A New Perspective on Time Pressure and Creativity: Distinguishing Employees' Radical versus Incremental Creativity

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Abstract

The role of time pressure for individual employees' creativity remains ambiguous, with prior studies reporting positive, negative, and curvilinear relations. The present research aims to address this issue. Drawing from the attentional focus model, we (a) distinguish the consequences of time pressure for radical vs. incremental creativity and (b) introduce external and internal knowledge scanning as distinct mediating mechanisms. Moreover, we cast employees' long-range and short-range planning as moderators of the indirect time pressure-creativity linkages. Time-lagged data from 203 employees and their supervisors revealed that time pressure hampered employees' radical creativity by undermining their external scanning, with long-range planning alleviating this negative indirect relationship. In contrast, we found an indirect, inverted U-shaped linkage between time pressure and incremental creativity through internal scanning. Unexpectedly, this indirect relation was not contingent on employees' short-range planning. These results offer a new theoretical perspective that helps to reconcile previous, seemingly contradictory findings on the relationship between time pressure and creativity. Moreover, our results offer practical implications for modern workplaces that require employees' creative contributions under conditions of time scarcity.

Keywords: creativity; time pressure; knowledge scanning; time planning

In today's fast-paced and competitive work environments, many employees experience intense time pressure (i.e., insufficient time to complete one's tasks; Ohly & Fritz, 2010). Nonetheless, organizations often expect these employees to deliver creative contributions, developing novel, potentially useful ideas for products, services, and procedures under conditions of time scarcity (Kach et al., 2012; Shalley et al., 2004). Accordingly, the role of time pressure for individuals' creativity has become a major focus of organizational research (e.g., Baer & Oldham, 2006; Khedhaouria et al., 2017).

In summarizing this literature, however, scholars have bemoaned a prevalence of inconsistent and conflicting findings (Acar et al., 2019; Gutnick et al., 2012). Indeed, prior empirical research has yielded strikingly different results, illustrating that time pressure–creativity linkages may be negative (e.g., Amabile et al., 1996; Andrews & Smith, 1996; Antes & Mumford, 2009; Damadzic et al., 2022), positive (e.g., Noefer et al., 2009; Ohly & Fritz, 2010; Rostami et al., 2019), or curvilinear (i.e., inverted U-shaped; Baer & Oldham, 2006; Binnewies & Wörnlein, 2011; Ohly et al., 2006). Thus, it is clear that time pressure is a prevalent factor that may critically shape creativity—but its specific consequences remain ambiguous: Does employees' creativity suffer or benefit from time pressure experiences, or is there some optimal, intermediate time pressure level at which creativity is maximized? To further address this important question and advance a better theoretical understanding of time pressure–creativity linkages, we believe research needs to address a number of challenges.

Most importantly, time pressure-creativity research has typically conceptualized creativity as a unidimensional construct (e.g., Baer & Oldham, 2006; Binnewies & Wörnlein,

2011). Crucially, however, a growing body of literature instead advocates a more complex, multidimensional approach that distinguishes *radical creativity* (i.e., novel, unconventional, groundbreaking ideas) from *incremental creativity* (i.e., minor but practical improvements to existing practices; Madjar et al., 2011; Sung et al., 2020). These creativity types reflect independent dimensions that emerge through distinct processes, such that the same conditions may yield different consequences for either type (Gilson & Madjar, 2011; Gong et al., 2017). A specific predictor may diminish radical creativity, for example, yet may not affect (or even benefit) incremental creativity (Gilson et al., 2012). More specifically, theorists have emphasized that external constraints, such as time pressure, may yield distinct consequences for radical vs. incremental creativity (Acar et al., 2019). Hence, the unidimensional perspective on creativity common in research on time pressure's consequences may at least partially explain prior inconsistent findings.

Additionally, our limited understanding of time pressure–creativity linkages may arise from a relative lack of empirical research on mechanisms and boundary conditions (Acar et al., 2019; Gutnick et al., 2012). A handful of studies have illustrated the mediating role of individuals' cognitive (e.g., challenge appraisal, creative cognition; Amabile et al., 2002; Ohly & Fritz, 2010), motivational (e.g., engagement, creative self-efficacy; Montani et al., 2020; Shao et al., 2019), and behavioral reactions (e.g., knowledge sourcing, job crafting; Khedhaouria et al., 2017; Yu & Wang, 2022). Moreover, a few studies have demonstrated individual (e.g., openness, mindfulness, cognitive complexity, and promotion focus) and contextual moderators (e.g., fairness, creativity support, job control, and leadership; Baer &

Oldham, 2006; Binnewies & Wörnlein, 2011; Janssen, 2000, 2001; Montani et al., 2020; Shao et al., 2019; Yu & Wang, 2022). Again, however, this research has not considered creativity's multidimensional nature – and we believe this is a critical omission. After all, individuals use unique behaviors to attain radical vs. incremental creativity (Liu et al., 2022; Yu & Choi, 2022), and time pressure may distinctly shape these behaviors. Similarly, individuals may differ markedly in their approaches toward dealing with scarce temporal resources (Claessens et al., 2004; Zampetakis et al., 2010), potentially altering their behavioral reactions toward time pressure and, thus, their radical vs. incremental creativity. Hence, unraveling time pressure's creativity consequences requires consideration of (a) unique mechanisms that explicate its distinct roles for radical and incremental creativity and (b) specific boundary conditions that shape its implications for either creativity type.

This investigation develops such an approach. We follow conceptualizations of creativity as a "knowledge process" (Campbell, 1960, p. 384) that entails both the generation of completely new insights (akin to radical creativity) and the refinement of existing knowledge (akin to incremental creativity; Khedhaouria & Jamal, 2015; Majchrzak et al., 2004). From this perspective, knowledge acquisition is a key antecedent that increases individuals' ability to devise and validate creative ideas (Perry-Smith & Shalley, 2003)—and research has shown that time pressure shapes individuals' knowledge attainment efforts (e.g., Khedhaouria et al., 2017). Moving beyond this work, we aim to identify specific processes of knowledge acquisition that explicate time pressure's distinct linkages with radical vs. incremental creativity. We draw from the attentional focus model—a theory that explains

how individuals direct their attention and efforts under conditions of time scarcity (Karau & Kelly, 1992, 2004)—to suggest unique mediating roles of *external* vs. *internal scanning.* These scanning types reflect employees' efforts to acquire new knowledge from either outside or inside their organization (Nag & Gioia, 2012), and research has shown them to differentially relate to radical vs. incremental creativity (Jaussi & Randel, 2014). Extending these insights, we propose that time pressure exhibits (a) an indirect negative relation with radical creativity through external scanning and (b) an indirect curvilinear relation with incremental creativity through internal scanning.

Moreover, the attentional focus model suggests that a full understanding of time pressure's consequences requires taking into account relevant boundary conditions (Karau & Kelly, 2004). Research has emphasized, in particular, that individuals' approaches toward time management shape their reactions toward temporal scarcity (Rostami et al., 2019). Further, although not examining the role of time pressure, studies have linked time management with employees' creative performance (van Eerde et al., 2022; Zampetakis et al., 2010). On this basis, we cast employees' planning approaches – which represent key aspects of time management (Claessens et al., 2004) – as crucial contingency factors. As shown in Figure 1, we hold that *long-range planning* (i.e., setting distal goals and scheduling activities over extended periods; Britton & Tesser, 1991) moderates the indirect time pressure–radical creativity link via external scanning. *Short-range planning* (i.e., emphasizing proximal goals and schedules; Barling et al., 1996), by contrast, is suggested to moderate the indirect time pressure–incremental creativity link via internal scanning.

Overall, our multidimensional perspective on creativity offers important contributions to theory advancement. To integrate prior inconsistencies, recent studies have emphasized curvilinear time pressure–creativity associations (i.e., creativity may benefit from moderate, rather than distinctly low or high time pressure) and/or moderating factors (i.e., third variables may alter the strength and direction of time pressure's implications; Acar et al., 2019). Beyond these approaches, we aim to illustrate that the role of time pressure is more complex than previously believed. Indeed, time pressure–creativity linkages may exhibit fundamentally different shapes, depending on the type of creativity under consideration (i.e., radical vs. incremental), and acknowledging this diversity is pivotal for an adequate understanding of time pressure's consequences. Similarly, our investigation of mechanisms and boundary conditions is critical. By integrating employees' internal and external scanning, we avoid a "black box" approach, highlighting specific mediators that provide for a coherent, theory-driven account of time pressure's diverse creativity outcomes. Also, our examination of long-range and short-range planning as moderators further clarifies prior ambiguity, demonstrating that individual employees differ markedly in their susceptibility to time pressure's distinct influences. Hence, beyond illustrating *that* time pressure differentially shapes radical vs. incremental creativity, this research offers a comprehensive theoretical explanation for *why* and *when* these distinct linkages occur.

