Journal of Business and Psychology
https://doi.org/10.1007/s10869-024-09951-w

ORIGINAL PAPER

Bringing Self-Determination Theory to the Forefront: Examining How Human Resource Practices Motivate Employees of All Ages to Succeed

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Accepted: 3 April 2024

Abstract

Self-determination theory (SDT) is widely used in human resource (HR) practice studies to explain how HR practices impact work outcomes. However, there is little empirical evidence establishing the complete SDT mediational process in the HR domain, which entails basic psychological needs and motivation acting as mediators of relations between HR practices and work outcomes. The present study addresses this issue with a mixed methods approach. Using an item classification task with subject matter experts ($N = 48$), HR practices were classified as autonomy-, competence-, and relatedness-supportive. Based on this scheme, we tested an SDT-based conceptual model in a three-wave sample of working adults ($N = 818$). Results from Multilevel Structural Equation Modeling (MSEM) support the hypothesized model: basic psychological need satisfaction and autonomous motivation mediate the relationship between HR practice perceptions and work outcomes (performance, thriving, affective organizational commitment, and turnover intentions). Autonomy-supportive practices had a positive effect on autonomy need satisfaction, while competence-supportive practices had positive associations with all three basic psychological needs. Counterintuitively, relatedness-supportive practices had negative effects on autonomy and competence need satisfaction, and the relationship between relatedness-supportive practices and autonomy need satisfaction was moderated by chronological age. We discuss our findings in the context of prominent HR studies that utilize SDT and offer a supplemental age-inclusive HR practice scheme for HR managers interested in understanding the benefits of supporting basic psychological needs from both a motivation and workforce retention standpoint.

Keywords Self-determination theory · Human resource practices · Motivation · Age-inclusivity · Longitudinal study

Self-determination theory (SDT; Deci & Ryan, 2000; Gagné & Deci, 2005) is a macro theory of human motivation that spans many disciplines, cultures, and age groups (Deci & Ryan, 2008; Mackenzie et al., 2018; Vansteenkiste et al., 2010). It proposes that people of all ages have three basic psychological needs that, if satisfied, will lead to optimal motivation (or effort expenditure) at work (Gagné & Deci, 2005; Van den Broeck et al., 2016, 2021). These basic psychological needs pertain to feeling like one is acting of their own volition (autonomy), one is efficacious in their actions (competence), and one has meaningful relationships at work (relatedness) (Gagné, 2018; Gagné & Deci, 2005).

One method for motivating employees is through the use of human resource (HR) practices, which are policies and procedures designed to govern work behaviors (Becker & Huselid, 1998; Jiang et al., 2012). Consequently, a number of HR practice studies invoke SDT as part of their justification for how HR practices influence motivation and subsequent work outcomes—typically, SDT processes such as basic psychological need satisfaction and motivation are proposed to be mediators, but these processes are not explicitly examined together (e.g., Bos-Nehles & Veenendaal, 2019; Chang et al., 2014; Gardner et al., 2011; Hong et al., 2016; Jo et al., 2020). The few HR studies that explicitly measure SDT-relevant processes tend to focus on intrinsic motivation (e.g., Hong et al., 2016), and the measurement of basic psychological need satisfaction is virtually non-existent (for a sole exception, see Marescaux et al., 2013 who assessed need satisfaction without motivation). The omission of basic psychological need satisfaction measurement alongside

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Published online: 04 May 2024

motivation within the HR literature creates a disconnect that gives rise to several issues.

First, the complete SDT mediational process (HR practices ➔ basic psychological need satisfaction ➔ motivation ➔ work outcomes) is never empirically established in the HR literature, creating a cycle that limits the theoretical development of SDT within this research space. Second, invoking SDT to propose mediation without empirical testing in HR designs presents a significant issue as it can lead researchers to falsely assume the existence of mediation (MacKinnon et al., 2007). In essence, the current state of the HR literature lacks the necessary empirical foundation to support robust mediation frameworks based on SDT, hindering a comprehensive understanding of the underlying mechanisms at play.

In the following sections, we discuss why monitoring employees' HR practice *perceptions* is appropriate when studying work motivation. We then outline how SDT is typically used in the HR literature—elucidating why basic psychological needs and motivations should be explicitly examined despite seemingly obvious associations between HR practices and motivation. Through integrating the lifespan developmental perspective (Baltes et al., 1999), we then detail how chronological age should moderate associations between HR practice perceptions and basic psychological need satisfaction, and finally, we specify the ways that need-supportive HR systems support both motivation and retention through comparing basic psychological needs with lifespan developmental needs. This is accomplished through assessing for mediation and moderated-mediation using multilevel structural equation modeling (MSEM).

In conducting this research, we respond to SDT-scholar calls to: a) more deeply understand the motivational potential of HR practices (Van den Broeck et al., 2019, p. 519) and b) better integrate basic psychological need satisfaction with other motivational theories (Van den Broeck et al., 2016, p. 1223). Through merging SDT with lifespan developmental perspectives, we additionally address calls to: c) understand the role of age in moderating work environmental influences on basic psychological needs (Ng & Feldman, 2015, p. 74); d) develop a theoretical understanding of how we can best accommodate an aging workforce (North, 2019, p. 434); and e) clarify which specific practices provide the best value in dealing with a changing age demographic (Boehm et al., 2021, p. 226). Our findings address a longstanding need for HR practice studies to be more generalizable (Gardner et al., 2011, p. 344), since we examine HR practice perceptions and motivations in people across various industries and occupations. The primary goal of this study is to, undoubtedly, bring self-determination theory to the forefront of research on HR practices.

Self-Determination Theory

Self-determination theory (SDT; Deci & Ryan, 1985) is a cognitive motivational theory that is humanistic-phenomenological in nature. It is grounded on nearly four decades of research on human motivation, and it is a synthesis of five mini theories that detail the universality of basic psychological needs, as well as their influences on a typology of motivations (Gagné & Deci, 2005; Vansteenkiste et al., 2010). The need for *autonomy* pertains to feeling like one has freedom; the need for *competence* is the feeling that a person has the skills and ability to achieve goals; and the need for *relatedness* captures the feeling of being connected to others (Gagné & Deci, 2005). Through satisfying basic psychological needs, people experience higher levels of autonomous (i.e., self-directed/self-determined) motivation, which is the ideal type of motivation since it leads to optimal functioning at work (Gagné & Deci, 2005; Van den Broeck et al., 2016). According to SDT scholars (e.g., Deci et al., 2017; Gagné & Deci, 2005), basic psychological needs and motivations are distinct constructs that should be modeled simultaneously in research designs, but to date, we have not identified an HR study to do this despite the proliferation of SDT theorizing in HR research (see Gardner et al., 2011; Hong et al., 2016; Ng & Feldman, 2015). In later sections, we articulate why this is problematic and remedy the issue by serving as the first major application of SDT to the HR practice literature. Before doing so, however, we discuss why employee-based HR practice perceptions are preferable to management-based ratings when evaluating employee motivation.

Human Resource Practices and Employee-Based Perceptions

It is well known that HR practices are designed to encourage productive behaviors from employees (Becker & Huselid, 1998), and enhance employees' skills, motivations, and opportunities to perform (Jiang et al., 2012). These practices are broadly viewed as being performance-based (Becker & Huselid, 1998) and commitment-based (Arthur, 1992, 1994) HR systems[1], and they have longstanding associations with important work outcomes such as affective commitment (Kehoe & Wright, 2013) and performance (Collins & Smith, 2006), respectively. In the present study, we

[1] We recognize that HR practice systems are not mutually exclusive and can have HR practices that overlap with one another. Most employee-based HR practice measures use custom-made scales instead of pre-existing ones (Beijer et al., 2021). A commonality among many of these HR practice measures is that they acknowledge the fact that HR systems are performance- and/or commitment-based (Beijer et al., 2021).

focus on employees' HR practice *perceptions*, as opposed to management-based ones, since there can be a discrepancy between what a manager believes is being implemented by an organization and what the employee actually experiences (Laguerre, 2022; Piening et al., 2014). Employee perceptions of HR practices are a critical part of HR systems because employees' attitudes and behaviors are shaped by what they perceive (Beijer et al., 2021; Khilji & Wang, 2006; Kooij et al., 2010; Piening et al., 2014). For this reason, the use of employee-based ratings of HR practices have increased from 9% of HR studies in 2000-2002, to nearly 40% of HR studies in 2015-2017 (Beijer et al., 2021). Thus, we continue this trend in our design, particularly because the employee is a reliable source of information to determine whether HR practices motivate them through SDT pathways.

