mean square residual; TLI, non-normed fit index; Δdf, change in degrees of freedom associated with the $\Delta\chi^2$; $\Delta\chi^2$, change in χ^2 between the higher factor model and the more parsimonious model; χ^2, chi-square value.

[a]The two higher order factors are: job resources (skill variety, problem-solving, information processing, job feedback, feedback from others, role clarity, scheduling autonomy, decision-making autonomy, method autonomy, social support, and task significance) and job demands (role overload, work–home conflict, and role conflict).

[b]The three higher order factors are: job resources (skill variety, problem-solving, information processing, job feedback, feedback from others, role clarity, scheduling autonomy, decision-making autonomy, and method autonomy); job demands (role overload, work–home conflict, and role conflict); and relational work characteristics (social support and task significance).

[c]The four higher order factors are: relational and mastery work characteristics combined (social support, task significance, job feedback, feedback from others, and role clarity); stimulating work characteristics (skill variety, problem-solving, and information processing); autonomous work characteristics (scheduling autonomy, decision-making autonomy, and method autonomy); and tolerable work characteristics (low role overload, low work–home conflict, and low role conflict).

[d]Morgeson and Humphrey's (2006) model comprising: task characteristics (scheduling autonomy, decision-making autonomy, method autonomy, skill variety, task significance, and job feedback); knowledge characteristics (problem-solving and information processing); social characteristics (social support and feedback from others); and tolerable work characteristics (low role overload, low work–home conflict, and low role conflict).

14 first-order factors are specified to be uncorrelated and residual variances are uncorrelated. Model 3 (M3) represents a first-order, 14 factor oblique model in which first-order factors are correlated and residual variances are uncorrelated. Model 4 (M4) represents a second-order model with a single second-order work design factor on which the 14 first-order factors load. Model 5 (M5) comprises two second-order factors, with job resources (skill variety, problem-solving, information processing, job feedback, feedback from others, role clarity, scheduling autonomy, decision-making autonomy, method autonomy, social support, and task significance) loading on one factor and job demands (role overload, work–home conflict, and role conflict) loading on the second factor. Model 6 (M6) comprises three second-order factors, a job resources factor comprising skill variety, problem-solving, information processing, job feedback, feedback from others, role clarity, scheduling autonomy, decision-making autonomy, method autonomy, a job demands factor comprising role overload, work–home conflict, and role conflict, and a relational characteristics factor comprising social support and task significance. Model 7 (M7) consists of four second-order factors: a factor containing "relational" and "mastery" work characteristics combined (social support, task significance, job feedback, feedback from others, and role clarity), a "stimulating" factor (skill variety, problem-solving, and information processing), an "autonomous" factor (scheduling autonomy, decision-making autonomy, and method autonomy), and a "tolerable" factor (low role overload, low work–home conflict, and low role conflict). We combined relational and mastery work characteristics as the 5FHOM suggested the highest correlation between these two factors ($r = 0.90$). Finally, Model 8 (M8) comprised three of the four factors in the model proposed by Morgeson and Humphrey (2006), plus an additional work demands factor, as follows: (1) task characteristics (scheduling autonomy, decision-making autonomy, method autonomy, task significance, and job feedback); (2) knowledge characteristics (skill variety, problem-solving, information processing, and role clarity); (3) social characteristics (social support and feedback from others); and (4) job demands (workload, work–home conflict, and role conflict). We included role clarity as a knowledge resource because understanding one's roles and responsibilities is information the individual can apply to their everyday work. We did not include any indicators for Morgeson and Humphrey's "work context" factor as our focus was on psychological and not physical aspects of work. Table 3 displays key fit statistics for all nine models. The 5FHOM fits the data better than all the other models except for M3, as indicated by the significant *p*-values of the chi-square change statistic. M3 has fewer degrees of freedom and is a more parsimonious model than the 5FHOM, hence it is unsurprising that it fit the data better. However, theoretically, the 5FHOM makes better sense than M3 as it allows groups of work characteristics to be meaningfully categorized according to common themes and considered holistically when theorizing links with outcomes or, practically, when designing work. The 5FHOM is therefore the preferred model.

Step 3 showed that the target coefficient (TC), the relative normed fit index (RNFI), and the RMSEA-P were 0.94, 0.96, and 0.07, respectively, indicating that the higher order factors explain a large proportion of the lower order covariation (Credé & Harms, 2015).

In Step 4, three second-order factors, "stimulating," "autonomous," and "tolerable" met the average variance extracted (AVE; Fornell & Larcker, 1981) benchmark of 0.50 or above (0.72, 0.86, and 0.50, respectively), and "mastery" almost met this level (0.44). This indicates these higher order factors could adequately explain the variance in their respective lower order factors. The AVE for "relational" was below the benchmark (0.32), likely due to the low loading of task significance on the second-order factor. We retained task significance in the model due to its theoretical standing as an important relational work characteristic (Grant & Parker, 2009), and because it performed adequately on all other criteria, but we improved its assessment in Study 2. In addition, Credé and Harms (2015) do not recommend using stringent cut-offs but assessing the validity of a model using a range of indexes.

In Step 5, we showed that an average of 37% (min = 20%, max = 61%) of the variance in the manifest variables was attributable to the higher order factor, with 35 of the 40 items meeting the benchmark of 25%. An average of 35% (min = 5%, max = 71%) of the variance was "attributable to the idiosyncratic influence of the first-order factor" (Credé & Harms, 2015, p. 854), meeting the benchmark of 24%.

Taking the results across all five steps, overall, the 5FHOM fits the data well and better than any of the alternative models, supporting hypotheses 1a, 2a, 3a, 4a, and 5a.

3 | STUDY 2: VALIDITY OF THE STRUCTURE

An independent sample with three waves of data allowed us to first replicate the fit of the 5FHOM using time 1 data. We included beneficiary contact and a broader measure of social support, which incorporated colleague and supervisor support (Van Veldhoven & Meijman, 1994), to improve the breadth of characteristics captured by relational work characteristics and enhance its AVE score. We also included task variety as an additional indicator for stimulating work characteristics. Second, we tested the usefulness of the structure by examining how the higher order work design factors predict job satisfaction via various pathways. To reduce common method variance (CMV), we assessed the work characteristics at time 1; the mediators, challenge appraisals, work meaningfulness, and fulfillment of relatedness needs at time 2 (1 week after time 1); and the mediator, high activated negative affect, and the outcome, job satisfaction at time 3 (2 weeks after time 1).