Theory and Hypotheses

Theoretical Background

Time pressure is a prevalent – and sometimes defining – feature of work for many

employees around the globe (e.g., Cai, 2017; Eurofound, 2017; Maestas et al., 2017). Consequently, a large body of empirical research has developed, drawing from diverse samples across many countries, cultures, and industries to unravel the role of time pressure for a wide array of work behaviors (e.g., Rostami et al., 2019; Ryari et al., 2021; Shao et al., 2019; Škerlavaj et al., 2018; Yu & Wang, 2022).

A prominent theory used to understand time pressure's consequences for individual employees' thoughts and actions is the attentional focus model (Karau & Kelly, 1992; Lopez-Kidwell et al., 2013; Waller et al., 2001). Initially developed to explain within-group information processing, this model has subsequently been applied to suggest that time pressure alters the salience of the various demands, goals, and activities in individuals' work environment, inducing employees to accordingly direct their attention and efforts (Kelly & Loving, 2004; Razinskas et al., 2022). With high time pressure, concerns about immediate task completion are paramount (Karau & Kelly, 1992). Consequently, employees may focus on imminent deadlines, allocating their efforts toward activities that facilitate timely goal accomplishment while limiting their involvement in other activities (Kelly & Loving, 2004; Sijbom et al., 2018). With lower time pressure decreasing the relevance of quick task completion, by contrast, employees may widen their attention and efforts to include activities that less directly benefit core task attainment (Karau & Kelly, 1992). Integrating this conceptual logic with research that has cast knowledge acquisition as critical for individuals' creativity (Jaussi & Randel, 2014; Khedhaouria et al., 2017), we suggest that time pressure may differentially affect employees' specific knowledge acquisition efforts (i.e., external vs.

internal scanning), with distinct consequences for radical and incremental creativity.

Time Pressure, External Scanning, and Radical Creativity

Building on the attentional focus model, we anticipate a negative, linear relationship between time pressure and external scanning. Such scanning is effortful and time consuming, requiring employees to search for knowledge sources outside their home organization, establish contacts with these distal sources, and process the acquired information to be usable for internal purposes (Jaussi & Randel, 2014). Moreover, the eventual utility of external scanning is often uncertain because (a) employees may lack a clear-cut picture of the knowledge available in the organization's environment and (b) such knowledge is not tailored to internal tasks and, thus, may not lend itself to easy application (March, 1991; Zahra & George, 2002).

As noted earlier, the attentional focus model suggests that low time pressure reduces the salience of deadlines and efficient task completion (Karau & Kelly, 1992). Under such conditions, employees have leeway in determining their work activities—including the flexibility to explore the outside environment for new knowledge (Karau & Kelly, 2004). Hence, despite its time-consuming and uncertain characteristics, employees may be willing to devote effort to external scanning, aiming to obtain information from outside the organization to benefit their long-term job performance (e.g., by acquiring new insights and skills).

With higher time pressure, by contrast, employees may increasingly focus on meeting their tight deadlines by working quickly and efficiently (Karau & Kelly, 1992). As a result, employees are likely to emphasize core task accomplishment, steering their efforts away from

activities that are not immediately task-relevant and, thus, may threaten swift goal attainment (Karau & Kelly, 1992; Sijbom et al., 2018). As outlined before, external scanning is a prime exemplar of this activity type, given its time-consuming and uncertain nature. Research has shown, accordingly, that individuals are less willing to invest effort "to achieve a thorough, rich, and accurate understanding of the world" under conditions of time scarcity (De Dreu et al., 2008, p. 23), instead exhibiting a more superficial approach toward information search and processing (Bechtoldt et al., 2010; De Dreu, 2003). Hence, we expect that employees experiencing higher time pressure will direct their knowledge scanning away from remote, external sources that are difficult to access and present uncertain success chances.

Furthermore, we draw from prior theory and research to suggest that external scanning promotes radical creativity. External information often differs markedly from the knowledge available within one's home organization (Perry-Smith & Shalley, 2003). Additionally, given the diversity of possible external knowledge sources, external scanning can provide employees with rich and heterogeneous insights, including information about previously unrecognized developments that differ substantially from the status quo (Flor et al., 2018). As such, external scanning may enable employees to substantively expand their knowledge (Tang et al., 2020), stimulating them to restructure their existing cognitive schemas and build remote associations between diverse, seemingly unrelated pieces of information (Jaussi & Randel, 2014). In sum, external scanning may offer key inputs for the development of radically novel ideas, facilitating the "outside the box" thinking that

characterizes radical creativity.[1]

Taken together, this reasoning leads us to anticipate a negative linkage between time pressure and external scanning, whereas external scanning should positively relate to an employee's radical creativity. Hence, we propose:

Hypothesis 1: Time pressure has an indirect negative relationship with individual employees' radical creativity, as mediated by external scanning.

Time Pressure, Internal Scanning, and Incremental Creativity

Considering time pressure and internal scanning, we anticipate a curvilinear (i.e., inverted U-shaped) association. Internal (rather than external) scanning is less effortful and time consuming because employees garner knowledge from relatively proximal sources inside their home organization (e.g., colleagues or superiors) that are easier to access (Miller et al., 2006). Moreover, the outcomes of internal scanning are less uncertain, as insights from within an employee's organization are typically more closely related and thus more easily applicable to the task at hand (Benner & Tushman, 2003; March, 1991).

Drawing from the attentional focus model, we anticipate that employees' internal scanning will remain limited at distinctly low time pressure levels. Employees should then attach little relevance to quick and efficient core task completion, instead focusing their attention on other, broader job aspects (e.g., exploring new opportunities; Karau & Kelly, 1992). Importantly, however, the knowledge available from internal scanning is often most

[1] We do not expect external scanning to benefit incremental creativity, although we examine this association in an exploratory manner. External knowledge often differs markedly from existing organizational processes or products (Moreira et al., 2018; Zahra & George, 2002), and thus, it may be of limited value for the gradual refinement of existing organizational practices. Jaussi and Randel (2014) have, accordingly, found external scanning to positively relate to radical, but not incremental creativity.

useful for the solution of operational problems related to one's daily work tasks (Benner & Tushman, 2003; Wang et al., 2014). Hence, employees are unlikely to dedicate pronounced efforts to attaining this type of information when they experience little time scarcity. Moreover, employees' resources (e.g., attention and effort) are finite even in situations of low time pressure, such that resources directed toward any specific activity cannot be devoted to other actions (Barnes et al., 2008). Hence, to the extent that employees emphasize external scanning in low time pressure situations (as previously suggested), internal scanning is likely to suffer.

Similarly, we anticipate that employees limit their internal scanning at pronouncedly high time pressure levels. In this situation, employees are likely to perceive pressing deadlines as being of paramount importance; therefore, they may strive to finish their tasks as quickly as possible and avoid distractions (Karau & Kelly, 1992). Importantly, internal scanning's primary benefit is to provide new ideas for the gradual improvement of work practices (Jaussi & Randel, 2014), rather than directly advancing prompt task completion and immediate goal attainment. Moreover, although more time-efficient than external scanning, internal scanning still requires employees to invest key resources (e.g., to access information from colleagues or internal knowledge repositories; Khedhaouria & Jamal, 2015; Khedhaouria et al., 2017) that, consequently, are diverted from immediate task accomplishment. Hence, rather than engaging in internal scanning, extreme time pressure may lead employees to emphasize well-learned behaviors and routine practices that contribute to direct task completion (Andrews & Smith, 1996; Byron et al., 2010).

In contrast, we anticipate that employees will emphasize internal scanning at intermediate time pressure levels. In this situation, employees should perceive their deadlines as rather salient, focusing more on core task accomplishment than on peripheral job aspects (Karau & Kelly, 1992). Nevertheless, moderate (rather than very high) time pressure may still allow employees to maintain some personal leeway and to consider activities that advance task completion in a relatively indirect manner (i.e., beyond finalizing the task at hand as quickly as possible; Karau & Kelly, 2004). As noted before, internal scanning can rather efficiently provide employees with task-related knowledge, indirectly aiding their goal achievement by facilitating process improvements (Benner & Tushman, 2003; Miller et al., 2006). Moreover, internal (rather than external) scanning is more likely to offer actionable insights that match an employee's task requirements (March, 1991). Hence, we expect that employees will at least partially use the discretion retained at moderate time pressure levels to optimize their operational task completion through internal scanning. We therefore anticipate more internal scanning at moderate time pressure levels compared with very low or high time pressure.