A Scholarly Paradox: Self-Determination Theory is Often Invoked in HR Research but Seldom Explored

An examination of high impact journals in the organizational sciences will reveal that a number of influential studies have established a solid premise for the idea that HR practices influence employee motivation (e.g., Batt, 2002; Gardner et al., 2011; Hong et al., 2016; Jiang et al., 2012; Ng & Feldman, 2015), seemingly calling into question the value of an HR practice study that tests SDT—a well-established and intuitive theory of motivation. Upon closer inspection of these works, there are some problems that arise particularly as it pertains to our understanding of HR practices and SDT. In what follows, we highlight a few pieces to illustrate a trend.

Relegated to the Background: SDT in the HR Domain

Example HR Study 1: Support for SDT.

A widely cited *Personnel Psychology* article states that "the theoretical lens that best explains the process by which greater use of motivation, empowerment, and skill-enhancing [HR] practices affect individual commitment, prior to cumulating into collective commitment, is self-determination theory" (Gardner et al., 2011, p. 320). In this example, Gardner et al. (2011) invoke SDT as the best theory for explaining the linkages between HR practices and affective commitment, arguing that HR practices should satisfy basic psychological needs and influence intrinsic motivation. Nevertheless, this mediational chain is not explicitly evaluated, and instead, another mediator is used. Further, despite SDT being the "best" theory for their design, the HR system is not classified in accordance with basic psychological needs. Instead, other HR frameworks are introduced (i.e., motivation, empowerment, and skill-enhancing practices) which are argued to be need supportive (Gardner et al., 2011). For example, empowerment-enhancing practices were argued to support all three basic psychological needs, while motivation-enhancing practices were argued to satisfy relatedness and competence needs (Gardner et al., 2011). Although the authors' rationale is sound, there is no direct empirical evidence for their claims. The hypotheses of Gardner et al. (2011), in this case, were generally supported although they were grounded in untested mediational pathways between HR practices, basic psychological needs, and motivation.

Example HR Study 2: Failure to Support SDT.

The importance of SDT is echoed by an influential *Journal of Applied Psychology* article, which argued that intrinsic motivation is part of a mediational process that links initiative-enhancing HR practices to personal initiative (Hong et al., 2016). Citing SDT scholars in their rationale (e.g., Deci & Ryan, 1985; Gagné & Deci, 2005), Hong et al. (2016) state that "employees will perceive enhanced levels of self-determination when embedded in an environment with high initiative climate" (p. 690). We identified that there were no mediating effects of intrinsic motivation in their results—constituting evidence in opposition to their SDT-based argumentation. Nevertheless, upon closer inspection of their design, we identified a plausible reason for their unsupported SDT-based theorizing.

According to SDT theorists, intrinsic motivation (i.e., working for fun or enjoyment) would require the *highest levels* of basic psychological need satisfaction (Gagné & Deci, 2005), and evidence suggests that another type of autonomous motivation is better suited for predicting work outcomes (e.g., working because the job is personally important; see Van den Broeck et al., 2021). In order for an HR system to impact intrinsic motivation, however, SDT scholars would argue that these practices should *first* satisfy employees' basic psychological needs (Deci et al., 2017; Gagné, 2018; Van den Broeck et al., 2016). Basic psychological need satisfaction was not assessed in Hong et al.'s (2016) study, which makes it unclear why the SDT theorizing did not hold true—did the HR system fail to sufficiently satisfy basic psychological needs, or was the wrong operationalization of autonomous motivation used?

Example HR Study 3: Mixed Support for SDT

Finally, job autonomy is a key feature of HR systems as it allows employees independence and discretion for carrying out their work (Meijerink & Bondarouk, 2023; van Hoorn, 2018). A *Work, Aging and Retirement* meta-analysis evaluated the moderating effects of chronological age on

associations between job autonomy and work outcomes (Ng & Feldman, 2015). Like the aforementioned examples, Ng and Feldman (2015) based their rationale on SDT, stating that "self-determination theory strongly emphasizes that external environments differ in the extent to which they provide support for individual autonomy" and "the work environment can foster or thwart people's inherent needs for growth" (p. 65). Nevertheless, Ng and Feldman (2015) found inconsistent support for chronological age as a moderator, such that job autonomy sometimes had stronger associations for older workers and other times weaker associations for older workers. Without literature that examines and triangulates information on HR practice perceptions, basic psychological needs, and age, it is difficult to explain their results, raising more questions about the true role of SDT in the HR domain. Hence, Ng and Feldman (2015) called for the explicit assessment of basic psychological need satisfaction alongside chronological age (p. 74).

Summary These high-impact studies illustrate a trend in the HR domain with respect to SDT. First, SDT is typically relegated to the background of HR designs[2]. It is invoked as a prominent motivational theory, but when HR studies find support (e.g., Gardner et al., 2011), no support (e.g., Hong et al., 2016), or mixed support (e.g., Ng & Feldman, 2015) for their SDT-inspired hypotheses, there is no (or very little) direct empirical evidence to develop SDT theorizing for HR systems. Because basic psychological needs are not measured in concert with motivation, there is an overreliance on underdeveloped mediational pathways in HR studies that use SDT to justify their designs. For this reason, among others, SDT scholars have claimed "to date, the relationship between HR practices and employee motivation remains poorly understood" (Van den Broeck et al., 2019, p. 518) and "more research is necessary to understand the motivational potential of HR practices" (Van den Broeck et al., 2019, p. 519). Therefore, the present study brings SDT to the forefront of research on HR practice perceptions and employee outcomes. We accomplish this through not only by measuring basic psychological need satisfaction and motivation, but also through operationalizing HR practices based on SDT principles.

[2] Even when SDT is not explicitly mentioned, SDT-related principles are used. For example, another seminal HR article in the *Academy of Management Journal* established the longstanding idea that HR practices inherently support autonomy (e.g., individual discretion), competence (e.g., ongoing learning), and relatedness (e.g., collaboration with others) as they foster employee performance and commitment (Batt, 2002, pg. 588).

Bringing SDT to the Forefront of HR Research

Inspired by previous research that has used SDT to argue for HR systems' impact on motivation, we suggest the notion of autonomy-, competence-, and relatedness-supportive HR practices. Our HR practice conceptualization aligns with SDT-scholar theorizing in the organizational sciences (see Deci et al., 2017; Gagné, 2018); yet, going beyond prior work that aligns disparate HR practice schemes with SDT principles (e.g., Batt, 2002; Gardner et al., 2011; Hong et al., 2016), we explicitly *operationalize* our HR system according to SDT and model the complete mediational pathway of SDT motivational processes (HR practices ➔ basic psychological need satisfaction ➔ motivation ➔ work outcomes; see Fig. 1). Our outcomes of interest are derived from Gagné's (2018) SDT-based conceptual model—*the motivational model of organizational goal pursuit*—which delineates four key individual outcomes of autonomy-, competence-, and relatedness-supportive HR practices: individual performance, affective organizational commitment, turnover intentions, and thriving. These outcomes hinge on autonomous motivation, where employees primarily put effort at work because they find their work interesting or important.

Gagné's (2018) SDT-based model includes these outcomes since they have well-established associations with need satisfaction (Van den Broeck et al., 2016) and because they collectively maximize the chances that employees' efforts attain strategic goals valued by organizations. When employees internalize individual goals through autonomous motivation, their performance improves as they become more closely aligned with organizational objectives, transforming external goals into personally owned pursuits (Gagné, 2018). Experiencing autonomous motivation, characterized by finding work interesting or important, not only enhances organizational commitment and reduces turnover but also instills enthusiasm toward tasks, even those perceived as mundane (Gagné, 2018). This positive outlook transforms routine tasks into opportunities for professional development. This positive mindset is captured by the concept of thriving, defined as "a psychological state in which people feel they are learning and growing, and feel energized and vitalized through their work" (Gagné, 2018, p. 93).

In summary, we utilize these outcome variables—individual performance, affective organizational commitment, turnover intentions, and thriving—to align with SDT frameworks in the organizational sciences (Gagné, 2018; see also Deci et al., 2017; Gagné & Deci, 2005), shedding light on the different facets of optimal functioning at work. This underscores the idea that supporting basic psychological needs yields a set of interconnected benefits, directly and indirectly contributing to the achievement of strategic goals.