3.1 | Materials and methods

Participants at time 1 consisted of 795 English-speaking adults who worked at least 10 h per week. They were recruited from Amazon Mechanical Turk (MTurk) and paid US$3 to participate in a 20-min study about their work experiences. We followed recommendations by Bernerth et al. (2021) to ensure quality data from this type of sample. We removed 86 participants from our sample who had either

failed to respond to most questions ($n = 76$) or declared their data unreliable ($n = 10$), in accordance with careless responding recommendations (Curran, 2016; Ward et al., 2017). The final sample of 709 participants had 56% men, a mean age of 40.4 years (SD = 10.9), and a mean job tenure of 6.9 years (SD = 6.3). Participants mostly included managers (24.3%) and professionals (26.9%). Participants were from varied industries, including health care and social work (12.7%); retail trade (11.1%); and professional, scientific, and technical services (10.3%). Most people were employed on a permanent (71.9%) or fixed-term (18.1%) contract and worked an average of 42.5 h per week (SD = 9.7).

All Time 1 participants were invited to complete the second survey, and those completing both the first and second surveys were invited to complete the third survey and paid USD$2 for each of the subsequent 10-min surveys. The response rates for the second and third surveys were 83% ($n = 661$) and 90% ($n = 595$), respectively. We removed participants with incomplete data or responses declared unreliable. The final matched sample for the multi-wave study was 573 participants, comprising 54.8% men, a mean age of 41 years (SD = 11.3), and a mean job tenure of 7 years (SD = 6.3). Sample demographics were similar to those for the time 1 data.

For the measures, all responses were recorded on a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree) unless stated otherwise. The same indicators of work design as used in Study 1 were assessed at Time 1, with four exceptions: (1) for tolerable work characteristics, role overload was assessed using a more extensively validated measure than that used in Study 1 (Van Veldhoven & Meijman, 1994), an example being, "Do you have too much work to do?" (1 = Never; 5 = Always), and all items were reverse coded as in Study 1; (2) we included an additional indicator for stimulating work characteristics (four items measuring task variety (Morgeson & Humphrey, 2006), an example being, "The job requires a variety of skills"); (3) for relational work characteristics, we included a measure of social support which captured both colleague and supervisor support (four items (Van Veldhoven & Meijman, 1994), examples being, "Can you count on your immediate supervisor/manager when you come across difficulties in your work?" and "Can you count on your colleagues when you encounter difficulties in your work?" [1 = Never to 5 = Always]); and (4) we included an additional indicator for relational work characteristics (two items measuring beneficiary contact (Grant, 2012) an example being, "My job gives me the opportunity to meet the people who benefit from my work").

3.1.1 | Challenge appraisal

Challenge appraisal was measured at Time 2 using four items (Ohly & Fritz, 2010), with slight changes to two items to make work the focus (adaptations in italics): "*In my work*, I feel challenged," and "I view my *work* tasks today as challenging." A third item was already work focused and did not require adapting: "My work today brings me closer to the accomplishment of personal goals." A fourth item was adapted to refer to "goals," as opposed to "skills": "The work tasks today are adequate for my personal *goals*."

3.1.2 | Work meaningfulness

Four items from the "meaning" dimension of Spreitzer's (1995) concept of psychological empowerment were assessed at Time 2. Example items are, "The work I do is very important to me"; "My job activities are personally meaningful to me."

3.1.3 | Fulfillment of relatedness needs

Three items from the 18-item work-related basic needs scale (van den Broeck et al., 2010) were measured at Time 2. An example item is, "At work, I feel part of a group."

3.1.4 | Activated negative affect

Four items from Warr et al.'s (2014) measure of this concept were included at Time 3. Each item had the stem, "During the past month, how often have you felt the following at work?" An example item is, "Anxious" (1 = Never; 6 = Always).

3.1.5 | Job satisfaction

Three items from Allen and Meyer (1990) were assessed at Time 3. An example item is, "Overall, I am satisfied with the kind of work I do."

3.1.6 | Demographics

The variables, gender, age, tenure, industry, job role, employment situation, and hours worked were included in the Time 1 survey to provide context.

3.2 | Results

To assess the higher order structure, we followed the same strategy as for Study 1. CFAs resulted in a final set of 49 items that loaded 0.70 or above on their first-order factor (see Table in Supplementary Analyses). The means, SDs, alphas, and correlations for the final set of variables are shown in Table 4. All reliabilities were high (>0.80). Indicators for higher order constructs positively correlated with each other as expected: stimulating work characteristics 0.47–0.67; autonomous work characteristics 0.33–0.47; mastery work characteristics 0.76–0.86; relational work characteristics 0.26–0.31; and tolerable work characteristics 0.24–0.39.

Next, we examined the higher order structure following the five-step procedure outlined by Credé and Harms (2015). The fit of the 5FHOM was very good ($\chi^2 = 2032.37$, $df = 1104$, $p = <0.001$, CFI = 0.96, TLI = 0.95, RMSEA = 0.03, SRMR = 0.07), suggesting that it can satisfactorily reproduce observed covariation in manifest

TABLE 4 Study 2 means, standard deviations, and bivariate correlations between the demographics, each of the first-order work design variables, the higher order work design constructs, hypothesized mediators, and the outcome, job satisfaction derived from the MTurk sample ($N = 573$).