Furthermore, we expect internal scanning to positively relate to incremental creativity. Internal knowledge sources (e.g., colleagues or supervisors) typically operate in related business areas and share the home organization's overarching goals, processes, and culture (Raveendran et al., 2020). Hence, the information obtained from these sources may aid employees in making targeted adjustments to their task accomplishment, for example by highlighting relevant inefficiencies and identifying improvement potentials (Benner &

Tushman, 2003; Jaussi & Randel, 2014). Moreover, internal scanning may provide employees with new, task-related insights that are similar (although not identical) to their own, stimulating employees to rethink existing frameworks and processes and thus, facilitating the refinement of established work procedures (Liu et al., 2022; Wang et al., 2014). Consistent with this rationale, research has illustrated a positive relation between individuals' internal scanning and incremental creativity (Jaussi & Randel, 2014).

In sum, we propose a curvilinear relationship between time pressure and internal scanning, whereas internal scanning should positively relate to incremental creativity. On this basis, we formulate the following curvilinear indirect effects hypothesis:

Hypothesis 2: Time pressure has an indirect curvilinear (i.e., inverted U-shaped) relationship with individual employees' incremental creativity, as mediated by internal scanning.

Considering a possible role of internal scanning for radical creativity, theory and research are somewhat ambiguous. Scholars have noted that internal sources often provide insights similar to an employee's existing knowledge and to established organizational practices, such that internal scanning is unlikely to stimulate highly unconventional, radically new ideas (Liu et al., 2022; Perry-Smith, 2006). On this basis, we do not anticipate internal scanning to substantively promote radical creativity, although one study has empirically illustrated a positive relationship between these constructs (Jaussi & Randel, 2014). Hence, we do not develop a formal hypothesis on the mediating role of internal scanning in the time pressure–radical creativity link, but we examine this association in an exploratory manner.

The Moderating Role of Employees' Time Planning

Research on the attentional focus model suggests that individual differences (e.g., in expertise, personality, or preferences) alter how people react when experiencing time pressure (Karau & Kelly, 2004). Similarly, time management research has shown that employees exhibit differing approaches toward dealing with time scarcity, in general, and toward temporal planning, in particular (Barling et al., 1996; Britton & Tesser, 1991). As noted earlier, some individuals prefer to plan for the long term and prioritize relatively distal objectives, whereas others focus their planning on short-term, more immediate goals and activities (i.e., long-range vs. short-range planning; Claessens et al., 2004; Zampetakis et al., 2010). Integrating these notions, we cast these time planning approaches as key boundary conditions for the indirect relationships between time pressure and different creativity types.

The Role of Long-Range Planning

Employees with a preference for long-range planning adopt an extended time perspective when thinking about their work; they plan ahead for several months, aiming to devise well-structured schedules to organize their accomplishment of overarching, long-term objectives (Britton & Tesser, 1991; Zampetakis et al., 2010). Moreover, the attentional focus model suggests that "individuals who carefully consider future consequences in their decisions…are likely to engage in consistent, goal-directed behavior over an extended period of time" (Karau & Kelly, 2004, p. 202). On this basis, we anticipate long-range planning to moderate the time pressure–external scanning linkage.

As outlined before, external scanning often provides knowledge that is not

immediately actionable and requires time-consuming implementation (Moreira et al., 2018; Zahra & George, 2002), such that employees may shy away from such behavior in situations of time scarcity. Employees who adopt a long-term approach toward planning their work activities, however, may recognize the utility of external, relatively abstract knowledge to a greater extent. Even when facing time pressure, these employees may see value in scanning the environment for information that may influence their future goal attainment. In fact, external scanning may offer the very type of insights required for effective long-range planning, enabling employees to uncover broad trends and developments that affect their future work (Flor et al., 2018; Perry-Smith & Shalley, 2003). We therefore propose that a preference for long-range planning will counteract employees' tendency, in situations of time pressure, to discount the relevance of external knowledge that does not directly aid immediate task completion (Zahra & George, 2002). Hence, employees who prefer this planning approach may remain motivated for external scanning even when experiencing time shortages. Overall, we therefore expect long-range planning to mitigate the negative relationship between time pressure and external scanning. Moreover, as outlined earlier, external scanning should benefit radical creativity. Combining these arguments, we propose:

> *Hypothesis 3: Long-range planning diminishes the negative indirect relationship between time pressure and individual employees' radical creativity, as mediated by external scanning.*

The Role of Short-Range Planning

Employees with a preference for short-range planning adopt a short-term approach

toward time management, aiming to organize their operational task completion over relatively brief periods (e.g., by setting goals and schedules for a specific day; Britton & Tesser, 1991). In doing so, employees strive to adequately distribute their efforts across current job demands to efficiently accomplish ongoing tasks (Claessens et al., 2004). We contend that such planning moderates the role of time pressure for internal scanning.

As argued before, we generally anticipate conditions of low and high (rather than moderate) time pressure to diminish internal scanning. With very low time pressure, employees may experience little motivation for improving operational efficiency through such scanning because quick task accomplishment is not particularly salient (Karau & Kelly, 1992). A strong preference for short-term planning, however, may ameliorate this tendency. To effectively plan their operational task attainment, employees need information about organizational requirements, challenges, and opportunities, and they need to understand how their tasks depend on others' inputs and contributions (Raveendran et al., 2020). Such insights enable employees to devise meaningful, goal-directed schedules and to adequately coordinate their ongoing work activities. Internal scanning efforts, such as communicating with colleagues, supervisors, or subordinates, are a prime way of obtaining this type of information (Wang et al., 2014). In other words, internal scanning may provide employees with the detailed operational knowledge that is vital for short-range planning. Consequently, we anticipate employees with a pronounced tendency toward short-range planning to remain motivated for internal scanning even at low time pressure levels.

Similarly, we have suggested very high time pressure to stifle employees' internal

scanning by focusing their efforts on immediate task execution and prompting them to avoid distractions (Byron et al., 2010). Notably, however, employees with a strong preference for short-range planning may not perceive internal scanning as an unnecessary distraction. Such employees strive to attain a sense of control over their time, and they feel that adequate task execution requires a systematic approach that builds on clear structures and schedules (Claessens et al., 2004; Macan, 1994). Hence, these employees may find it important to acquire the information necessary to develop such a systematic approach even under high time pressure —and they are thus likely to value internal scanning behaviors that can deliver such information (Wang et al., 2014).

Finally, at intermediate time pressure levels, we have suggested that employees will lean toward internal scanning to a relatively large extent, with salient (albeit not extremely urgent) deadlines motivating them to access proximal knowledge sources for information about possible improvements to their task accomplishment. In principle, a preference for short-range planning may further underline this tendency because, as indicated, such planning may benefit from the operational knowledge internal scanning can provide. With moderate time pressure already triggering rather pronounced tendencies toward internal scanning, however, even employees who prioritize short-range planning may have little room for an additional emphasis on such behavior. Hence, akin to a ceiling effect, we anticipate employees to exhibit similarly high internal scanning at intermediate time pressure levels, largely irrespective of their short-range planning preferences.

Overall, we expect short-range planning to mitigate the adverse roles of both low and

high time pressure for internal scanning. Hence, the suggested inverted U-shaped relationship between time pressure and internal scanning may primarily apply among employees who do not value short-range planning. A stronger preference for such planning, by contrast, is likely to flatten the curvilinear linkage, with employees exhibiting relatively high internal scanning at low, intermediate and high time pressure levels.[2] Furthermore, as outlined above, we expect internal scanning to benefit incremental creativity. Hence:

Hypothesis 4: Short-range planning diminishes the indirect, inverted U-shaped relationship between time pressure and individual employees' incremental creativity, as mediated by internal scanning.

Methods

Sample and Procedures

To test the hypotheses, we collected multisource, time-lagged survey data from employees (i.e., knowledge workers) and their supervisors across various organizations in China. These employees were required to process complex information and knowledge in their jobs, giving them adequate opportunity for radical and incremental creativity. Hence, this sample was suitable for examining our conceptual model. Before data collection, we

[2] We do not anticipate (a) long-range planning to moderate the link between time pressure and internal scanning and (b) short-range planning to moderate the link between time pressure and external scanning. Internal scanning primarily yields insights on individuals' immediate task execution, with limited relevance for their long-term plans (Britton & Tesser, 1991; March, 1991). External scanning, by contrast, primarily yields broad information about the organizational environment, with limited relevance for employees' immediate tasks (Moreira et al., 2018; Zahra & George, 2002). Hence, it is unlikely that a preference for long-range (short-range) planning will alter the role of time pressure for internal (external) scanning. For completeness, however, we will explore these alternative moderation possibilities.

introduced the general purpose and procedures of this research to 43 supervisors (part-time MBA students at a university in central China) without revealing the hypotheses, and the supervisors conveyed this information to their employees (i.e., direct subordinates). We subsequently used electronic surveys with anonymized ID codes to match supervisor and employee responses. Participation was voluntary and confidential, and only the researchers had access to the data.