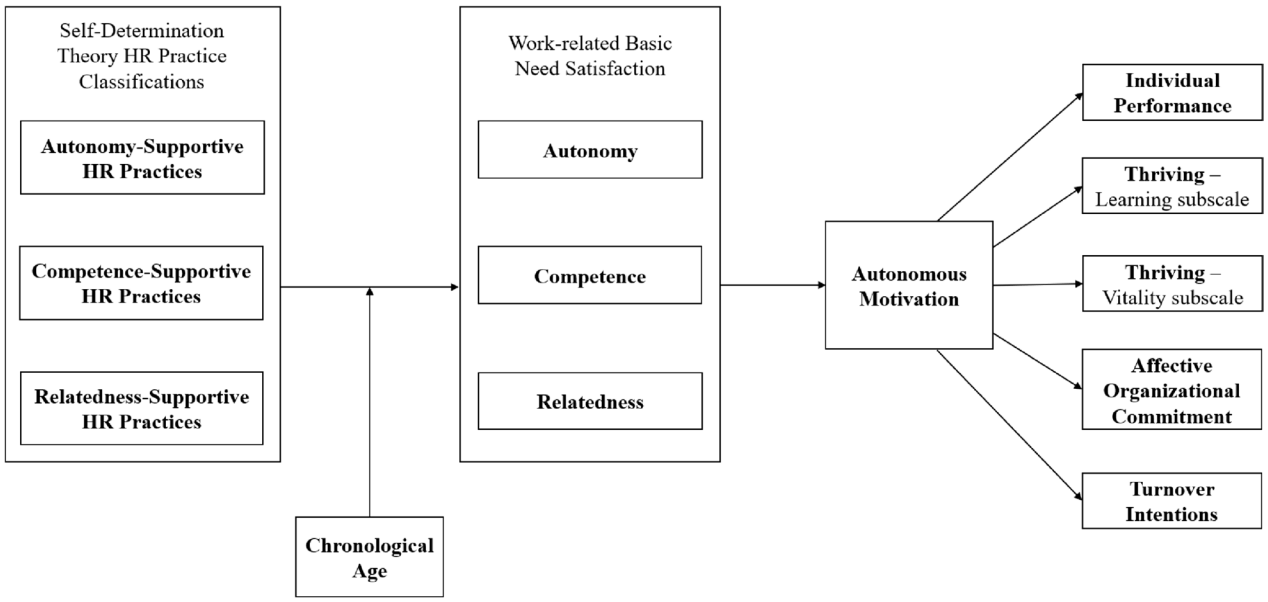

Fig. 1 Conceptual model

Hypothesis 1: HR practice perceptions are positively related to autonomy (H1a), competence (H1b), and relatedness (H1c) need satisfaction at work.
Hypothesis 2: HR practice perceptions have an indirect effect on individual performance (H2a), affective organizational commitment (H2b), thriving (H2c), and turnover intentions (H2d) via work-related basic psychological need satisfaction and autonomous motivation. We expect a positive association between basic psychological need satisfaction and autonomous motivation; moreover, we anticipate that autonomous motivation will relate positively to performance, affective organizational commitment and thriving, and negatively to turnover intentions.

Self-Determination Theory and Chronological Age: Incorporating a Lifespan Developmental Perspective

An SDT meta-analysis in the *Journal of Management* found significant effects between age and basic psychological need satisfaction, reporting a ρ of .03 between age and autonomy need satisfaction and a ρ of .06 between age and competence need satisfaction, suggesting that older people generally experience greater need satisfaction at work (Van den Broeck et al., 2016). Considering these insights from the meta-analysis and previous studies indicating a consistent linear relationship between age and subjective well-being (e.g., Galambos et al., 2015; Karwetzky et al., 2022), we anticipate observing main effects of age on basic psychological needs in our study without explicitly hypothesizing this relationship. However, we propose that age also acts as a moderator of the relations between HR practice perceptions and basic psychological need satisfaction—formulating a hypothesis to this regard. This hypothesis stems from the understanding that motivations change over the course of human development, from conception to death (Baltes, 1987).

In what follows, we respond to SDT scholar calls to integrate SDT with other motivational theories (Van den Broeck et al., 2016, p. 1223) and understand HR systems' motivational potential (Van den Broeck et al., 2019, p. 519). First, using a broad set of lifespan developmental theories, we argue for the interactive effects of age on the relationship between HR practices and basic psychological needs. Second, we take a fine-grained approach and more deeply integrate lifespan developmental theory to better understand the HR system's capacity to motivate people to continue working into older age—supporting age inclusivity and retention (Kooij et al., 2010, 2013, 2014; Pak et al., 2021). We accomplish this by juxtaposing basic psychological needs with lifespan developmental needs: underscoring the dual role of HR practices in both motivating and retaining employees throughout their lives, thereby maximizing human capital.

Theoretical Evidence for Interactive Effects of Age in Relations between HR Practices and Basic Psychological Needs

Autonomy Needs Through the Lens of Selection, Optimization, and Compensation Theory Selection, optimization, and compensation theory (SOC; Baltes & Baltes, 1990) serves as the foundation for the lifespan development perspective.

It proposes that people mitigate functional losses incurred when aging by developing unique strategies for performing their jobs. These strategies are contingent on having *autonomy* and involve *selecting* goals that are attainable, *optimizing* the pursuit of those goals, and *compensating* when faced with difficulty through utilizing alternative strategies (Baltes & Baltes, 1990). Older workers, in particular, benefit from SOC strategy use because they can efficiently manage their energy in ways that enable them to perform better at work (Abraham & Hansson, 1995; Rudolph, 2016) and remain in the workforce longer (Müller et al., 2012). Overall, research converges on the idea that *autonomy* facilitates SOC strategy use (Rudolph, 2016), suggesting that HR practices that support autonomy (e.g., flexible work arrangement, decision latitude) have greater importance for older employees because they need to more frequently utilize personalized strategies for accomplishing work.

Competence Needs Through the Lens of the Motivational Theory of Lifespan Development The motivational theory of lifespan development (MTLD; Heckhausen et al., 2010), which is based on SOC theory, purports that people strive to gain increasing levels of control over their environments as they age. This is accomplished through acquiring and optimizing competencies; namely, through investing time, energy, and resources into developing knowledge, skills, and abilities over the lifespan (Heckhausen et al., 2010). We propose that the need to feel competent at work grows for older workers as a function of the greater amount of resources invested into competencies, when compared to their younger counterparts (for a discussion on expertise, see Baltes, 1987; Baltes et al., 1999). Thus, we propose that HR practices that support, reward, and recognize hard-earned competencies should (broadly) be more important for older workers.

Relatedness Needs Through the Lens of Socioemotional Selectivity Theory Finally, socioemotional selectivity theory (SST; Carstensen, 1991), which is also derived from SOC theory, proposes that people become increasingly selective in their social relationships as a means of coping with mortality and age-related declines in psychophysiological functioning. The main proposition of SST is that people have a general pattern of placing greater importance on relationships in older age, since satisfying emotions rather than accomplishing instrumental goals is one way to combat the emotional turmoil associated with feeling one has a limited time to live (Carstensen, 1991; Kooij et al., 2018). This is evidenced by the fact that older workers seek more positive contact with coworkers (Hennekam, 2015), and they have been found to have a greater need to feel needed and respected at work (Beal, 2016).

Summary Lifespan developmental theories of human motivation (e.g., SOC, MTLD, and SST) underscore the increasing significance of autonomy, competence, and relatedness needs as individuals age. Consequently, HR practices catering to these needs are anticipated to exert a more pronounced positive impact on the basic psychological need satisfaction of older employees (i.e., an interactive effect for age). Moreover, the impact of the HR system on basic psychological needs is interconnected. Workplace features can support multiple psychological needs simultaneously, with the extent varying based on how employees interpret their surroundings (Gagné, 2018).

> Hypothesis 3: Chronological age moderates the relationship between HR practice perceptions and autonomy (H3a), competence (H3b), and relatedness (H3c) need satisfaction at work. The relationship between HR practice perceptions and basic psychological need satisfaction are strengthened as chronological age increases.

Basic Psychological Needs and Lifespan Developmental Needs: Integrating Two Perspectives on Human Development to Better Understand how HR Systems Support Motivation and Retention Across the Lifespan

Until now, we argued for the interactive effects of age, drawing from several interconnected lifespan developmental theories rooted in the SOC model, which is the model that serves as the foundation for the lifespan developmental perspective. Now, our focus shifts to a more comprehensive integration of SDT with the SOC model's gain/loss principle. The gain/loss principle allows us to incorporate *lifespan developmental needs* into our SDT-based HR framework to better understand how HR systems serve the dual purpose of motivating and retaining employees throughout their careers.

Comparing Self-Determination Theory with the Lifespan Developmental Gain/Loss Principle Self-determination theory (Deci & Ryan, 2000) and the lifespan developmental perspective (Baltes, 1987) share a metatheoretical foundation rooted in ontogenesis—a view portraying humans as active, continuously adapting organisms. Both perspectives are founded on universal principles of human development: 1) SDT asserts that optimal functioning requires the satisfaction of all three basic psychological needs (Deci & Ryan, 2000), while 2) the lifespan developmental perspective, as derived from the SOC model, asserts that any developmental gain is accompanied by a loss in adaptive capacity—encapsulating the gain/loss principle (Baltes, 1987; Baltes et al., 1999). Consequently, people have a fundamental need to simultaneously *maximize* gains and *minimize* losses across their lifespan (Baltes et al., 1999). Though both SDT and the lifespan developmental perspective highlight optimal human development,

they diverge in focus. SDT emphasizes effort expenditure and self-actualization, while the lifespan developmental perspective places significance on maintaining effectiveness as one undergoes biological declines inherent to aging.