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Gender (T1)	0.46	0.51													
2. Age (T1)	41.05	11.32	−0.26												
3. Job tenure (T1)	7.19	6.32	−0.10	0.43											
4. Employment situation (T1)	1.12	0.44	−0.14	0.05	−0.14										
5. Hours worked (T1)	39.10	8.08	0.19	−0.01	0.18	−0.52									
6. Task variety (T1)	3.92	0.88	−0.09	0.09	0.16	−0.07	0.14	(0.94)							
7. Skill variety (T1)	4.01	0.84	−0.07	0.10	0.13	−0.03	0.10	0.67	(0.87)						
8. Problem-solving (T1)	3.57	0.98	0.02	0.07	0.11	−0.06	0.13	0.47	0.57	(0.82)					
9. Information processing (T1)	3.96	0.94	−0.02	0.11	0.18	−0.13	0.17	0.51	0.61	0.60	(0.81)				
10. Scheduling autonomy (T1)	3.91	0.85	0.05	0.08	0.09	−0.04	0.05	0.17	0.23	0.16	0.19	(0.88)			
11. Decision-making autonomy (T1)	3.65	0.97	0.05	−0.02	0.12	−0.15	0.12	0.31	0.35	0.20	0.28	0.47	(0.88)		
12. Method autonomy (T1)	4.32	0.66	−0.12	0.10	0.13	0.02	0.01	0.15	0.17	−0.01	0.09	0.39	0.33	(0.91)	
13. Job feedback (T1)	3.73	0.96	−0.01	0.09	0.11	0.03	0.06	0.32	0.33	0.29	0.32	0.09	0.09	0.16	(0.90)
14. Feedback from others (T1)	3.94	0.89	−0.04	0.10	0.12	0.03	0.05	0.34	0.35	0.35	0.34	0.15	0.13	0.22	0.77
15. Role clarity (T1)	3.89	0.93	0.02	0.06	0.14	0.01	0.07	0.33	0.33	0.34	0.30	0.12	0.13	0.21	0.76
16. Task significance (T1)	3.49	1.02	−0.02	0.10	0.11	−0.07	0.12	0.32	0.34	0.30	0.39	0.19	0.27	0.17	0.19
17. Social support (T1)	3.76	0.90	0.00	0.07	0.13	−0.19	09	0.22	0.27	0.12	0.15	0.22	0.47	0.33	0.15
18. Beneficiary contact (T1)	3.59	1.15	−0.02	0.00	0.11	−0.22	0.12	0.32	0.30	0.28	0.19	0.08	0.24	0.09	0.17
19. Low role overload (T1)	2.75	0.83	0.06	0.01	−0.04	0.14	−0.22	−0.28	−0.20	0.19	−0.26	−0.05	−0.11	0.01	0.08
20. Low work–home conflict (T1)	3.70	1.11	0.04	0.05	0.01	0.11	−0.15	0.04	0.04	−0.09	−0.07	0.09	0.13	0.24	0.10
21. Low role conflict (T1)	3.55	1.07	−0.04	0.10	0.03	0.03	−0.02	0.03	0.08	−0.02	−0.07	0.09	0.13	0.29	0.09
22. Stimulating WCs (T1)	3.86	0.75	−0.05	0.11	0.18	−0.09	0.17	0.79	0.86	0.81	0.83	0.23	0.34	0.11	0.38
23. Autonomous WCs (T1)	3.96	0.64	0.00	0.06	0.15	−0.09	0.08	0.28	0.33	0.17	0.25	0.81	0.82	0.68	0.14
24. Mastery WCs (T1)	3.85	0.86	−0.01	0.09	0.13	0.02	0.06	0.36	0.36	0.35	0.35	0.13	0.13	0.21	0.91
25. Relational WCs (T1)	3.61	0.74	−0.02	0.07	0.16	−0.23	0.15	0.40	0.42	0.33	0.34	0.22	0.44	0.26	0.24
26. Tolerable WCs (T1)	3.33	0.75	0.02	0.07	0.01	0.12	−0.17	−0.07	−0.02	−0.13	−0.16	0.07	0.08	0.26	0.12
27. Challenge appraisals (T2)	3.57	0.92	−0.05	0.08	0.16	−0.02	0.09	0.37	0.42	0.43	0.44	0.24	0.38	0.17	0.29
28. Work meaningfulness (T2)	3.68	1.12	−0.10	0.16	0.19	0.03	0.02	0.34	0.39	0.35	0.34	0.25	0.32	0.21	0.31

(Continues)

TABLE 4 (Continued)

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
29. Fulfillment of relatedness needs (T2)	3.63	0.97	−0.03	0.07	0.20	−0.20	0.16	0.28	0.27	0.21	0.18	0.28	0.37	0.32	0.13
30. Activated negative affect (T3)	2.14	1.04	−0.05	−0.18	−0.09	−0.05	0.02	−0.13	−0.16	−0.06	−0.06	−0.16	−0.15	−0.25	−0.17
31. Job satisfaction (T3)	3.82	1.02	−0.03	0.12	0.12	0.03	0.03	0.30	0.33	0.23	0.26	0.25	0.36	0.24	0.31

Variable	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
14. Feedback from others (T1)	(0.89)																
15. Role clarity (T1)	0.86	(0.86)															
16. Task significance (T1)	0.26	0.22	(0.95)														
17. Social support (T1)	0.21	0.21	0.26	(0.87)													
18. Beneficiary contact (T1)	0.21	0.21	0.27	0.31	(0.94)												
19. Role overload (T1)	0.02	0.03	−0.15	0.06	−0.04	(0.81)											
20. Work–home conflict (T1)	0.11	0.11	0.04	0.33	0.03	0.39	(0.97)										
21. Role conflict (T1)	0.12	0.11	−0.03	0.33	0.02	0.24	0.38	(0.93)									
22. Stimulating WCs (T1)	0.42	0.40	0.41	0.23	0.33	−0.28	−0.03	−0.00									
23. Autonomous WCs (T1)	0.21	0.19	0.28	0.45	0.19	−0.07	0.19	0.20	0.31								
24. Mastery WCs (T1)	0.94	0.94	0.24	0.21	0.21	0.05	0.12	0.11	0.43	0.19							
25. Relational WCs (T1)	0.31	0.30	0.70	0.69	0.77	−0.06	0.17	0.13	0.45	0.41	0.30						
26. Tolerable WCs (T1)	0.12	0.12	0.05	0.34	0.01	0.67	0.82	0.75	−0.12	0.16	0.13	0.12					
27. Challenge appraisals (T2)	0.34	0.34	0.41	0.36	0.28	−0.09	0.11	0.19	0.51	0.36	0.35	0.48	0.24				
28. Work meaningfulness (T2)	0.37	0.36	0.44	0.36	0.32	−0.01	0.16	0.15	0.43	0.34	0.37	0.51	0.21	0.73			
29. Fulfillment of relatedness needs (T2)	0.20	0.20	0.35	0.54	0.33	−0.08	0.10	0.20	0.28	0.42	0.19	0.55	0.23	0.48	0.51		
30. Activated negative affect (T3)	−0.22	−0.23	−0.14	−0.32	−0.08	−0.32	−0.36	−0.36	−0.12	−0.23	−0.22	−0.24	−0.46	−0.22	−0.30	−0.30	
31. Job satisfaction (T3)	0.36	0.34	0.36	0.36	0.22	0.14	0.32	0.27	0.34	0.37	0.36	0.47	0.32	0.66	0.71	0.53	−0.43