At Time 1, supervisors forwarded a link to a survey measuring time pressure as well as long-range and short-range planning (along with demographics and controls) to all of their employees (ranging from 2 to 16). At Time 2 (15 days later), we used the same procedure to measure employees' internal and external scanning. Finally, at Time 3 (another 15 days later), supervisors rate their individual employees' radical and incremental creativity.[3] We employed these time gaps because they were likely (a) long enough to ameliorate possible common source/method concerns (see also Podsakoff et al., 2003) and (b) short enough to prevent major changes in employees' time pressure experiences. Notably, prior research has used comparable gaps to illustrate time pressure's consequences for employees' work behavior (e.g., Maruping et al., 2015), and a number of studies on the antecedents of creativity have used time gaps between two (e.g., Chen et al., 2021; Huang et al., 2016) and four weeks (e.g., Gong et al., 2017; Liu et al., 2021).

Initially, 215 employees received a survey invitation from their supervisors. After

[3] To prevent previous ratings from influencing this key dependent variable measure and avoid survey fatigue, supervisors did not complete any survey items at T1 and T2.

omitting 2 supervisors and 12 employees due to excessive missing data, we were able to match 41 supervisors (each representing a separate organization) with 203 employees who had completed both the T1 and T2 surveys (for a response rate of 95.3% among supervisors and 94.4% among employees). Of the employees, 41.9% were women, and 93.1% had a college degree. Their mean age was 30.3 years (*SD* = 6.84), and their mean organizational tenure was 5.1 years (*SD* = 4.96). The organizations in our sample were distributed across six industries, such that 21.7% of the participating employees worked in information technology, 17.2% in architectural design, 16.3% in electric power generation, 15.8% in software development, 15.8% in telecommunications, and 13.2% in consumer electronics.

Measures

We used a back-translation procedure, as suggested by Brislin (1980), to develop Chinese versions of our survey measures.

Time pressure (T1). Time pressure was measured using six items from Andrews and Smith (1996). Sample items are "I need more hours in the day to get my work done" and "I feel like I have a lot of time on my hands" (reverse-coded). Items were assessed on a 7-point scale (1= strongly disagree, 7 = strongly agree; α = .79).

Long-range and short-range planning (T1). We used items from Britton and Tesser (1991) to assess employees' long-range planning (5 items; α = .79) and short-range planning (7 items; α = .89). Sample items for long-range planning are "Do you regularly review your work notes, even when a performance appraisal is not imminent?" and "Do you have a set of goals for the entire quarter?" Sample items for short-range planning are "Do you make a list

of the things you have to do each day?" and "Do you plan your day before you start it?" All items were assessed on a 5-point scale (1 = never, 5 = always).

External and internal scanning (T2). An eight-item scale from Jaussi and Randel (2014) was used to measure employees' external and internal scanning (four items each). Sample items for external scanning are "I ask questions of individuals outside of this organization about how they do their jobs" and "I scan the environment outside the organization for technical ideas/expertise" ($\alpha = .91$). Sample items for internal scanning are "I try to find out what other departments/divisions of our company are doing for projects or events" and "I scan the internal environment here at my organization for technical ideas/expertise" ($\alpha = .90$). Items were assessed on a 5-point scale (1 = never, 5 = always).

Radical and incremental creativity (T3). Supervisors rated their individual employees' radical and incremental creativity using a six-item scale from Madjar et al. (2011; three items for each creativity type). Sample items for radical creativity are "This employee is a good source of highly creative ideas" and "…suggests radically new ways for doing his/her job" ($\alpha = .84$). Sample items for incremental creativity are "This employee easily modifies previously existing work processes to suit current needs" and "…is very good at adapting already existing ideas" ($\alpha = .84$). Items were rated on a 7-point scale (1 = strongly disagree, 7 = strongly agree).

Control variables. We considered employees' *education* (from 1 = high school to 4 = Ph.D.) and *organizational tenure* (in years) as controls because research suggests that these variables may promote creativity (e.g., by equipping employees with broader insights;

Mumford & Gustafson, 1988; Tierney & Farmer, 2002). Moreover, to account for contextual factors that may influence employees' opportunities for creativity, we incorporated the six *industries* in our sample (using five dummy variables) and employees' perceived *job complexity* (using two items from Oldham et al., 1995; α = .79) as potential covariates. We note that prior research has argued for positive relations between job complexity and creativity (Shalley et al., 2004). Additionally, research has shown employees' conformity (i.e., their tendency to comply with norms), willingness to take risks, and intrinsic/extrinsic motivation to influence creativity (Gilson & Madjar, 2011; Madjar et al., 2011). Hence, we included these factors as possible controls, using four items to measure *conformity* (Miron et al., 2004; α = .77), four items for *willingness to take risks* (Gomez-Mejia & Balkin, 1989; α = .79), and four items each for *intrinsic/extrinsic motivation* (Grant & Berry, 2011; α = .94/.82).

Analytical strategies

As each supervisor rated multiple employees' creativity, we examined whether there were supervisor-level nesting effects on our dependent variables. One-way ANOVA results yielded no significant supervisor effects on employees' radical creativity (F[162, 40] = 1.30, *n.s.*; ICC[1] = .05) and incremental creativity (F[162, 40] = 1.42, *n.s.*; ICC[1] = .08). Notably, with each supervisor representing a different organization, this also indicates a lack of significant organization-level nesting effects. Similarly, one-way ANOVA results yielded no significant industry effects on employees' radical creativity (F[197, 5] = .62, *n.s.*; ICC[1] = .02) and incremental creativity (F[197, 5] = 1.49, *n.s.*; ICC[1] = .04). Consistent with prior research (e.g., de Vries et al., 2014; Huang et al., 2021), we therefore tested the hypotheses at

the individual employees' level. To do so, we performed regression analyses in Mplus 8.3 (with maximum likelihood estimation; Muthén & Muthén, 2019), testing separate regression models for the mediators and outcome variables. To examine the hypothesized (conditional) linear indirect effects, we then employed bootstrap procedures (with 20,000 resamples; Edwards & Lambert, 2007). Moreover, we followed Hayes and Preacher's (2010) recommendations to examine the suggested (moderated) curvilinear indirect relations.

Results

Confirmatory Factor Analyses

We conducted two sets of confirmatory factor analyses to test the discriminant and convergent validity of the employee-rated (time pressure, short-range/long-range planning, internal/external scanning) and supervisor-rated variables (radical/incremental creativity), respectively. As shown in Table 1, the anticipated five-factor measurement model for the employee-rated variables (with all items loading on their latent factors, uncorrelated error terms, and no cross-loadings) yielded adequate fit to the data, and its fit was superior to a series of four-factor models and a single-factor model. Similarly, for the supervisor-rated variables, the anticipated two-factor model yielded adequate fit, and it fit the data significantly better than a single-factor model. All items in either of the anticipated models loaded significantly on their respective latent factors (all $p < .01$).

Insert Table 1 about here

Descriptive Statistics and Correlations

Table 2 displays descriptive statistics and correlations. In line with expectations, time pressure was negatively related to external scanning (r = -.26, p < .001), and external scanning was positively related to radical creativity (r = .28, p < .001). Moreover, time pressure was positively related to internal scanning (r = .14, p = .05), and internal scanning was positively related to both radical and incremental creativity, although the latter correlation was substantively stronger (r = .15, p = .04 vs. r = .31, p < .001).

As further shown in Table 2, the control variables were only weakly and inconsistently related to the focal study variables. Following scholarly recommendations (e.g., Becker, 2005; Becker et al., 2016), we tested our hypotheses both with and without the controls, which yielded virtually identical results and conclusions. We subsequently interpret the findings including all controls; results without controls are depicted in the online Appendix.[4]

Insert Table 2 about here

Hypotheses Testing

Hypothesis 1 suggested an indirect negative association between time pressure and radical creativity via external scanning. Our results yielded a negative relation between time pressure and external scanning (B = -.17, SE = .05, p = .001; Table 3, Model 1), and external scanning was positively related to radical creativity, even after controlling for time pressure and other study variables (B = .28, SE = .10, p = .008; Table 3, Model 6). Consistent with this pattern, bootstrap mediation analysis showed that the indirect relationship between time

[4] Online Appendix can be found via https://osf.io/8y45z.

pressure and radical creativity, through external scanning, was negative and significant (*estimate* = -0.04; 95% confidence interval (CI) = [-.11, -.01]). Thus, Hypothesis 1 was supported.