Lifespan Developmental Needs and HR Practices Drawing from the SOC model's gain/loss principle, Kooij et al. (2014) devised four HR bundles—developmental, maintenance, utilization, and accommodative—aligned with key lifespan developmental needs. These needs encompass *growth* (developing capabilities), *maintenance* (sustaining current capabilities), *recovery* (restoring prior levels of functioning after loss), and *regulation of losses* (minimizing adverse consequences of capability decline). Correspondingly, developmental HR practices address growth needs, maintenance practices cater to maintenance needs, utilization practices facilitate recovery by offering flexibility in using alternative skills during challenges, and accommodative practices aid in regulating losses by enabling functioning at lower levels than ideal (Pak et al., 2021). The age-related HR literature conceptualizes these HR practices as being inherently age-inclusive (also referred to as age-neutral or age general; Boehm et al., 2021) since they facilitate successful aging at work for all age groups.

Maximizing HR Impact: Integrating Basic Psychological Needs and Lifespan Developmental Needs We propose that HR systems, designed to enhance skills and motivation through supporting basic psychological needs (*autonomy, competence,* and *relatedness*), must inherently cater to peoples' lifespan developmental needs: the need to maximize gains (through *growth*, *maintenance,* and *recovery*) and minimize losses (through the *regulation of losses*).

Basic psychological needs and lifespan developmental needs are interconnected, as competence-supportive practices, for instance, are likely to also foster growth/development. However, the unique contribution and advantage of incorporating the lifespan developmental perspective with SDT is that we not only understand how HR practices motivate employees to exert higher levels of effort, but we gain insights into how HR practices simultaneously serve to support employee retention (namely, through supporting one's capacities for maintenance, recovery, and the regulation of losses). This should help HR managers frame conversations around the need for specific HR systems from a motivational standpoint and help them think about which combinations of practices to implement when workforce retention is the aim.

Method

Participants and Procedure

We used a mixed methods approach that enabled us to classify HR practices according to SDT then test our conceptual model. First, we employed a qualitative methodology outlined by Anderson and Gerbing (1991) for assessing the content validity of our HR classifications. This was accomplished through having four independent raters classify a set 60 HR practices twice: first, according to SDT needs (*autonomy-*, *competence-*, and *relatedness-supportive)*, then according to (supplemental) lifespan developmental needs (*developmental, maintenance, utilization,* and *accommodative*)—respondents were provided with a one-page description of the terms[3]. Forty-eight subject matter experts (SMEs) were then recruited from our professional networks to complete the same item classification task via online survey (randomized per respondent). The SMEs were from 34 academic institutions, were 46% PhD students and 54% Professors/Faculty, and all reported their discipline as industrial/organizational psychology, or a related field. To incentivize participation, each SME received a $50 Amazon eGiftcard. After the qualitative SME phase, we conducted a confirmatory factory analysis (CFA) of the SDT-based HR classifications using T1 data ($N = 1467$ working adults) from our longitudinal data collection effort[4].

We collected longitudinal data from a diverse sample of employees across different job types and organizations in the United States. Data collection was conducted through Prolific, an online panel provider widely used in research (Porter et al., 2019). The data represents three waves of a larger longitudinal data collection effort on the attitudes and motivations of aging employees, and no studies have been published with these data. We selected a time lag of six weeks between the assessments, which aligns with prior research that has shown significant variability in our dependent variables over similar periods (e.g., Cowan & Taylor, 2015; Prem et al., 2017; Weigelt et al., 2019). The workers were financially compensated for their time, and those enrolled in the study earned up to $6.98 for remaining until T3 (three months total). To ensure data quality, several measures were taken during the cleaning process, including the use of attention checks (Curran, 2016) and monitoring survey completion times (Leiner, 2019). Following data cleaning, the final sample consisted of $N = 1467$ participants at T1, $N = 1061$ at T2, and $N = 818$ at T3. For the sake of brevity, we present the characteristics of the T3 sample as our conceptual model was tested specifically among participants who provided data for all three waves. At T3, these workers were full-time employed adults ($M_{age} = 38.91$, $SD_{age} = 10.22$, 57.5% male, 78.5% white, $M_{tenure} =$

[3] See appendix for the descriptions.

[4] For an illustrative example of the application of Anderson and Gerbing's (1991) content validity procedure, see Mathieu et al. (2020) which served as the basis for our approach.

9.67, SD_{tenure} = 8.60). Respondents generally worked over 40 hours a week ($M_{hours/wk}$ = 42.11 $SD_{hours/wk}$ = 5.31) and held occupations across a wide array of U.S. industries—the three largest being education (17.2%), healthcare (13.6%), and technology (13.6%). Most of them (55.5%) worked non-management or non-supervisory positions, and the majority (58.8%) were employed in organizations with 500+ employees[5].

Measures

The initial pool of 60 HR practice perception items was derived mainly from three existing measures. Furthermore, we supplemented this list by reaching out to organizations directly and inquiring about their utilization of HR practices. Our main objective was to categorize existing HR practices (i.e., those already implemented by organizations) according to SDT principles. Subsequently, we used these categorizations to test our hypotheses based on SDT. While acknowledging that a comprehensive scale development study could have been a suitable approach, we acknowledge this as a limitation of our study (see Discussion). Nonetheless, our objective was twofold: first, to provide initial evidence of content validity for the widely held notion that HR practices align with basic psychological needs—a gap in the existing literature; and second, to establish an empirical foundation for mediation-based theorizing in HR research rooted in SDT. In testing the conceptual model, HR practice perceptions were collected only at T1 since we did not anticipate significant changes in HR practice perceptions during the 3-month duration of the study. However, all dependent variables were assessed at three time points.

Qualitative Phase: HR Practice Item Classification Task

High Performance HR Practices A set of 15 HR practices from Kehoe and Wright's (2013) measure were used. This measure captures HR practices that are designed to enhance performance (e.g., increased decision latitude).

High Commitment HR Practices A set of 23 HR practices from Kooij et al.'s (2014) measure were used. The HR practices capture four age-inclusive dimensions: development (e.g., regular training), maintenance (e.g., flexible working times), utilization (e.g., lateral job movement), and accommodative (e.g., reduced workload)[6].

Age-related HR practices A set of 6 HR practices from the Later Life Workplace Index (Wilckens et al., 2021) was used. Three items each were derived from two subscales: Health & Retirement Coverage (e.g., provides information about financial responsibility (e.g., money management, financial literacy, saving strategies)), and Health Management (e.g., promotes doing sports outside (e.g., company sports groups, cooperation with gym)).

Additional HR Practices A set of 16 additional HR practices were identified through contacting organizations. This was done to ensure that the content domains for autonomy-, competence-, and relatedness-supportive HR practices were saturated (e.g., Welcome orientation/party and onboarding perks)[7].

Quantitative Phase: Testing the Conceptual Model

Autonomy-, Competence-, and Relatedness-Supportive HR Practices We assessed HR practice perceptions at T1 using the same HR practice items/measures from the qualitative phase. Based on a CFA, our final measure used a set of 58 HR practice items classified according to SDT: autonomy-supportive (α = .80; 19 items—e.g., flexible work schedules), competence-supportive (α = .87; 22 items—e.g., promotion), and relatedness-supportive (α = .86; 17 items—e.g., reward systems encourage cooperation). Our stem was:

[5] We recognize that attrition may have biased our sample. To address potential bias due to attrition in our sample, an attrition analysis based on the guidelines of Goodman and Blum (1996) was conducted. The results indicated that several variables, including tenure, performance, turnover intentions, and relatedness HR, predicted participant departure. T-tests revealed minor but significant mean differences between Stayers and Leavers for some variables (e.g., ΔM for CA = 2.14, Turnover Intentions = -.15, Autonomy Need Satisfaction = .13). Importantly, regression analyses comparing partial and full samples demonstrated that the relationships among study variables remained consistent, indicating that selection bias does not undermine the interpretation of results or the substantive conclusions of this study (Goodman & Blum, 1996). Complete attrition analysis results as well as demographic characteristics for each wave are available from the first author.

[6] While acknowledging the availability of Boehm et al.'s (2014) age-inclusive practice measure as a potential option for our study, we chose to utilize Kooij et al.'s (2014) measure. The decision was based on several considerations. First, Kooij et al.'s measure offers a comprehensive list of specific HR practices that align with our research aims. Moreover, its descriptive nature allows for easy categorization into SDT categories, facilitating our analysis. In contrast, Boehm et al.'s measure combines both descriptive and evaluative text, posing challenges for item sorting (e.g., "offer training and education for managers on how to deal with an age-diverse work force and how to respond to the needs of different age groups?"). The integration of evaluative content within the measure hinders its adaptability for our purposes, as it is problematic in HR studies (Beijer et al., 2021). Hence, we opted for HR practice perception measures that primarily adopt a descriptive approach.