Note: For all $r \geq 0.09$, $p < 0.05$; for all $r \geq 0.11$, $p < 0.01$; reduced sample size is due to listwise deletion in SPSS; WCs = work characteristics; Gender, 1 = male, 2 = female; employment situation, 1 = Full-time, 2 = Part-time; Cronbach's alpha reliability coefficients are in the diagonal.

variables (Step 1). Following Step 2, the significant *p*-values associated with the chi-square change statistic suggested that the 5FHOM fits the data better than other models (Table 5). The TC, RNFI, and RMSEA-P were 0.88, 0.89, and 0.08, respectively, suggesting that the higher order factors can explain a large proportion of the lower order covariation (Step 3). The two second-order factors, "stimulating" and "autonomous," met the AVE benchmark of 0.50 indicating that these factors could satisfactorily explain variance in their lower order factors (Step 4). The other three factors, "mastery," "relational," and "tolerable," had acceptable values (0.47, 0.38, and 0.39, respectively). An average of 41% (min = 15%, max = 76%) of the variance in the manifest variables was attributable to the higher order factor, well over the benchmark of 25%. An average of 38% (min = 2%, max = 69%) of the variance was due to the idiosyncratic influence of the first-order factor (Credé & Harms, 2015), exceeding the benchmark of 24%. In summary, this study showed substantial support for the five-factor higher order structure. Additional tests of the structure can be found in the Supplementary Material.

To assess the usefulness of the structure, we tested the relationships between the five higher order constructs, job satisfaction, and mediators. Table 4 shows that all first-order work characteristics assessed at Time 1 correlated with job satisfaction as expected, with correlations ranging from 0.14 (low role overload) to 0.47 (social support). As expected, each indicator within a higher order set correlated in similar ways with their theorized mediators, and all higher order constructs predicted job satisfaction in the theorized direction.

Next, we assessed the predicted relationships between the higher order constructs, mediators, and outcomes using factor scores for each variable in a full structural equation model.[3] Bootstrapping with 10,000 resamples was used to ensure robust standard errors and obtain confidence intervals for the indirect effects. The overall model fit was satisfactory ($\chi^2 = 74.71$, $df = 16$, $p = <0.001$, RMSEA = 0.07, CFI = 0.96, SRMR = 0.03), and the hypothesized indirect paths were all significant (see Table SD, Supplementary Analyses). Specifically, work meaningfulness and challenge appraisal mediated between stimulating work characteristics and job satisfaction, supporting Hypotheses 1c and 1d. Work meaningfulness mediated between autonomous work characteristics and job satisfaction, supporting Hypothesis 2c. Challenge appraisals and activated negative affect mediated between mastery work characteristics and job satisfaction, supporting Hypotheses 3c and 3d, respectively. Work meaningfulness and the fulfillment of relatedness needs mediated between relational work characteristics and job satisfaction, supporting Hypotheses 4c and 4d. Activated negative affect mediated between tolerable work characteristics and job satisfaction, with tolerable work characteristics being associated with lower negative affect, supporting Hypothesis 5c. All bootstrapped 95% confidence intervals for the indirect paths did not cross zero, suggesting robust results (see Table SC, Supplementary Analyses).

TABLE 5 Study 2 fit statistics and model comparison statistics between the five-factor higher order model (5FHOM) and the eight more parsimonious alternative models derived from the MTurk sample ($N = 709$).

Model	Description	χ^2	*df*	*p*	RMSEA	CFI	SRMR	$\Delta\chi^2$	Δdf	*p*
5FHOM	Five-factor higher order model	2032.37	1104	<0.001	0.03	0.96	0.07	-	-	-
M1	Single factor model	16549.87	1127	<0.001	0.14	0.25	0.17	6935.98	23	<0.001
M2	16 factor orthogonal model	4922.66	1128	<0.001	0.07	0.82	0.22	2473.58	24	<0.001
M3	16 factor oblique model	1594.33	1010	<0.001	0.03	0.97	0.03	−476.56	−94	<0.001
M4	One higher order factor model	3289.68	1114	<0.001	0.05	0.89	0.13	1118.34	10	<0.001
M5	Two higher order factor model[a]	3125.58	1113	<0.001	0.05	0.90	0.13	952.99	9	<0.001
M6	Three higher order factor model[b]	3068.27	1111	<0.001	0.05	0.91	0.13	1453.04	7	<0.001
M7	Four higher order factor model[c]	2070.84	1108	<0.001	0.04	0.95	0.07	26.68	4	<0.001
M8	M&H four factor higher order model[d]	10126.26	1121	<0.001	0.11	0.56	0.14	2986.20	17	<0.001

Abbreviations: CFI, comparative factor index; *df*, χ^2 degrees of freedom; *p*-value, statistical significance (<0.05) associated with χ^2 or $\Delta\chi^2$; RMSEA, root mean square residual; SRMR, standardized root mean square residual; TLI, non-normed fit index; Δdf, change in degrees of freedom associated with the $\Delta\chi^2$; $\Delta\chi^2$, change in χ^2 between the higher factor model and the more parsimonious model; χ^2, chi-square value.

[a]The two higher order factors are: job resources (task variety, skill variety, problem-solving, information processing, job feedback, feedback from others, role clarity, scheduling autonomy, decision-making autonomy, method autonomy, social support, task significance, and beneficiary contact) and job demands (role overload, role conflict, and work–home conflict).

[b]The three higher order factors are: job resources (task variety, skill variety, problem-solving, information processing, job feedback, feedback from others, role clarity, scheduling autonomy, decision-making autonomy, and method autonomy); job demands (role overload, role conflict, and work–home conflict); and relational work characteristics (social support, task significance, and beneficiary contact).

[c]The four higher order factors are: relational and mastery work characteristics combined (social support, task significance, beneficiary contact, job feedback, feedback from others, and role clarity); stimulating work characteristics (skill variety, problem-solving, and information processing); autonomous work characteristics (scheduling autonomy, decision-making autonomy, and method autonomy); and tolerable work characteristics (low role overload, low role conflict, and low work–home conflict).

[d]Morgeson and Humphrey's (2006) model comprising: task characteristics (scheduling autonomy, decision-making autonomy, method autonomy, task variety, skill variety, task significance, and job feedback); knowledge characteristics (problem-solving and information processing); social characteristics (social support, feedback from others, and beneficiary contact); and work context characteristics (role overload, role conflict, and work–home conflict).