Insert Table 3 about here

Hypothesis 2 suggested an indirect curvilinear relationship between time pressure and incremental creativity via internal scanning. The squared term of time pressure was negatively related to internal scanning (B = -.11, SE = .03, p < .001; Table 4, Model 1). This curvilinear, inverted U-shaped relation is depicted in Figure 2, with further analysis yielding an inflection point (i.e., where the tangent slope is zero and changes from positive to negative) at .38 *SD* above the mean of time pressure. Furthermore, internal scanning was positively related to incremental creativity (B = .40, SE = .10, p < .001; Table 4, Model 6).

Overall, this pattern suggests the possibility of an indirect curvilinear relationship between time pressure and incremental creativity through internal scanning. To further test this notion, we calculated the instantaneous indirect effects of time pressure on incremental creativity through internal scanning at different time pressure values (i.e., the mean as well as 2 *SD* and 1 *SD* around the mean; cf. Hayes & Preacher, 2010). Corroborating the anticipated inverted U-shape, these instantaneous indirect effects were positive at -2 *SD* (*estimate* = .20; 95% CI = [.07, .39]) and -1 *SD* (*estimate* = .12; 95% CI = [.04, .23]), nonsignificant at the mean (*estimate* = .03; 95% CI = [-.01, .09]) and +1 *SD* (*estimate* = -.05; 95% CI = [-.17, .01]), and negative at +2 *SD* (estimate = -.14; 95% CI = [-.33, -.03]). Therefore, Hypothesis 2 was

supported.

Parenthetically, we note that the above analyses included both external and internal scanning when predicting radical as well as incremental creativity. As expected, however, neither the internal scanning–radical creativity link (*B* = .15, *SE* = .10, *p* = .126; Table 3, Model 6) nor the external scanning–incremental creativity link (*B* = -.08, *SE* = .10, *p* = .462; Table 4, Model 6) were statistically significant. These findings corroborate the unique roles of external scanning for radical creativity and internal scanning for incremental creativity.

Insert Table 4 and Figure 2 about here.

Hypothesis 3 proposed a moderating role of long-range planning for the indirect relationship between time pressure and radical creativity through external scanning. As shown in Table 3, the interaction coefficient for time pressure × long-range planning was significantly related to external scanning (*B* = .19, *SE* = .07, *p* = .004; Model 2). Figure 3 illustrates the pattern of this interaction. Simple slopes tests showed that when long-range planning was low (- 1 *SD*), time pressure was negatively related to external scanning (*B* = -.26, *SE* = .07, *p* < .001). This relationship was nonsignificant, by contrast, when long-range planning was higher (+ 1 *SD*; *B* = -.03, *SE* = .08, *p* = .676). In other words, long-range planning buffered the negative relationship between time pressure and external scanning.[5]

Insert Figure 3 about here.

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[5] Parenthetically, short-range planning did not moderate the role of time pressure for external scanning, whereas the anticipated time pressure × long-range planning interaction remained significant even when controlling for short-range planning and the associated interaction terms (Table 3, Models 3 and 4).

Moreover, as noted earlier, external scanning was positively related to radical creativity. Consequently, these findings suggest that long-range planning may ameliorate the indirect, negative relationship between time pressure and radical creativity, as transferred by external scanning. To directly examine this notion, we compared the respective conditional indirect effects at different moderator values (Edwards & Lambert, 2007). When long-range planning was low (-1 *SD*), the indirect relationship was negative (*estimate* = -.08; 95% CI = [-.17, -.02]). When long-range planning was higher (+ 1 *SD*), by contrast, the indirect relationship was nonsignificant (*estimate* = -.01; 95% CI = [-.07, .03]). Moreover, there was a significant difference between these two conditional indirect relationships (*estimate* = .07; 95% CI = [.01, .18]). Hence, supporting Hypothesis 3, long-range planning ameliorated the negative indirect relationship between time pressure and radical creativity through external scanning.

Hypothesis 4 suggested that short-range planning moderates the indirect curvilinear relationship between time pressure and incremental creativity via internal scanning. As shown in Table 4, however, the interaction coefficient between the squared term of time pressure and short-range planning was not significantly related to internal scanning (as were none of the other interaction coefficients for either short-range or long-range planning; see Models 2 and 3). Hence, it is clear that short-range planning did not have the suggested moderating role in the indirect linkage from time pressure to incremental creativity via internal scanning, refuting Hypothesis 4.

Finally, despite general support for our suggested indirect relations, we note that the

direct linkages between time pressure and employee creativity remained significant after incorporating the proposed mediators. Considering radical creativity, the coefficients for both time pressure (B = -.19, SE = .08, p = .012) and time pressure × long-range planning (B = .25, SE = .10, p = .008) were significant after controlling for external scanning (Table 3, Models 6 and 7). Similarly, considering incremental creativity, the coefficients for both time pressure squared (B = -.09, SE = .05, p = .050) and time pressure squared × short-range planning (B = -.12, SE = .06, p = .027) were significant after controlling for internal scanning (Table 4, Models 6 and 8). These findings suggest that there are additional mechanisms beyond external/internal scanning through which time pressure may influence distinct creativity types. Moreover, the moderating role of temporal planning may be even more potent than expected, potentially shaping these alternative mechanisms as well. We will return to these points in the Discussion section.

Discussion

This study illustrates that the role of time pressure for employee creativity differs substantively across creativity types, with distinct mechanisms and boundary conditions. Time pressure may have detrimental consequences for radical creativity by restraining employees' external scanning—although long-range planning can ameliorate this negative relation. For incremental creativity, by contrast, we found a "too-much-of-a-good-thing" effect (see Pierce & Aguinis, 2013), such that moderate (rather than very low or high) time pressure may benefit such creativity by promoting internal scanning. Unexpectedly, this curvilinear relation was not contingent on individuals' short-range planning.

Theoretical Implications

These findings make important contributions to the literature on time pressure and creativity. Our multidimensional perspective on creativity, in particular, is an important step. Recent studies have often examined curvilinear and/or moderated relationships to integrate previous, inconsistent evidence for both negative and positive time pressure–creativity associations (for a review, see Acar et al., 2019). Although interesting, we believe the unidimensional approach toward creativity common in these studies (as in most research on stressor-creativity relations; e.g., De Clercq et al., 2017; Probst et al., 2007) provides for an incomplete picture that underestimates the complexity of time pressure-creativity linkages. By distinguishing radical and incremental creativity, our investigation illustrates that the role of time pressure differs markedly across distinct creativity types. For incremental creativity, we indeed find evidence for a curvilinear association, such that this creativity type benefits from moderate time pressure, yet suffers when time pressure is lower or higher. For radical creativity, by contrast, time pressure's negative consequences prevail, with such creativity deteriorating as employees are more pressed for time. Moving beyond previous insights, our findings therefore illustrate that an adequate theoretical understanding of time pressure–creativity linkages requires thorough consideration of creativity's multifaceted nature. More broadly, we believe theory and research on stressor-creativity relations may benefit from such a multidimensional approach, enabling more clear-cut knowledge on how stressful working conditions shape employees' creative contributions.

Further, our examination of generative mechanisms addresses the "queries of *why*"

that are central for theory development (Sutton & Staw, 1995, p. 378). Prior research has shown the relevance of knowledge acquisition (e.g., through feedback or help seeking; Liu et al., 2022; Yu & Choi, 2022) for creativity, and Khedhaouria et al. (2017) has illustrated employees' general knowledge sourcing to mediate the role of time pressure for overall creativity. Extending this work, our findings highlight specific types of knowledge acquisition as unique mechanisms for the diverse creativity outcomes of time pressure, with *external* scanning transferring time pressure' negative role for radical creativity and *internal* scanning transferring its curvilinear relation with incremental creativity. Hence, by uncovering these distinct processes, this research offers a novel, coherent theoretical explanation for the complex creativity implications associated with employees' experiences of time scarcity. Of course, this is not to say that external/internal scanning are the *only* relevant mechanisms. In fact, our results yielded significant direct linkages of time pressure with radical and incremental creativity, even after considering such scanning. Hence, future studies may benefit from examining additional mediators, further opening the "black box" of time pressure's multifaceted relationships with creativity. We will return to this issue when discussing future research directions.