[7] While examining existing HR practice measures, we observed a lack of representation for HR practices related to relationship building, specifically those supportive of relatedness. To address this gap, we included additional HR practice items to rectify the issue and provide subject matter experts (SMEs) with a comprehensive set of practices to classify based on SDT.

"Here we've listed different HR practices that can be part of the HR policy of your company. Could you please indicate whether your company offers you these HR practices." Response options were 1 = yes, 2 = no, 3 = don't know. An additive index was used, which sums the total number of "yes" responses within a bundle to create a dichotomous (yes vs. no/don't know) variable. The ranges were 0-19, 0-22, and 0-17 for autonomy, competence, and relatedness dimensions, respectively.

Work-related Basic Need Satisfaction We assessed basic psychological need satisfaction at T1, T2, and T3 using the 16-item Work-related Basic Need Satisfaction scale (W-BNS; Van den Broeck et al., 2010). The stem is "The following statements aim to tap into your personal experiences at work", and there are three dimensions: Need for Autonomy (avg. α = .82; 6 items—e.g., I feel like I can be myself at my job), Need for Competence (avg. α = .88; 4 items—e.g., I feel competent at my job), and Need for Relatedness (avg. α = .91; 6 items—e.g., At work, I feel part of a group). The measure uses a 5-point response scale (1 = totally disagree, 5 = totally agree).

Autonomous Motivation[8] We assessed autonomous motivation at T1, T2, and T3 using a 5-item version of the autonomous motivation subscale (avg. α = .93) of the Multidimensional Work Motivation Scale (MWMS; Gagné et al., 2015), aligning with recommendations based on recent psychometric improvements made to the MWMS (Trépanier et al., 2023). Specifically, autonomous motivation is best operationalized as a unidimensional construct that combines two MWMS factors: identified regulation and intrinsic motivation (Trépanier et al., 2023). The stem is "Why do you or would you put efforts into your current job?"; a sample item for identified regulation is "Because putting efforts in this job has personal significance to me," and a sample item for intrinsic motivation is "Because the work I do is interesting." The measure uses a 7-point response scale (1 = not at all, 7 = completely).

Individual Performance We assessed individual performance at T1, T2, and T3 using the 3-item individual task proficiency subscale (avg. α = .90) of the Work Role Performance scale (Griffin et al., 2007). The stem is "Please rate how often you carried out the behavior over the past month", and a sample item is "Carried out the core parts of your job well." The measure uses a 5-point response scale (1 = very little, 5 = a great deal).

Thriving We assessed thriving at T1, T2, and T3 using a 10-item measure developed by Porath et al. (2012). Those who thrive "experience growth and momentum marked by both a sense of feeling energized and alive (vitality) and a sense that they are continually improving and getting better at what they do (learning)" (Porath et al., 2012, p. 250). Thriving consists of two factors that pertain to Learning (avg. α = .92; 5 items) and Vitality (avg. α = .92; 5 items). We opted to model these dimensions separately to investigate the unique impact autonomous motivation has on each component of thriving. This decision facilitates a clearer interpretation of results and aligns with the approach commonly used in the organizational sciences when examining thriving (refer to Kleine et al., 2019 for a meta-analysis on thriving). The stem is "At work, ...", and a sample item for the Learning subscale is "…I find myself learning often.", while a sample item for the Vitality subscale is "…I feel alive and vital." The measure uses a 7-point response scale (1 = strongly disagree, 7 = strongly agree).

Turnover Intentions We assessed turnover intentions at T1, T2, and T3 using a 3-item measure (avg. α = .88) from Hanisch and Hulin (1990). A sample item is "How often have you thought about leaving your job?". The measure uses a 4-point response scale (1 = never/almost never, 4 = often).

Affective Organizational Commitment We assessed affective organizational commitment at T1, T2, and T3 using an 8-item measure (avg. α = .92) by Allen and Meyer (1990). A sample item is "I would be very happy to spend the rest of my career with this organization." To reduce model complexity, we used a 3-item parcel for this measure (Little et al., 2002), aligning with a similar MSEM strategy used by Zhou et al. (2022). The measure uses a 7-point response scale (1 = strongly disagree, 7 = strongly agree).

Controls We controlled for chronological age, gender, tenure, and education.

[8] According to self-determination theory, work motivation is conceptualized as the reason "why" people put effort towards work (Deci & Ryan, 2000; Gagné & Deci, 2005). People have different reasons for working, and the reason "why" influences both the duration and intensity of their work efforts. SDT distinguishes between the quality and type of work motivation, placing different reasons on a continuum of self-regulatory processes. At the highest levels of work motivation, doing work because one finds it interesting or enjoyable (intrinsic motivation) or because work is personally important to them (identified regulation) means that the person is ***autonomously motivated*** since their efforts are not controlled by other people or their environment. Conversely, at lower levels of work motivation, doing work to receive an external reward or avoid punishments (external regulation), or doing work to avoid feeling guilty or ashamed (introjected regulation) means that a person has ***controlled motivation*** since they essentially need to be prodded to do their work. Basic psychological need satisfaction leads to autonomous motivation. When people are autonomously motivated, they are most likely to put the highest levels of sustained effort at work and have more positive work-related outcomes when compared to those who have controlled motivation (Gagné, 2018; Gagné & Deci, 2005).

Analytical Strategy

Classifying HR Practice Perceptions According to SDT

We used Fleiss' kappa to assess the inter-rater agreement among four independent raters and establish a "correct" category for each HR practice item prior to SME classifications. We evaluated the SME classifications based on suggestions of Anderson and Gerbing (1991), using content (substantive) validity indices. The first index is the *proportion of substantive agreement* (P_{sa}), which ranges from 0 to 1, with higher values indicating the percentage of SMEs who placed an item into the "correct" category. The second index is the *substantive-validity coefficient* (C_{sv}), which ranges from -1 to 1, with higher values suggesting greater content validity. A binomial test (i.e., a type of probability test) was used to determine the probability that SME classifications were by chance, so our final groupings of HR practices were based on item classifications deemed to be non-random. Items were re-classified if a significant number of SMEs chose an alternative category[9]. In our T1 worker sample, we conducted a CFA in Mplus 8.9 (Muthén & Muthen, 2017) using weighted least squares means and variance adjusted (WLSMV) estimation, which is recommended for a CFA with binary indicators (Beauducel & Herzberg, 2006). Moreover, items were dropped if factor loadings were < .40 (Beauducel & Wittmann, 2005). This procedure was repeated for our lifespan developmental-based supplemental HR scheme.

Multilevel Structural Equation Modeling (MSEM)

We tested our conceptual model and hypotheses with Mplus 8.9 (Muthén & Muthen, 2017), using the multilevel structural equation modeling (MSEM) framework of Preacher et al. (2010, 2011), which accounts for the nested structure of repeated observations using maximum likelihood (ML) estimation. This approach models between- and within-person variability simultaneously to provide more accurate estimates of path coefficients when compared to traditional (i.e., conflated/unconflated) multilevel modeling (MLM) techniques (Preacher et al., 2011). Given that our HR practice perception measures were only collected at T1, they solely reside at the between-person level; therefore, the indirect effects could only be assessed at the between-level of analysis (Preacher et al., 2010, 2011). Importantly, however, when core analyses are conducted at the between-level (as with this design), a within-level model *must* still be specified in order to generate accurate estimates of the between-level effects (Preacher et al., 2010, 2011)—thus, collecting multiple waves of data was still necessary as it allowed us to do a robust and comprehensive assessment of mediation. We allowed for random intercepts at both levels and used latent variables that were derived from continuous latent indicators. This means that at the between-level, for instance, each factor indicator had three waves of data, and the indicators were allowed to vary across cluster—further accounting for measurement error. Furthermore, an important consideration in our analysis is that according to Preacher et al. (2010, p. 215), when applying the general MSEM model to raw data, explicit centering is not required. Therefore, we only chose to grand-mean center HR practice perceptions and chronological age to facilitate the interpretation of interaction effects. Conversely, we kept all other focal variables in their original forms, as MSEM implicitly partitions them into latent between- and within-components (Preacher et al., 2010).

Considering our research focus on empirically establishing the complete mediational pathway of SDT within the HR domain (i.e., HR practices ➔ basic psychological need satisfaction ➔ motivation ➔ work outcomes), the strategic adoption of MSEM was especially important. This is because MSEM dramatically reduces bias in estimating indirect effects, particularly at the between-level, and it has been shown to have better confidence interval (CI) coverage than traditional MLM approaches (Preacher et al., 2011). To this end, based on the guidelines of Preacher et al. (2010, 2011) for estimating indirect effects in multilevel mediation, we used 20,000 parametric bootstraps and 90% CIs. Importantly, our approach aligns with recent studies that have recommended 90% CIs for multilevel mediation analysis (e.g., Taylor et al., 2019; Zhou et al., 2022). We tested all our hypotheses with and without controlling for chronological age, gender, education, and tenure, and the hypothesis testing results remained the same. For parsimony, we reported results without control variables and only included chronological age when testing for moderations.