To directly investigate the mediating paths, we tested each of the hypothesized mediation relationships separately by entering the relevant predictor, mediator and outcome together, with no other variables in the model. As is standard practice, in each case, the direct effect was specified in addition to the hypothesized indirect effect to assess whether the indirect effect remained significant when the direct effect was present (MacKinnon et al., 2012). An additional positive direct pathway was found between tolerable work characteristics and job satisfaction. All hypothesized mediation relationships were significant and none of the bootstrapped 95% confidence intervals crossed zero, suggesting robust results (Table SD, Supplementary Analyses). Figure 1 displays the final model.

Finally, we conducted an additional analysis to determine the validity and value of our higher order factors (Johnson et al., 2012). Specifically, we tested whether the higher order factors could explain at least as much variance in the outcome as the lower order factors (Hypothesis 6). Each higher order factor was treated separately, and the lower order factors were regressed on the outcome, job satisfaction, in separate analyses. The higher order factors were then regressed on the outcome in separate analyses. The residuals from each analysis were saved, and the difference between the residuals for each pair of models was assessed using the chi-square statistic. There were no significant differences between the residuals for each model, suggesting the higher order factors are at least as powerful as the lower order factors in predicting the mediators and outcome,[4] supporting Hypothesis 6.

4 | STUDY 3

In this study, we provide further evidence of the validity of the higher order work design categories by examining their association with leader ratings of job performance. The primary value of these analyses is that CMV concerns are addressed.

The Final Structural Equation Model Showing the Usefulness of the Higher Order Constructs (N = 709)

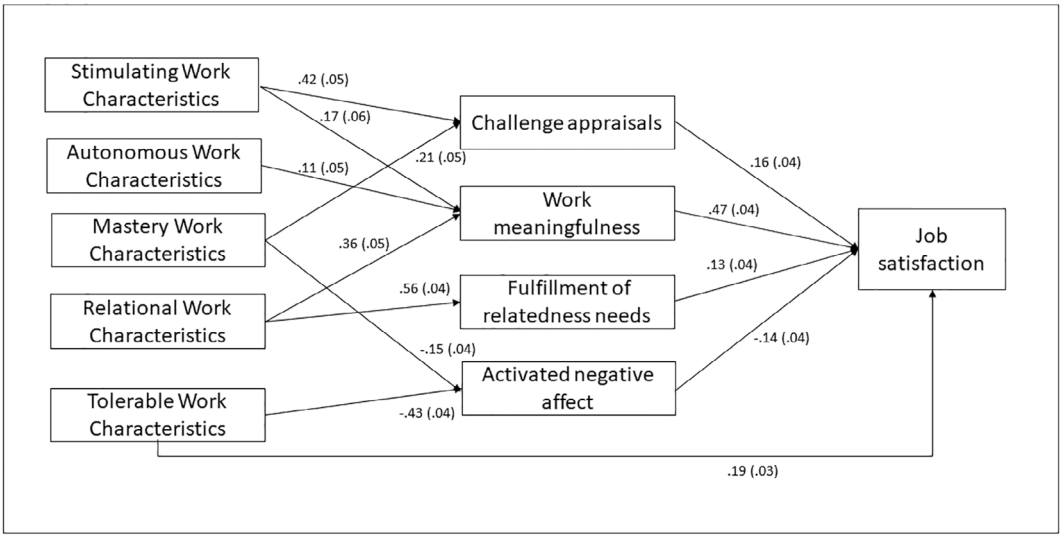

FIGURE 1 The final structural equation model showing the usefulness of the higher order constructs (*N*-790).

TABLE 6 Study 3 means, standard deviations, and bivariate correlations between the higher order work design variables and performance measures, derived from the MBA sample ($N = 108$).

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. Core task performance	4.25	0.56	-								
2. Proactive performance (taking charge)	3.63	0.73	0.40	-							
3. Proactive performance (strategic scanning)	3.45	0.68	0.32	0.47	-						
4. Adaptive performance	4.02	0.47	0.23	0.23	0.23	-					
5. Stimulating work characteristics	4.03	0.62	−0.01	−0.01	0.05	−0.01	-				
6. Autonomous work characteristics	3.95	0.72	0.23	0.25	0.25	0.12	0.35	-			
7. Mastery work characteristics	3.74	0.73	0.27	0.15	0.09	0.22	0.39	0.29	-		
8. Relational work characteristics	3.52	0.67	0.24	0.08	0.05	0.30	0.54	0.29	0.64	-	
9. Tolerable work characteristics	2.86	0.71	0.18	0.12	0.04	0.22	−0.22	0.19	0.26	0.19	-

Note: For all $r \geq 0.19$, $p < 0.05$; for all $r \geq 0.25$, $p < 0.01$.

4.1 | Materials and methods

As part of a part-time MBA program, study respondents ($N = 108$) participated in a developmental process in which their leaders provided feedback on their performance. The participants were working (68% in the private sector, 21% in the public sector, and 10% in the not-for-profit sector), had a mean age of 35 years (SD = 7), and 35% were female. Job types were mostly managers (45.8%) or professionals (49.5%) with 2% being clerical/administrators. Most participants were from Australia (67%) with 19% from Europe, 9% from Asia, 4% from Africa, and 2% from the United States.

The participants reported on various aspects of their work design. We created five higher order variables by creating an average from the constituent subscales. The same higher order constructs and measures were used as for Study 1 above. The one exception was that, for autonomous work characteristics, timing autonomy was assessed with four items that assessed autonomy over working times (rather than the timing of tasks), such as "to what extent can you influence the length of your work day?"

The managers of the MBA participants rated their performance. In a small number of cases in which the participants had more than one leader, the ratings were averaged across the leaders. Core job performance was assessed using three items from the core task proficiency scale of Griffin et al. (2007). An example item is: (this person) "carries out the core parts of his/her job well." We included an additional item: (this person) "fulfils all the requirements of the job" to increase reliability. Proactive performance was assessed with two measures capturing different aspects of proactivity. First, taking charge, a type of proactive work behavior focused on taking control of and bringing about change within the internal work environment, was assessed using four items from Parker and Collins (2010); a shortened version of Morrison and Phelps' (1999) measure. An example item is: (this person) "tries to bring about improved procedures in the workplace." Second, strategic scanning, a type of proactive strategic behavior focused on bringing about change in the organization's strategy to achieve fit with the external environment, was assessed with the measure developed by Parker and Collins (2010). An example item is: (this person) "identifies long-term threats and opportunities for the company." Adaptivity was measured by Griffin et al.'s (2007) 3-item scale assessing individual task adaptivity (e.g., this person "adapts well to changes in his/her core tasks") and team member adaptivity (e.g., this person "deals effectively with changes affecting his/her work unit"). All scales had internal reliabilities greater than 0.85.