Finally, our examination of moderating variables further contributes to the integration of previous findings. Beyond yielding unique consequences for different creativity types (through unique mechanisms), we demonstrate that time pressure is unlikely to uniformly affect all employees' radical and incremental creativity. Expanding prior research on the direct association between time management and creativity (e.g., van Eerde et al., 2022;

Zampetakis et al., 2010), in particular, we investigated employees' distinct approaches toward time planning as critical boundary conditions for time pressure's creativity consequences. Unexpectedly, short-range planning did not moderate the indirect curvilinear relation between time pressure and incremental creativity via internal scanning—possibly because the knowledge gained through internal scanning may be less valuable for short-range planning than we had assumed. Notably, however, we found short-range planning to moderate the direct curvilinear association between time pressure and incremental creativity. Thus, short-range planning indeed appears to be a relevant boundary condition, although its moderating influence may unfold via mechanisms other than anticipated. Clearly, additional research is needed to further examine this unexpected moderation pattern.

Importantly, as predicted, our results illustrated long-range planning as a buffering factor in the indirect negative relation between time pressure and radical creativity via external scanning. Moreover, even after controlling for external scanning, long-range planning moderated the direct time pressure–radical creativity linkage, illustrating the particular relevance of such planning. Overall, our moderation findings further underline the complexity of time pressure's role for creativity, and they advance a better understanding of relevant boundary conditions. Beyond motivational/dispositional or contextual aspects (e.g., Andrews & Smith, 1996; Baer & Oldham, 2006; Binnewies & Wörnlein, 2011), we illustrate that employees' proactive approaches toward time management are critical, enabling them to deliberately regulate the consequences of time pressure for distinct creativity types. Hence, this study paves the way for a new, more agentic perspective that explicates key differences

between individual employees' creativity reactions when dealing with time scarcity.

Managerial Implications

Although both employees' radical and incremental creativity can be crucial for organizations, the relative importance of these creativity facets may differ across positions or departments (e.g., R&D vs. accounting). Our findings suggest that, depending on the type of creativity most relevant in a specific situation, organizations may benefit from different approaches to managing employees' time pressure. If radical creativity is desired, organizations are well advised to minimize time pressure experiences, for example by avoiding tight deadlines and allowing for temporal flexibility. If incremental creativity is more important, by contrast, a different approach may be needed. Although excessive time scarcity may still be detrimental, this creativity type is likely to benefit if organizations create moderate time pressure, for example by setting challenging yet achievable deadlines and equipping employees with sufficient resources to meet them.

Moreover, our moderation results yield important practical insights. Modern work environments often include distinct temporal challenges (e.g., when time-to-market is critical). In such situations, high time pressure may be inevitable – with potentially detrimental consequences for employees' radical as well as incremental creativity. Our findings show that organizations may benefit, in this regard, from considering employees' tendencies toward long-range and short-range planning in their staffing decisions and human resource development efforts (see also Osburn & Mumford, 2006). By doing so, organizations may be able to retain employees' creative performance even under conditions

of substantive time pressure.

Finally, our research reiterates the value of external and internal scanning for employees' radical and incremental creativity, respectively (see also Jaussi & Randel, 2014). Hence, beyond managing time pressure, organizations may seek additional means of promoting such knowledge scanning. To facilitate external scanning (and stimulate radical creativity), organizations may create opportunities for knowledge exchanges with other organizations, for example by encouraging employees' attendance of external workshops, conferences, or trade fairs and by enabling interorganizational collaborations (Phelps et al., 2012). Moreover, to facilitate internal scanning (and stimulate incremental creativity), organizations may encourage information flows between their work units, for example by implementing adequate knowledge management systems (Ren & Argote, 2011) or creating opportunities for interdepartmental cooperation (Tsai, 2002).

Limitations and Directions for Future Research

These contributions notwithstanding, a number of limitations should be considered when interpreting the present findings, and we believe these issues also point toward interesting research directions. Although our use of multisource, time-lagged data ameliorates common method/source concerns (Podsakoff et al., 2003), our research design does not allow for causal conclusions, and alternative model configurations remain possible. Contrary to our theorizing, for example, one may wonder whether it might be more plausible to conceptualize time planning as a mediator (rather than moderator) and knowledge scanning as a moderator (rather than mediator). We conducted supplementary analyses to examine these possibilities

(see online Appendix, Tables C and D). Neither long-range nor short-range planning were significantly related to radical or incremental creativity, however, after controlling for time pressure. Hence, these planning types do not seem viable as alternative mediators. Moreover, there was no conclusive evidence for a moderating role of external or internal scanning in the direct (linear and curvilinear) linkages between time pressure and radical/incremental creativity.[6] Overall, we therefore conclude that our proposed model is more tenable – both theoretically and empirically – than such alternatives. Nevertheless, additional research is needed to further validate our findings and enable causal evidence. Longitudinal and within-person designs (e.g., experience sampling methods) might be particularly interesting because an employee's time pressure experiences may vary over time. Examining such variation and its creativity consequences may enable a finer-grained understanding of the relationships examined in our study (see also Acar et al., 2019).

Furthermore, our investigation was conducted in one country, and we therefore cannot ascertain cross-cultural generalizability. As noted earlier, time pressure is prevalent among employees in many societies (Cai, 2017; Eurofund et al., 2017; Maestas et al., 2017), and research has illustrated time pressure–creativity linkages within diverse cultures (e.g., Antes & Mumford, 2009; Binnewies & Wörnlein, 2011; Rostami et al., 2019; Shao et al., 2019; Yu & Wang, 2022). Nevertheless, some organizations in China are known to impose extreme workloads and time pressure on their employees (e.g., through "996" schedules that expect

[6] We had measured time planning at T1 and knowledge scanning at T2. Hence, we could not meaningfully examine a possible moderating role of external/internal scanning in the linkages between time pressure and long-range/short-range planning.

employees to work from 9am to 9pm, 6 days a week), and Confucian values (e.g., endorsement of hierarchies and respect for authorities; Farh et al., 2007) may foster acceptance of such demands. Indeed, research has shown that Confucian traditionality can shape individuals' reactions to work demands and stressors (Xie et al., 2008), possibly altering the creativity consequences of time pressure. We note, however, that "996" schedules have been met with increasing resistance and governmental backlash in China in recent years (Yip, 2021), and such work practices are a rare exception among the organizations in our sample. Moreover, even individuals within Confucian cultural contexts differ pronouncedly in their respective values, and individuals from other countries may also adhere to Confucian values to a stronger or lesser degree (Juma & Lee, 2012; Spreitzer et al., 2005) – particularly in a globalized environment with culturally diverse societies (for the US, see Monte & Shin, 2022). Beyond constructive replication in other countries, future research may therefore advance a finer-grained, more culture-specific understanding of the linkages in our model by measuring participants' Confucian traditionality (Farh et al., 2007) and examining this variable as a potential boundary condition.

In fact, besides such cultural aspects, future research might fruitfully expand the present considerations by examining a wider range of contingency factors – particularly regarding the linkage between time pressure and internal scanning (which was not moderated by short-range planning in our study). Potentially, motivational factors that enhance the personal relevance of one's home organization (e.g., organizational identification; Ashforth et al., 2008) may encourage internal scanning even if employees perceive very low time

pressure. Similarly, relevant job resources (e.g., social support, autonomy) or personal resources (e.g., self-efficacy, optimism; Hobfoll & Shirom, 2001) may enable employees to sustain their internal scanning even at pronounced time pressure levels.

Additionally, as noted earlier, we observed direct linkages between time pressure and radical as well as incremental creativity even after considering the mediating role of knowledge scanning, and employees' time planning moderated these direct associations. Hence, future research may benefit from exploring additional mechanisms that may account for time pressure-creativity linkages. For example, continued time pressure may trigger pronounced strain and mental health issues (e.g., burnout), with potential ramifications for different creativity types (Akinola et al., 2019). Moreover, time pressure may distinctly shape employees' learning approaches as well as challenge and threat appraisals (Gutnick et al., 2012; Khedhaouria et al., 2017), and employees' time management preferences might alter these relationships, with potentially unique implications for radical vs. incremental creativity. By examining such notions, future studies may advance a broader understanding of the complex association between time pressure and diverse creativity facets.