Results

Table 1 shows the intraclass correlation coefficients (ICC), means, standard deviations, and correlations among all study variables both at Level 1 and Level 2. As shown in Table 1, the ICC_1 values ranged from .65 (performance) to .90 (affective organizational commitment), suggesting that 65% to 90% of the variance of our multi-wave variables resided between persons. Further, there were significant amounts of between- and within-person variance for all dependent variables, supporting the application of MSEM for stabilizing the interpretation of between-level effects.

[9] Our approach has similarities with Mathieu et al.'s (2020) use of the procedure, who used the *substantive-validity coefficient* (C_{sv}) for descriptive purposes. In practice, the goal of Anderson and Gerbing's (1991) procedure is to rule out false positives (i.e., items included that should not be in a factor) prior to a CFA.

Table 1 Means, ICCs, Standard Deviations, and Correlations Among Study Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Autonomy HR	9.49	3.73	-												
2. Competence HR	12.55	5.01	**.74**	-											
3. Relatedness HR	7.35	4.19	**.72**	**.76**	-										
4. CA	38.91	10.22	**-.09**	-.05	**-.08**	-									
5. Autonomy Need	3.34	0.82	**.39**	**.44**	**.30**	**.10**	.81/.93	**.17**	**.40**	**.35**	**.13**	**.21**	**.28**	**.47**	**-.29**
6. Competence Need	4.36	0.64	**.11**	**.16**	.06	**.21**	**.52**	.76/.90	**.17**	.06	**.24**	**.09**	**.13**	.05	-.03
7. Relatedness Need	3.57	1.00	**.32**	**.41**	**.29**	**.11**	**.75**	**.50**	.85/.94	**.26**	**.14**	**.17**	**.26**	**.52**	**-.14**
8. Autonomous Motivation	4.57	1.54	**.36**	**.43**	**.32**	**.14**	**.79**	**.48**	**.67**	.85/.94	**.13**	**.14**	**.21**	**.30**	**-.15**
9. Performance	4.34	0.69	**.09**	**.19**	**.08**	**.16**	**.46**	**.81**	**.43**	**.44**	.65/.85	**.11**	**.11**	**.12**	**-.12**
10. Thriving: Learning	5.26	1.30	**.40**	**.52**	**.36**	.05	**.66**	**.39**	**.60**	**.74**	**.41**	.70/.88	**.60**	**.27**	-.06
11. Thriving: Vitality	4.78	1.51	**.37**	**.46**	**.34**	**.14**	**.79**	**.55**	**.70**	**.82**	**.49**	**.77**	.79/.92	**.32**	-.07
12. Org Commitment	4.40	1.46	**.38**	**.47**	**.35**	**.15**	**.82**	**.47**	**.79**	**.79**	**.39**	**.71**	**.79**	.90/.96	**-.34**
13. Turnover Intentions	1.91	0.86	**-.27**	**-.35**	**-.24**	**-.13**	**-.70**	**-.32**	**-.53**	**-.57**	**-.32**	**-.55**	**-.61**	**-.75**	.83/.94

Note. Significance of bolded entries reflect $p < .05$. Level 1 (within-person) correlations are above the diagonal ($N = 2454$) and Level 2 (between-person) correlations are below the diagonal ($N = 818$). Intraclass correlation coefficients (ICC_1/ICC_2) are shown along the diagonal. Autonomy HR = autonomy-supportive HR practices; Competence HR = competence-supportive HR practices; Relatedness HR = relatedness-supportive HR practices; CA = chronological age; Autonomy Need = autonomy need satisfaction; Competence Need = competence need satisfaction; Relatedness Need = relatedness need satisfaction; Org Commit = affective organizational commitment

SDT Classifications of HR Practices

The initial classification results, based on data from four independent raters, provide support for the categorization of HR practices into three SDT categories. There was substantial agreement among the raters, indicated by a Fleiss' kappa coefficient of .64. The SMEs also largely agreed with the SDT classifications, with 87% of their classifications aligning with the original autonomy-, competence-, and relatedness-supportive categories. A total of eight re-classifications were made based on SME feedback. For comprehensive information regarding SME classifications, please refer to the Appendix Tables 7, 8, 9 and 10.

Tables 2, 3 and 4 present the combined classifications of SDT and age-inclusive (lifespan developmental need-based) frameworks, showcasing the intersection between the two motivational schemes. In this design, the primary classification system is based on SDT, while the supplemental scheme focuses on age-inclusivity[10]. Table 2 displays the characteristics of autonomy-supportive practices, which encompass features such as flexible schedules and the option to work remotely. Competence-supportive practices, as shown in Table 3, encompass elements like promotion schemes and performance appraisal systems. Lastly, Table 4 presents the features of relatedness-supportive practices, which may involve team-based work and reward systems that foster cooperation.

Based on a CFA, two HR practices were dropped due having factor loadings < .40. These were "working part time" from the autonomy-supportive subscale (Table 2), and "demotion (to a lower level job)" from the competence-supportive practice subscale (Table 3). As seen in Tables 2, 3 and 4, the factor loadings were strong for the final 58-item SDT-based HR practice scales, ranging from .41 - .76 for autonomy-, .44 - .82 for competence-, and .47 - .83 for relatedness-supportive practices. The fit indices were: $\chi^2(1592) = 10206.08$, <.001, CFI/TLI = .82/.82, RMSEA = 0.06, SRMR = 0.10.

Multilevel Confirmatory Factory Analysis

We conducted a multilevel CFA to confirm the factor structure of our dependent variables (i.e., three aspects of work-related basic need satisfaction, autonomous motivation, individual performance, affective organizational commitment, turnover intentions, and two aspects of thriving). We fit a 9-factor model at both the between and within levels, which fit our data well: $\chi^2(1408) = 5320.32$, $p < .001$, CFI/TLI = .91/.91, RMSEA = .034, $SRMR_{Between} = .07$, $SRMR_{Within} = .04$. We additionally fit a measurement model which included autonomy-, competence-, and relatedness-supportive HR practice scales and chronological age at the between-person level. This fit the data well, $\chi^2(1532) = 5659.94$, p

[10] The age-inclusive scheme demonstrated a moderate level of agreement with a Fleiss' kappa of .43, indicating that the SDT classifications served as the appropriate primary classification system. Furthermore, the majority (88%) of SME classifications aligned with the "correct" categories within the age-inclusive scheme.

Table 2 Final Set of Autonomy-Supportive HR Practices (20 items)

Item	Autonomy-Supportive HR Practices	Age-Inclusive Classification	Factor Loadings
57	Provides information about financial responsibility (e.g., money management, financial literacy, saving strategies)	Maintenance	.76
56	Provides retirement planning information (e.g., website, trainings, brochures, info sessions)	Maintenance	.69
23	Participation in decision-making about work	Developmental	.63
55	Comprehensive opportunities to save for retirement through organization.	Maintenance	.63
21	Reduced Workload	Accommodative	.62
27	Employees have a complaint process for addressing job issues	Maintenance	.61
8	Semi-retirement ("part time early retirement")	Accommodative	.61
35	Employees in the job are allowed to make important work-related decisions such as how the work is done or implement new ideas.	Developmental	.60
5	Additional Leave	Accommodative	.60
11	Flexible benefits (e.g., possibility to buy or sell vacation days)	Accommodative	.58
40	Maternity and Parental Leave	Accommodative	.58
32	In the last 4 months, the company has made a change in how work is completed in a department based on the suggestion(s) of an employee or group of employees.	Utilization	.55
19	Lateral job movement	Utilization	.53
7	Early Retirement	Accommodative	.52
3	Flexible work schedules (start and end times)	Accommodative	.49
9	Sabbatical or long term career break (prolonged career interruption)	Accommodative	.47
4	Working from home	Accommodative	.44
6	Exemption from shift work or working overtime	Accommodative	.43
2	Compressed work week (e.g., 4 days of 9 hours)	Accommodative	.41
1	*Working part-time**	*Accommodative**	.33*

Note. *= dropped in quantitative phase due to low factor loading. Final version of subscale uses 19 items. Items 1-23 are from Kooij et al. (2014); Items 24-38 are from Kehoe and Wright (2013); Items 39-54 are primarily from organizations; Items 55-60 are adapted from Wilckens et al. (2021)

< .001, CFI/TLI = .91/.90; RMSEA = .033; $SRMR_{Between}$ = .061; $SRMR_{Within}$ = .038.[11]

Hypothesis Testing

Table 5 and Fig. 2 show the standardized regression coefficients for our conceptual model. For parsimony, we summarize the between-level effects. As shown in Table 5 and Fig. 2, autonomy-supportive HR practices had a significant positive effect on autonomy need satisfaction at work (β = .20, p < .001), while competence-support HR practices had a significant positive effect on all three basic psychological needs (autonomy, β = .41, p < .001; competence, β = .24, p < .001; relatedness, β = .42 p < .001). Counterintuitively, however, relatedness-supportive HR practices had a significant negative effect on autonomy (β = -.12, p < .05) and competence (β = -.16, p < .01) need satisfaction at work. Thus, Hypothesis 1 had mixed support. Regression diagnostics revealed that multicollinearity[12] was not a major concern, suggesting that the mixed results should be interpreted in the context of theory (Arah, 2008). Table 6 shows that all

[11] We also conducted longitudinal measurement invariance tests based on the guidelines of Vandenberg and Lance (2000). These are tests available from the first author, but to summarize, there was scalar invariance across all constructs—indicating that factor structures, loadings, and intercepts were invariant over time.