4.2 | Results

Within each higher order category, exploratory factor analyses of subscales showed each category formed only one factor, and the subscales had an average intercorrelation within each higher order category of $r = 0.45$ ($p < 0.001$). The higher order variables also had low to medium-sized intercorrelations with each other (see Table 6), consistent with them being distinct categories. The correlations among the higher order categories of stimulating, autonomous, mastery, and relational work characteristics were positive, whereas tolerable work characteristics had a negative correlation with stimulating work characteristics but positive correlations with autonomous, mastery, and relational work characteristics.

Consistent with Hypothesis 7, and providing further evidence of the validity of the higher order factors, autonomous, mastery, and relational work characteristics each significantly correlated with core task performance ($r = 0.23$, $p < 0.05$; $r = 0.27$, $p < 0.01$, and $r = 0.24$, $p < 0.05$, respectively). Similarly, consistent with Hypothesis 8, autonomous work characteristics correlated with taking charge ($r = 0.25$, $p < 0.05$) and strategic scanning ($r = 0.25$, $p < 0.05$); the two types of proactive performance. In regard to the exploratory analyses, mastery, relational, and tolerable work characteristics positively associated with adaptive performance ($r = 0.21$, $p < 0.01$; $r = 0.30$, $p < 0.01$; $r = 0.22$, $p < 0.05$, respectively).

5 | DISCUSSION

In light of the continued and escalating importance of work design for addressing contemporary challenges, such as understanding how humans, technology, and AI can work together effectively (Parker & Grote, 2022), retaining older workers (Xie et al., 2019), and preventing burnout (Brower, 2022), our purpose in this article was to theorize and test a higher order model of work characteristics, the SMART model of work design. We have argued that this novel multidimensional model integrates, and expands, research from diverse theoretical perspectives, while also enabling researchers and practitioners to "see the wood from the trees." Across several studies capturing distinct samples, although there were some small deviations relative to our expectations (discussed later), there was strong support for the theorized structure, with robust evidence that the multiple work characteristics coalesce into five theoretically derived higher order categories. The validity of these higher order constructs was further demonstrated by virtue of their expected associations with job satisfaction and independently rated performance. Thus, consistent with the idea that variety and mentally complex work facilitates learning as well as eudemonic growth (Ohly & Fritz, 2010), stimulating work characteristics predicted job satisfaction via the appraisal of work as challenging and through fostering a sense of meaningfulness. Autonomous work characteristics means that people have control over their work tasks such that they can direct their efforts in ways that personally matter to them (Hackman & Oldham, 1976) and this also generated a sense of meaningfulness leading to greater job satisfaction. Autonomous work characteristics also correlated positively with leader ratings of core task performance and proactive performance, consistent with prior literature (Humphrey et al., 2007; Parker, 2007; Parker et al., 2010). Mastery work characteristics predicted job satisfaction through fostering a sense of challenge but also through lowering activated negative affect, such as feelings of worry. Aligning with findings from prior studies (Parker et al., 2021), mastery was also positively related to leaders' ratings of core task performance

and, in an exploratory analysis, adaptive performance. Relational work characteristics predicted job satisfaction via both meaningfulness and fulfillment of relatedness needs, which is also consistent with prior research (Grant, 2008; van den Broeck et al., 2016). This finding shows this factor has some aspects in common with other higher order categories (because of its link to meaningfulness) but that it also has some distinct elements by virtue of it uniquely predicting relational needs satisfaction. Relational work characteristics also positively linked to core task performance and adaptive performance as assessed by leaders, in line with previous research linking relational aspects of work to job performance (Grant, 2008). Finally, tolerable work characteristics was associated with higher job satisfaction, both through the expected pathway of lower activated negative affect, consistent with theorizing that job demands cause threat and anxiety (Rizzo et al., 1970), but also through an additional direct pathway.

5.1 | Theoretical implications

Altogether, there is good evidence for the five higher order dimensions of stimulating, mastery, autonomous, relational, and tolerable, which collectively capture the key organizing conditions that enable the meeting of organizational goals as well as the key psychological processes by which work design matters for individuals. With respect to organizing conditions, stimulating pertains to the horizontal division of labor and promotes the division of tasks that create varied and challenging work (Hackman & Oldham, 1976; Parker, 2014) as opposed to repetitive, Tayloristic work; autonomous work pertains to the vertical division of labor and encompasses the idea that authority over decision-making and the organization of work can be at different hierarchical levels (Puranam et al., 2014) with enriched work allowing individual employees a high level of control over their work (Hackman & Oldham, 1976; Karasek, 1979); integration through information processes (mastery) embodies the importance of communication, co-ordination and feedback for clarifying individual roles and responsibilities, and how they fit into wider team and organizational goals (Puranam et al., 2014; Sawyer, 1992); integration through social processes (relational) reflects the degree to which a person's work offers them the opportunity to connect meaningfully with others and feel supported (Grant, 2007; Karasek & Theorell, 1990; Morgeson & Humphrey, 2006); and the application of effort from individuals to achieve system-level goals is captured in the notion of tolerable, ensuring that such effort is not excessively psychologically costly (Demerouti et al., 2001; Puranam et al., 2014). With respect to key psychological processes, the five higher order factors have their influence through one or more of the psychological mechanisms of motivation (meaningfulness), strain (activated negative affect), social processes (meeting relational needs), and learning (challenge appraisals), which in turn map on to key work design perspectives in the literature (Demerouti et al., 2001; Grant & Parker, 2009; Hackman & Oldham, 1976; Karasek, 1979; Morgeson & Humphrey, 2006).

Altogether, therefore, the higher order structure—grounded in theory about how work arrangements enable the alignment of the organizational and the individual—was well supported. As such, the SMART work design model offers a more integrative perspective than the dominant work characteristic models that currently exist, including the JCM (Hackman & Oldham, 1976), the DCM (Karasek, 1979), the JD-R model (Demerouti et al., 2001), and Morgeson and Humphrey's (2006) expanded model of work design. All of these models omit important work characteristics, and none simultaneously consider motivation, strain, learning, and relational mediational processes. Evidence for a multidimensional structure also expands work design theory. In particular, our focus on a higher order structure means we have identified broader and more holistic work design constructs than typically considered which, as argued by authors in other fields (Ones & Viswesvaran, 1996; Roznowski & Hanisch, 1990), can increase the generality of theory and potentially yield greater construct and criterion validity (Edwards et al., 2000). At the subdimension level, we have also clarified the relationships among multiple work characteristics, showing how they covary in important ways, yet also remain distinct from each other.