Finally, beyond our focus on time pressure, other constraints may also shape individual creativity (e.g., related to financial resources, supplies, or equipment; Acar et al., 2019; Gutnick et al., 2012). Research suggests that cognitive mechanisms similar to the knowledge scanning types examined in our study may account for such creativity consequences (e.g., cognitive search strategies or fixation; Mehta & Zhu, 2016; Scopelliti et al., 2014), although motivational and social mechanisms (e.g., task enjoyment or team

dynamics; Rosso, 2014; Sellier & Dahl, 2011) may also be relevant. Hence, as Acar et al. (2019) noted, it would be interesting to simultaneously consider the role of different constraint types for employee creativity, to examine the potential interplay between such constraints, and to investigate similarities and differences in their mechanisms and boundary conditions. Expanding the scope of our study, this could advance a more comprehensive picture of the creativity benefits and detriments associated with the diverse challenges and pressure sources employees commonly experience at work.

Conclusion

The current research advances new theoretical knowledge about the relationship between time pressure and employee creativity by (a) distinguishing different facets of creativity, (b) examining distinct mechanisms for the linkage between time pressure and these creativity types, and (c) investigating key boundary conditions for these indirect relations. Our findings address important ambiguities and seeming contradictions in the existing research, illustrating that a thorough understanding of time pressure's consequences requires separately considering employees' radical vs. incremental creativity as well as employees' approaches toward knowledge scanning and time management. Moreover, our results have important implications for organizations and managers in modern work environments that often require the production of creative outputs under conditions of time scarcity.

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Table 1

Confirmatory Factor Analysis Results

Employee-rated variables	χ^2	*df*	CFI	TLI	RMSEA	SRMR
1. *Five factors*: Time pressure, internal scanning, external scanning, long-range planning, short-range planning	476.93	289	0.92	0.91	0.06	0.07
2. *Four factors*: Internal scanning and external scanning combined	997.70	293	0.71	0.67	0.11	0.12
3. *Four factors*: Long-range planning and short-range planning combined	705.40	293	0.83	0.81	0.08	0.09
4. *One factor*: All factors combined	1955.19	299	0.31	0.25	0.17	0.17
Supervisor-rated variables						
1. *Two factors*: Radical creativity, incremental creativity	10.26	8	0.99	0.99	0.04	0.03
2. *One factor*: Radical and incremental creativity combined	216.81	9	0.58	0.31	0.34	0.17

Table 2

Descriptive Statistics and Correlations

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Education	3.11	.56	—																		
2. Tenure	5.09	4.96	-.02	—																	
3. Software development	.16	.36	-.09	-.05	—																
4. Information technology	.22	.41	-.02	.23**	-.23**	—															
5. Architecture design	.17	.38	.07	-.11	-.20**	-.24**	—														
6. Electric power	.16	.37	.08	-.09	-.19**	-.23**	-.20**	—													
7. Telecommunication	.16	.36	.06	-.03	-.19**	-.23**	-.20**	-.19**	—												
8. Job Complexity	4.28	1.17	-.05	-.08	-.12	.09	.06	.08	-.04	(.79)											
9. Conformity	4.60	.87	.10	.08	.03	-.08	.08	.10	-.05	.03	(.77)										
10. WR	2.88	.77	.02	-.10	.00	-.09	.01	.15	-.01	.02	-.23**	(.79)									
11. Intrinsic Motivation	4.84	1.21	.10	-.11	.06	-.13	.06	.11	.00	.15*	.15*	.09	(.94)								
12. Extrinsic Motivation	4.90	1.04	.10	-.11	.03	-.04	.08	.11	-.05	.07	.22**	-.01	.50***	(.82)							
13. Time Pressure	4.04	.94	.02	.07	.00	-.02	-.03	.08	-.01	.13	-.05	-.10	-.10	-.04	(.79)						
14. External Scanning	3.50	.74	.10	-.06	-.02	.03	.04	.04	.04	.03	.17*	-.02	.34***	.26***	-.26***	(.91)					
15. Internal Scanning	3.52	.75	.10	.04	-.06	.21**	-.12	.06	-.05	-.04	.05	-.13	.10	.11	.14*	.19**	(.90)				
16. Long-range Planning	3.06	.65	.07	-.16*	-.15*	.03	-.03	.15*	.01	.10	.08	.04	-.05	.08	.03	.13	.08	(.79)			
17. Short-range Planning	2.90	.75	-.07	.01	-.08	.09	-.17*	-.10	.11	-.07	.14*	-.19**	-.16*	-.07	-.08	.14*	-.13	.22**	(.89)		
18. Radical Creativity	4.43	1.05	.04	.04	-.09	.02	-.03	.10	-.02	.11	.04	.15*	.23**	.10	-.19**	.28***	.15*	.00	-.02	(.84)	
19. Incremental Creativity	4.60	1.01	.02	-.06	-.02	-.01	.06	.14*	-.08	-.08	.12	.01	-.05	.09	.06	.00	.31***	.06	-.09	.30***	(.84)

Notes: $n = 203$; *$p < .05$; **$p < .01$; ***$p < .001$ (two-tailed). Values in parentheses are alpha coefficients. WR = willingness to take risks. Variables 3-7 are industry dummies.

Table 3 *Moderated Regression Results for External Scanning and Radical Creativity*

Variable	External Scanning								Radical Creativity									
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8		Model 9	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
1. Education	.04	.05	.03	.05	.05	.05	.04	.05	.02	.07	.00	.07	.00	.07	-.01	.07	-.01	.07
2. Tenure	.00	.05	-.02	.05	-.01	.05	-.02	.05	.09	.07	.10	.07	.07	.07	.11	.07	.07	.07
3. Software development	.23	.18	.20	.17	.21	.18	.25	.17	-.24	.26	-.30	.25	-.27	.25	-.31	.25	-.28	.25
4. Information technology	.30	.16	.29	.16	.31	.16	.31*	.16	-.04	.24	-.19	.24	-.17	.24	-.18	.24	-.15	.24
5. Architecture design	.29	.18	.16	.17	.28	.18	.23	.17	-.23	.26	-.28	.26	-.36	.25	-.27	.26	-.33	.25
6. Electric power	.27	.18	.22	.18	.29	.18	.28	.18	.03	.27	-.06	.26	-.06	.25	-.06	.26	-.03	.26
7. Telecommunication	.27	.17	.25	.17	.26	.17	.26	.17	-.17	.25	-.24	.25	-.25	.24	-.22	.25	-.21	.24
8. Job Complexity	.00	.05	-.03	.05	.01	.05	-.03	.05	.13	.07	.14*	.07	.11	.07	.14*	.07	.12	.07
9. Conformity	.03	.05	.05	.05	.04	.05	.04	.05	.05	.08	.03	.07	.04	.07	.03	.07	.04	.07
10. Willingness to Take Risks	-.03	.05	-.07	.05	-.02	.05	-.06	.05	.12	.07	.15*	.07	.12	.07	.13	.07	.10	.07
11. Intrinsic Motivation	.21***	.06	.21***	.06	.20***	.06	.22***	.06	.23**	.08	.16	.08	.18*	.08	.16	.08	.17*	.08
12. Extrinsic Motivation	.06	.06	.04	.06	.06	.06	.04	.05	.02	.08	-.01	.08	-.02	.08	-.01	.08	-.02	.08
13. Time Pressure	-.17**	.05	-.15**	.05	-.18**	.05	-.14**	.05	-.23**	.08	-.19*	.08	-.16*	.08	-.22**	.08	-.17*	.08
14. Time Pressure^2	.01	.03	.03	.03	.00	.03	.02	.03	-.11*	.05	-.10*	.05	-.09	.05	-.07	.05	-.07	.05
15. External Scanning											.28**	.10	.23*	.10	.27*	.10	.23*	.10
16. Internal Scanning											.15	.10	.17	.10	.14	.10	.16	.10
17. LRP	.12	.08	.10	.09			.07	.09	-.07	.11	-.12	.11	-.15	.12			-.15	.13
18. SRP	.15*	.07			.15	.08	.14	.08	.06	.10	.04	.10			.05	.11	.09	.11
19. Time Pressure×LRP			.19**	.07			.18**	.07					.25**	.10			.26**	.10
20. Time Pressure×SRP					.05	.06	.01	.06							.11	.09	.07	.09
21. Time Pressure^2 ×LRP			.04	.04			.04	.04					.04	.05			.04	.05
22. Time Pressure^2 ×SRP					.02	.04	.00	.04							-.06	.06	-.08	.06
Intercept	3.26***	.13	3.29***	.13	3.27***	.13	3.26***	.13	4.63***	.20	3.18***	.47	3.31***	.47	3.26***	.47	3.34***	.47
R^2	.24***		.25***		.24***		.27***		.15**		.20***		.23***		.21***		.24***	

Notes: Unstandardized coefficients are reported. * $p < .05$; ** $p < .01$; *** $p < .001$ (two-tailed). Variables 3-7 are industry dummies. LRP = long-range planning; SRP = short-range planning.