[12] We acknowledge that multicollinearity may be an issue when predictors are highly correlated. This may result in a 'reversal paradox' (e.g., suppression), where the signs of coefficients change as a function of predictors in a model (Akinwande et al., 2015; Tu et al., 2008). Given that relatedness-supportive HR practices had a positive effect on need satisfaction variables which then turned negative in the presence of autonomy- and competence-supportive HR practices, regression diagnostics were conducted to assess for multicollinearity. When using autonomy-, competence-, and relatedness-supportive HR practices as predictors, the variance inflation factors (VIFs) ranged from 2.5 to 2.9 across all dependent variable models. Therefore, multicollinearity (or suppression) is not a major concern due to the VIF values being below the standard cutoff of 10.0 (Hair et al., 1992) and lower than the more conservative threshold of 5.0 (Akinwande et al., 2015). For this reason, the negative effects of relatedness-supportive practices appear to be nonspurious.

Table 3 Final Set of Competence-Supportive HR Practices (23 items)

Item	Competence-Supportive HR Practices	Age-Inclusive Classification	Factor Loadings
14	Career planning	Developmental	.82
15	Continuous on-the-job development	Developmental	.79
58	Promotes eating healthy foods (e.g., through incentive programs or providing opportunities)	Maintenance	.77
16	Regular training	Developmental	.77
34	Qualified employees have the opportunity to be promoted to positions of greater pay and/or responsibility within the company.	Developmental	.76
38	Formal training each year.	Developmental	.75
30	Formal performance evaluations that occur at least once per year.	Developmental	.74
13	Performance appraisal (once a year)	Developmental	.74
20	Task enrichment (for example with a mentor role)	Developmental	.74
18	Promotion	Developmental	.71
31	Employees regularly receive formal communication regarding company goals and objectives.	Maintenance	.67
53	Equitable workload assignment	Maintenance	.66
29	Job provides opportunity to earn individual bonuses (or commissions) for productivity, performance, or other individual performance outcomes.	Developmental	.62
12	Good working conditions /Ergonomic adjustment	Maintenance	.61
33	Pay raises based on job performance.	Developmental	.61
10	Pay related to individual performance	Developmental	.60
22	Second career in the company (and so retraining)	Developmental	.58
36	The company hires only the very best people for this job.	Developmental	.56
43	Education reimbursement/discount	Developmental	.55
37	Total pay for this job is the highest for the type of work in the area.	Developmental	.45
25	Structured interviews (job related questions, same questions asked for all applicants) before hiring new employees	Maintenance	.45
24	Formal testing (e.g., paper and pencil or work sample) before hiring new employees	Maintenance	.44
17	*Demotion (to a lower level job)**	*Accommodative**	*.33**

Note. *= dropped in quantitative phase due to low factor loading. Final version of subscale uses 22 items. Items 1-23 are from Kooij et al. (2014); Items 24-38 are from Kehoe and Wright (2013); Items 39-54 are primarily from organizations; Items 55-60 are adapted from Wilckens et al. (2021)

significant pathways in our conceptual model represented a significant indirect effect because 90% CIs did not include zero. Specifically, as seen in Table 6, we observed significant indirect effects of autonomy-, competence-, and relatedness-supportive practices on all work outcomes—individual performance, affective organizational commitment, two types of thriving, and turnover intentions—via work-related basic need satisfaction and autonomous motivation. Thus, Hypothesis 2 was fully supported.

Table 5 and Fig. 2 also show a significant moderation effect. Chronological age significantly moderated the effect of relatedness-supportive practices on autonomy need satisfaction at work ($\beta = -.11$, $p < .05$). Simple slope analyses suggest that the effect of relatedness-supportive practices on work-related autonomy need satisfaction is significant and negative when chronological age is high (slope = -.042, $p < .001$), but not significant for those with a low chronological age (slope = -.001, $p = .92$). Figure 3 shows this pattern. Taken together, Hypothesis 3 was not supported. When examining the conditional indirect effect of relatedness-supportive practices on all work outcomes, mediated through autonomy need satisfaction and autonomous motivation, we found significant and negative simple slope effects for individuals with high chronological age, but not for those with low chronological age.

Table 4 Final Set of Relatedness-Supportive HR Practices (17 items)

Item	Relatedness-Supportive HR Practices	Age-Inclusive Classification	Factor Loadings
60	Promotes healthy behaviors (e.g., flyers, health-related training, emails)	Maintenance	.83
51	Reward systems encourage cooperation	Developmental	.79
59	Promotes doing sports outside of work (e.g., company sports groups, cooperation with gym)	Maintenance	.78
46	Welcome orientation/party and onboarding perks	Maintenance	.70
52	Activities such as 'family days'	Maintenance	.70
47	Extensive employee assistance program (e.g. confidential 24/7 support for work and personal life)	Maintenance	.69
26	Employees in the job are involved in formal participation processes such as quality improvement groups, problem solving groups, or roundtable discussions.	Developmental	.68
48	Third-party managed workplace (e.g., resting area/common place where employees are encourage to spend their breaks instead of using their workstation)	Maintenance	.67
39	Diversity management	Maintenance	.66
28	Job provides opportunity to earn group bonuses for productivity, performance, or other group performance outcomes.	Developmental	.65
42	Built-in counseling service	Maintenance	.65
44	Working in teams	Utilization	.60
45	Group discount rates for employees to do activities	Maintenance	.59
41	Adoption Assistance Program	Maintenance	.58
54	Equal job security	Maintenance	.58
49	Open spaces at work	Utilization	.55
50	Perks like free breakfast and food at work	Maintenance	.47

Note. Items 1-23 are from Kooij et al. (2014); Items 24-38 are from Kehoe and Wright (2013); Items 39-54 are primarily from organizations; Items 55-60 are adapted from Wilkens et al. (2021)

Supplementary Analyses[13]

Supplementary analyses were conducted to distinguish autonomy-, competence-, and relatedness-supportive HR practices from other HR scales. These are available in the Appendix Tables 7, 8, 9 and 10, but to summarize, a dominance analysis (Budescu, 1993; Laguerre, 2021) showed that the SDT-based HR schemes made comparable and distinct variance contributions to autonomy, competence, and relatedness need satisfaction at work when compared to high commitment and high performance HR practice scales.

Discussion

The present study sought to empirically establish the complete SDT mediational process in the HR practice literature. We accomplished this through assessing basic psychological needs alongside motivation as mediators of the relationship between HR practice perceptions and work outcomes. To our knowledge, this study represents the first attempt to: a) classify HR practices based on their ability to support basic psychological needs, b) empirically examine the impact of these practices on work-related basic psychological need satisfaction, motivation, and subsequent work outcomes—individual performance, affective organizational commitment, turnover intentions, and thriving, and c) systematically explore the moderating role of chronological age in the SDT processes that link HR practice perceptions to work outcomes. The study hypotheses were examined using a large longitudinal sample of employees from diverse job sectors and industries in the United States. Further, to test our hypotheses, we employed

[13] Comparing autonomy-, competence-, and relatedness-supportive HR scales with high commitment and high performance HR practice scales, we found that high performance practices explained the largest proportion of unique variance in autonomy (34.5% of R^2 =.22) and competence (48.3% of R^2 =.05) need satisfaction at work. Competence-supportive practices accounted for the second-highest proportion of unique variance for these needs at 24.7% and 21.2%, respectively. Regarding relatedness need satisfaction, competence-supportive practices explained the most unique variance (37.3% of R^2 =.17), followed by high performance practices (19.8% of R^2 =.17). Importantly, when considering the SDT-based schemes as a comprehensive HR system, autonomy-, competence-, and relatedness-supportive practices collectively accounted for the majority of unique variance in autonomy (51.8% of R^2 =.22) and relatedness (61.3% of R^2 = .17) need satisfaction at work, as well as a sizeable proportion of unique variance in competence (44.0% of R^2 = .05) need satisfaction. Further details can be found in the Appendix Tables 7, 8, 9 and 10.