Importantly, at the higher order level, our model brings together work characteristics that have traditionally been considered as disparate. For example, in the JD-R model (Demerouti et al., 2001), role clarity (or its reverse, role ambiguity) is treated as a "demand," and is predominantly considered in relation to strain outcomes, whereas feedback is traditionally treated as a "resource," and is predominantly considered in relation to motivation. Our model, in contrast, brings these concepts together in the form of mastery work characteristics and suggests that what binds these work characteristics together is the function they serve—that is, these job features provide individuals with the information they need to co-ordinate with others and to be effective within their work context. Linking together role clarity and feedback into a higher order construct helps to address a challenge with the JD-R model of work design, which is that scholars have sometimes struggled to distinguish between resources and demands (Schaufeli & Taris, 2014). The same argument applies to skill variety and task variety, which we identified as being aspects of stimulating work characteristics arising from how labor is horizontally divided. Yet, in their categorization of work characteristics, Morgeson and Humphrey (2006) identified skill variety as a "knowledge characteristic" that reflects the "knowledge, skill and ability demands that are placed on an individual…" (p. 1323), and meantime classified task variety as a "task characteristic" concerned with how the work itself is accomplished. Conceptually, we argued that task variety and skill variety have a common function of fostering "variety and novelty" that renders them both stimulating. Our assumption—supported empirically—is that this commonality around variety/novelty is more meaningful than the "task versus knowledge" distinction. It is clear from these examples that some work characteristics share a broad purpose that has not previously been considered.

5.2 | Practical implications

As we discussed at the outset, HRM practitioners have an important strategic role to play in addressing challenges such as ensuring remote

work is effective, dealing with the implementation of digital technologies, and alleviating worker burnout and job stress. Work design is critical to each challenge, yet the topic can seem overwhelming to non-academics (Parker & Jorritsma, 2021). Our early practical applications of the SMART work design model have shown that it helps practitioners to make sense of this complexity (see smartworkdesign.com.au for helpful resources). For example, one can use the model to assess the impact of remote working on well-being, such as the possibility that working from home might enhance autonomous work characteristics and yet simultaneously reduce relational work characteristics. Likewise, when introducing digital technologies, practitioners can take proactive steps to design and implement technologies that do not inadvertently undermine job quality, such as when automation creates passive monitoring roles (reduced stimulating work characteristics) or undermines human control (reduced autonomous work characteristics). Evidence exists for both of these risks of technology for work design (Parker & Grote, 2022). By consolidating the key work characteristics into a simple structure, practitioners can more readily grasp and hence incorporate work design principles.

Because each higher order factor is likely to be enabled and supported by particular sorts of HR policies and practices, our model also supports a more strategic approach to change. For example, if a team or organization is seeking to enhance scores on stimulating work characteristics, then policies and practices that foster the ability, motivation, and opportunity of workers to embrace complexity and variety would be important, as would be the selective hiring of individuals who are interested and able to acquire new skills. Also important might be work practices, such as job rotation or secondments that allow the opportunity for more varied work, and the cultivation of a strong learning culture. For an organization looking to build greater autonomy into people's work design, or to enhance autonomous work characteristics, practices and policies that enable and support worker self-management would be important. These could include, for instance, decentralized organizational structures, hiring individuals with a lower need for structure, and recruiting and rewarding bosses with an empowering leadership style. If mastery work characteristics are lacking, then the organization might turn its attention to aspects such as whether role descriptions and reporting structures are visible and up to date, whether performance management systems with clear performance criteria are in place, whether teams regularly engage in communication to clarify who is doing what, and whether managers are trained in providing effective feedback. Low scores on relational work characteristics would signal the need to consider how interdependence is managed, such as whether there are opportunities for team structures within the organization; to cultivate leaders who have strong interpersonal skills to enable highly supportive leadership; and to convey through various messages to workers about the impact of their work on others. Finally, if tolerable work characteristics are lacking, then the HR team might need to consider workforce planning with respect to the number of staff, reducing demands through increased efficiency of work practices and/or technologies, and recruitment and selection methods that enable a better fit between the job demands and the abilities of the worker. Altogether, while not intended as an exhaustive list, we would hope that the SMART approach to work design can help practitioners design and implement more strategic and targeted HR policies.

Importantly, these recommendations tend to assume a model in which organizations centrally create the work design or at least co-create it with employees. However, Reiche (2023) identified two increasingly prevalent modes of work organization that have much more fluid organizational boundaries than traditional organizational models: "formalized external work" (e.g., gig work) and "self-governing work" (e.g., portfolio or freelance work). We suggest that our higher order approach to work design applies to these work organization modes. For example, in the context of formalized external work such as gig work, social isolation (relational) and overwork/excessive hours (low tolerable) have been identified as work redesign risks (Wood et al., 2019). Nevertheless, the avenues for addressing poor work design might differ in such contexts. For example, the work design of gig workers might arise largely out of their own job crafting (e.g., which platforms they opt to work in; what boundaries they set around their work), as well as from the design of the technical system itself (e.g., whether the rules for income generation are transparent) and even more macro-level forces such as whether these workers are classified as "employees."

Altogether, whether used by HR practitioners, workers themselves, or even platform designers, our model can help people diagnose and evaluate comprehensively the quality of work across diverse occupations. From an assessment perspective, for most jobs, at least a subset of items from each higher order factor should be assessed as this will ensure coverage of the key psychological aspects of work design.[5] At the same time, if practitioners want a more nuanced analysis of a particular element, they can assess all of the work characteristics in that higher order construct. In other words, the higher order structure facilitates the analysis of work design at different degrees of breadth and depth.