Table 4 *Moderated Regression Results for Internal Scanning and Incremental Creativity*

Variable	Internal Scanning								Incremental Creativity									
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8		Model 9	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
1. Education	.04	.05	.04	.05	.03	.05	.03	.05	-.04	.07	-.05	.07	-.05	.07	-.06	.07	-.06	.07
2. Tenure	-.01	.05	.00	.05	-.01	.05	.00	.05	-.07	.07	-.07	.07	-.05	.07	-.06	.07	-.05	.07
3. Software development	.00	.18	.06	.18	-.02	.18	.00	.18	.24	.26	.26	.25	.26	.24	.26	.25	.25	.25
4. Information technology	.46**	.17	.49**	.17	.47**	.17	.47**	.17	.34	.24	.18	.23	.18	.23	.19	.23	.20	.23
5. Architecture design	-.21	.18	-.11	.18	-.20	.18	-.19	.18	.32	.26	.42	.25	.46	.24	.44	.25	.47	.25
6. Electric power	.07	.19	.15	.19	.11	.18	.11	.19	.47	.26	.47	.25	.49*	.25	.50*	.25	.52*	.25
7. Telecommunication	-.02	.18	.00	.18	.01	.18	.01	.18	.09	.25	.12	.24	.13	.24	.16	.24	.17	.24
8. Job Complexity	-.07	.05	-.06	.05	-.06	.05	-.07	.05	-.09	.07	-.06	.07	-.05	.07	-.06	.07	-.05	.07
9. Conformity	.05	.05	.03	.05	.06	.05	.05	.05	.16*	.07	.14*	.07	.14*	.07	.14*	.07	.14*	.07
10. Willingness to Take Risks	-.11*	.05	-.10	.05	-.12*	.05	-.13*	.05	.02	.07	.06	.07	.06	.07	.03	.07	.03	.07
11. Intrinsic Motivation	.11	.06	.12*	.06	.10	.06	.10	.06	-.12	.08	-.15	.08	-.16	.09	-.15	.08	-.15	.08
12. Extrinsic Motivation	.06	.06	.06	.06	.07	.06	.06	.06	.14	.08	.13	.08	.13	.08	.13	.08	.14	.08
13. Time Pressure	.08	.05	.08	.06	.08	.05	.07	.06	.04	.08	-.01	.08	-.03	.08	.00	.08	-.02	.08
14. Time Pressure^2	-.11***	.03	-.12**	.03	-.10**	.03	-.09*	.04	-.14**	.05	-.09*	.05	-.08	.05	-.06	.05	-.05	.05
15. External Scanning											-.08	.10	-.06	.10	-.06	.10	-.05	.10
16. Internal Scanning											.40***	.10	.39***	.10	.37***	.10	.36***	.10
17. LRP	.07	.08	.01	.09			.05	.09	-.01	.11	-.03	.11	-.07	.12			-.08	.12
18. SRP	-.16*	.07			-.08	.08	-.09	.08	-.10	.10	-.02	.10			.09	.11	.09	.11
19. Time Pressure×LRP			-.04	.07			-.01	.07					-.12	.10			-.09	.10
20. Time Pressure×SRP					.01	.06	.00	.06							-.04	.09	-.03	.09
21. Time Pressure^2 ×LRP			.01	.04			.02	.04					.03	.05			.04	.05
22. Time Pressure^2 ×SRP					-.07	.04	-.07	.04							-.12*	.06	-.12*	.06
Intercept	3.55***	.14	3.51***	.14	3.53***	.14	3.52***	.14	4.47***	.19	3.29***	.46	3.24***	.46	3.32***	.45	3.28***	.46
R^2	.21***		.20***		.22***		.23***		.13**		.19***		.20**		.21***		.22***	

Notes: Unstandardized coefficients are reported. * $p < .05$; ** $p < .01$; *** $p < .001$ (two-tailed). Variables 3-7 are industry dummies. LRP = long-range planning; SRP = short-range planning.

Figure 1

Theoretical Model

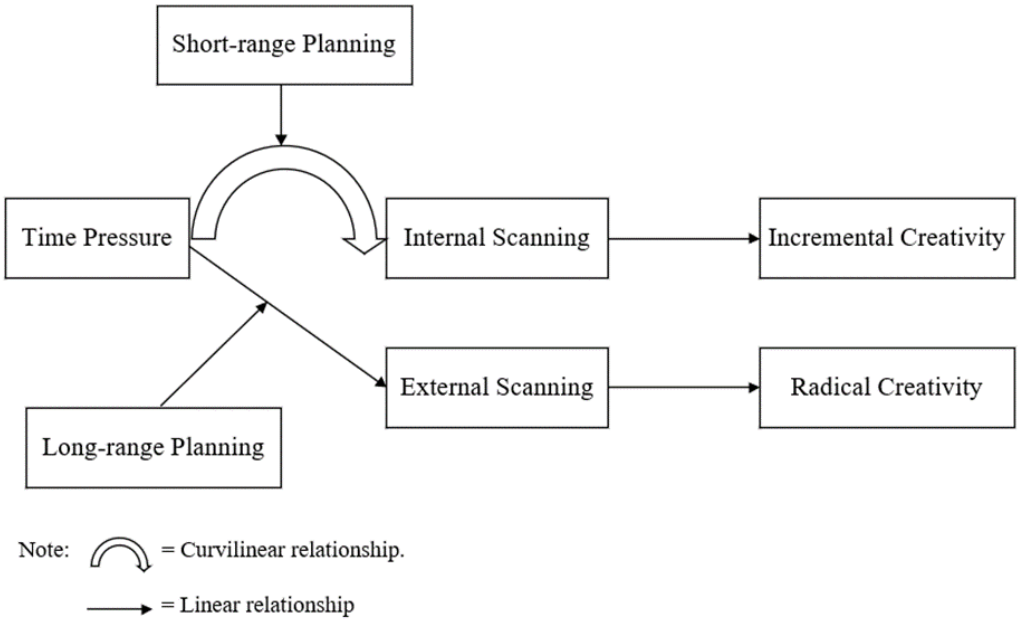

Figure 2

The Curvilinear Relationship between Time Pressure and Internal Scanning

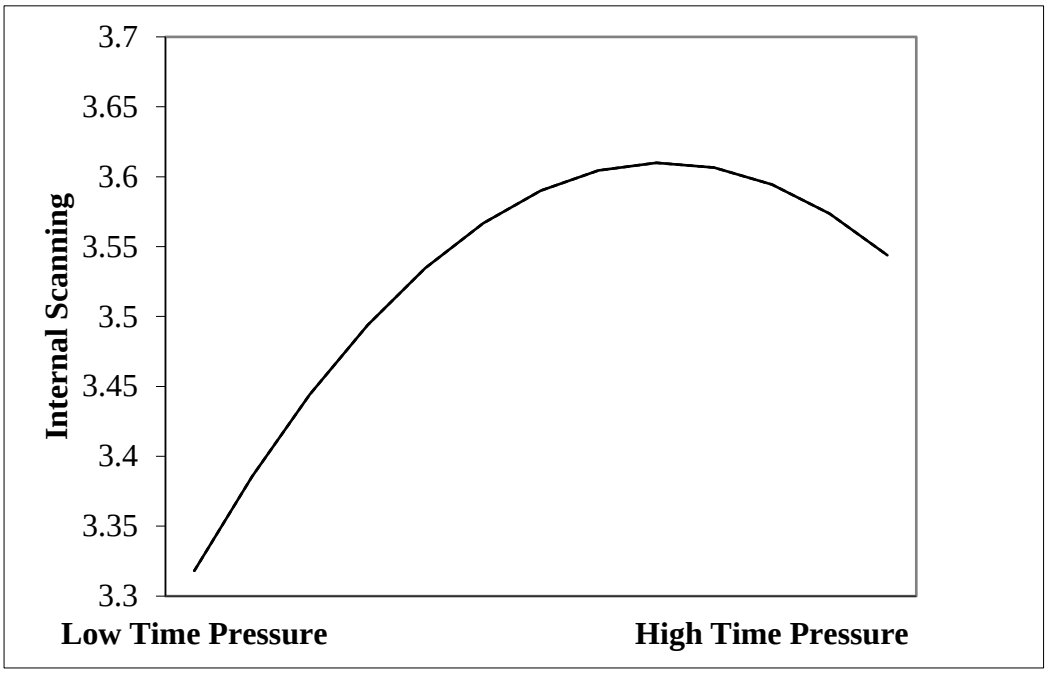

Figure 3

Interactive Relationship of Time Pressure and Long-Range Planning (LRP) with External Scanning