5.3 | Limitations and future directions

We sought in this research to capture the key higher order dimensions of work characteristics. However, at the subdimension level, due to survey length limitations, as well as constraints about how many indicators can be considered within a single model, we did not include all possible work characteristics. It is possible that there could be other indicators of the higher order constructs. Work characteristics that we especially recommend testing include for stimulating work characteristics—specialization and job complexity; for mastery work characteristics—task identity; for autonomous work characteristics—participative decision-making; and for relational work characteristics—interdependence and interaction with others outside the organization. Most importantly, the concept of tolerable work characteristics could be expanded. Here, we constrained job demands to be those that reflect having to put in a great deal of effort (what Schaufeli & Bakker, 2004 refer to as "quantitative work demands"), and hence are reasonably interchangeable. However, other qualitative

work demands that employees can experience, such as emotional demands, are important. If further diverse demands are included, we speculate that tolerable work characteristics might be better conceptualized as an aggregate construct in which multiple demands combine to create the construct (Bollen & Lennox, 1991; Johnson et al., 2012).

Another constraint of our current study pertains to its goal. That is, we aimed to assess the links of work design to job satisfaction/job performance so as to evaluate the validity of the higher order constructs. It was not our intention to develop or test a causal model. Consequently, our tests were limited in that we did not utilize a true longitudinal model, so the mediation results need to be interpreted with caution. The tests linking work design and performance were also limited to zero-order correlations rather than more complex models. Expanded approaches are important for future research.

Our research also highlights the need for scale development. In particular, in our studies, task significance and the satisfaction of the need for relatedness were operationalized using established measures that share similar item content (see Morgeson & Humphrey, 2006; van den Broeck et al., 2010). We conducted thorough reliability and validity analyses to ensure the distinctness of the constructs in our model, but more attention needs to be paid to separating measures out so that work design and mediating constructs have more distinct item content. Failure to do so risks the over-interpretation of inflated relationships.

There would also be value in including in future analyses a broader set of outcomes (e.g., burnout), as well as modeling the antecedents of the higher order constructs. For example, to further test the structure, one could test the theorized relationships between the higher order constructs and—at an aggregate level—key aspects of organizational design (e.g., the number of hierarchical levels, indicating a greater division of labor). As a case in point, Burton et al. (2015, p. 123) discussed how units with "knotty designs," that is, with both high variability and high connectedness (such as a gourmet restaurant), "require highly skilled employees and management that can simultaneously support autonomy, control, and learning," implying that these units will tend to have stimulating and autonomous work characteristics. On the other hand, one would predict that units with "orderly" designs in which work is "broken into pieces so you can direct each work unit to perform independently of one another" and with little need for co-ordination (p. 122) would have been less stimulating and less relational work characteristics. Such speculations could be fruitfully investigated.

As noted above, in this article, we have tended to assume that perceived work characteristics arise from organizational and managerial decisions, which is a "top-down" perspective on work design. However, work design is also influenced by the "bottom-up" actions of an individual, such as when a worker engages in job crafting to mold his/her work role to better fit one's abilities, skills, or interests (Hornung et al., 2014). Although our focus was not on such bottom-up processes, is interesting to observe that the five higher order factor structure maps well onto the key dimensions of job crafting that have been identified in the literature. Drawing on the Tims et al. (2012) model of four types of crafting, *increasing challenging job demands* relates especially to stimulating; *increasing structural job resources* (defined as gaining more responsibility, autonomy, or knowledge about the job) relates especially to autonomy, as well as to some degree to stimulating work; *increasing social job resources* relates especially to mastery when this type of crafting involves feedback seeking, and to relational when this type of crafting involves building networks and seeking support; and, finally, *decreasing hindering job demands* relates especially to achieving tolerable work. Relatedly, from the perspective of Zhang and Parker's (2019) hierarchical model of job crafting, approach-oriented forms of crafting are most likely to help achieve stimulating, mastery, autonomous, and relational work characteristics, whereas avoidant-oriented forms of crafting are most likely to address demands to achieve more tolerable work. In sum, the five higher order categories of work characteristics appear to capture the core types of job crafting, providing a basis for bringing together "top-down" and "bottom-up" forms of work design.

Additional methodologies can be used to help understand how the higher order work design dimensions work together holistically, without the restrictions associated with typical moderated regression analyses (Spurk et al., 2020). For example, necessary condition analysis (Dul, 2016) could identify which of the higher order dimensions and their combinations are required for outcomes like job satisfaction, and qualitative comparison analysis (Ragin, 1999) could identify configurations of factors that are sufficient yet not necessary. Likewise, latent profile analysis could be used to identify groups of people with distinct profiles of the higher order dimensions. For example, a profile involving high levels of stimulating and autonomous work characteristics, yet low on mastery, could undermine performance because workers have high levels of latitude yet little direction and feedback. Likewise, a profile with low tolerable demands yet all of the other elements is likely to be less stress-inducing than a profile, which is low in tolerable demands yet is also low on stimulating, mastery, autonomy, and relational, due to the potential buffering role of these job resources. Importantly, using SMART's higher order dimensions as a foundation for such additional holistic analyses may yield approaches that are less idiosyncratic than is currently the case. For example, as it stands, an enormous number of diverse profiles can be created according to which of the more than 30 single-dimension work characteristics are included.

Finally, the higher order structure was upheld in diverse samples, including largely professional/managerial workers in Study 1 and more heterogenous MTurk workers in Study 2, with participants across the three studies also being from different countries. Overall, our workers fit mostly into the modes of work described by Reiche (2023) as formalized external work (e.g., the MTurk sample) or the organizational modes, with arguably fewer participants from external self-governing modes (e.g., freelancers). There is merit in applying the model more broadly to check its generalizability, as well as to apply it within a specific organizations so as to test, for example, the extent that employees within the same groups or units have shared perceptions of their work design.

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CONFLICT OF INTEREST STATEMENT

We have no conflicts of interest to disclose.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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ENDNOTES

[1] Due to the statistical problems caused by having all possible work characteristics in the model (i.e., insufficient degrees of freedom and an overly complex model), we have focused on the most common work characteristics with clear evidence of their psychological impact. In the Discussion, we suggest including additional work characteristics in follow-up research.

[2] The MLR estimator is robust to non-normality and generates the chi-square scaling factor necessary to calculate change in chi-square between nested models.

[3] CFAs were also conducted for each of the mediators and job satisfaction to ascertain the structure of each construct. Following this process, we dropped two items from the "challenge appraisal" scale that loaded poorly on the construct. Reliabilities were good for all the mediator variables and job satisfaction (see Table SB, Supplementary Analyses). We also ascertained that each relational work characteristic is factorially distinct from the measure of fulfillment of relatedness satisfaction.

[4] Results are available from the corresponding author on request.

[5] For such a broad-brush analysis, we have identified a subset of 15 items that reliably assess the five higher order factors (please contact the corresponding author for these items).

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SUPPORTING INFORMATION

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

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