Table 5 Multilevel Structural Equation Modeling (MSEM) Path Analysis Results

	Autonomy Need	Competence Need	Relatedness Need	Autonomous Motivation	Performance	Thriving: Learning	Thriving: Vitality	Org Commit	Turnover Intentions
Variables	β *(SE)*	β *(SE)*	β *(SE)*	β *(SE)*	β *(SE)*	β *(SE)*	β *(SE)*	β *(SE)*	β *(SE)*
Level 2 Predictors									
Autonomy HR	.20 (.05)***	.07 (.05)	.07 (.05)						
Competence HR	.41 (.06)***	.24 (.06)***	.42 (.06)***						
Relatedness HR	-.12(.05)*	-.16 (04)**	-.08 (.05)						
Autonomy Need				.67 (.06)***					
Competence Need				.08 (.04)*					
Relatedness Need				.16 (.06)**					
Autonomous Motivation					.46 (.04)***	.75 (.02)***	.84 (.02)***	.82 (.02)***	-.58 (.04)***
CA	.14 (.03)***	.22 (.03)***	.13 (.03)***						
CAxAutonomy HR	.05 (.05)	.09 (.05)	.02 (.06)						
CAxCompetence HR	.06 (.05)	-.08 (.05)	.05 (.05)						
CAxRelatedness HR	-.11 (05)*	-.07 (.05)	-.09 (.05)						
Level 1 Predictors									
Autonomy Need				.28 (.07)***					
Competence Need				-.02 (.05)					
Relatedness Need				.16 (.05)**					
Autonomous Motivation					.12 (.04)**	.15 (.03)***	.21 (.04)***	.30 (.05)***	-.16 (.05)**

Note. Level 2 $N = 818$, Level 1 $N = 2454$, * $p < .05$, ** $p < .01$, *** $p < .001$, Autonomy HR = autonomy-supportive HR practices; Competence HR = competence-supportive HR practices; Relatedness HR = relatedness-supportive HR practices; Autonomy Need = autonomy need satisfaction; Competence Need = competence need satisfaction; Relatedness Need = relatedness need satisfaction; Org Commit = affective organizational commitment; CA = chronological age

multilevel structural equation modeling (MSEM), which is known for its ability to accurately estimate indirect effects (Preacher et al., 2010, 2011). We based our design on the work of prominent SDT scholars in the organizational sciences (e.g., Gagné, 2018; Gagné & Deci, 2005; Van den Broeck et al., 2016) and responded to SDT-scholar calls to more deeply understand the motivational potential of HR practices. Additionally, the present study integrated SDT with lifespan developmental theories of motivation to elucidate how need-supportive HR practices benefit people of all ages. In sum, this study contributes to a clearer and more nuanced understanding of the role of SDT in HR research, facilitating more thoughtful and comprehensive theoretical developments in this domain.

Research Implications

Our study contributes to the existing literature in several ways. First, our findings provide empirical support for the well-established notion that HR practices have a generally positive impact on work outcomes such as performance, thriving, organizational commitment, and turnover intentions (Batt, 2002; Boehm et al., 2014; Gagné, 2018; Gardner et al., 2011; Hong et al., 2016; Jiang et al., 2012; Kehoe & Wright, 2013; Ng & Feldman, 2015). Going beyond prior findings, we demonstrate that these effects are mediated by SDT motivational processes, specifically basic psychological need satisfaction and autonomous motivation. Our results are consistent with previous research in the organizational sciences that emphasizes the role of SDT in understanding

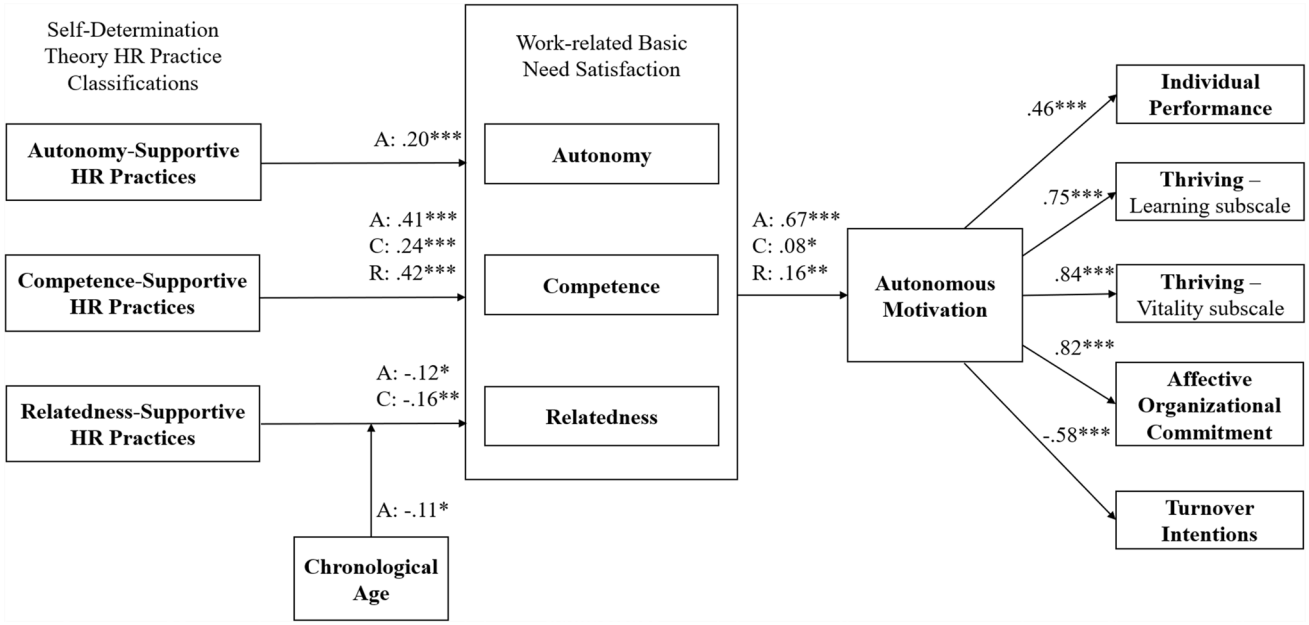

Fig. 2 Multilevel Structural Equation Modeling Path Model Results. Level 1 and non-significant effects are omitted for parsimony. *Note*. A: Autonomy, C: Competence, R: Relatedness. Coefficients are standardized. All indirect effects significant at 90% and 95% CI. * = $p < .05$; ** = $p < .01$; *** = $p < .001$

motivation (Deci et al., 2017; Gagné, 2018) and address a gap in the literature regarding the mechanisms through which HR practices influence motivation (Jiang et al., 2012; Van den Broeck et al., 2019). By conducting a systematic assessment of mediation, we provide empirical confirmation of mediation effects and address the gaps in the understanding of SDT pathways within the HR domain. It is noteworthy that despite the extensive use of SDT principles to infer motivational impact in the HR literature over the past two decades, the empirical establishment of this benchmark has been lacking. Our findings fill this void and contribute to a more robust and evidence-based understanding of the mediating mechanisms associated with SDT in the HR context.

Second, our findings on the differential effects of HR practice perceptions on basic psychological need satisfaction contribute to the limited understanding of boundary conditions for SDT within the HR domain. Specifically, we found that autonomy-supportive practices had a positive association with autonomy need satisfaction, while competence-supportive practices have positive associations with all three needs. However, an unexpected finding emerged, revealing that relatedness-supportive practices had a detrimental impact on autonomy and competence need satisfaction at work, and this was not primarily explained by multicollinearity. While our overall results align with previous literature demonstrating positive associations between HR practice perceptions and work outcomes, our mixed results concerning psychological needs coincide with the only prior study examining HR practice perceptions and basic psychological needs (Marescaux et al., 2013). Specifically, Marescaux et al. (2013) investigated the influence of five HR practices on basic psychological needs, including career development, training, mentoring, direct employee participation, and developmental appraisal. Their results showed significant negative associations between mentoring, direct employee participation, and training with competence need satisfaction. Notably, these associations became non-significant or significantly positive when implementation quality was high. Drawing from these findings, it is possible that relatedness-supportive practices may be perceived as invasive or undermining autonomy and competence needs at work when implementation quality is poor. Further research should consider factors such as HR practice implementation quality (Laguerre, 2022; Piening et al., 2014) and employees' perceptions regarding the underlying purpose of HR policies (e.g., control-oriented intentions; Nishii et al., 2008) to gain a better understanding of when HR practices may be negatively associated with specific basic psychological needs.

Third, when examining the moderating effects of chronological age, we found significant main effects of age, indicating that older workers tended to report higher levels of autonomy, competence, and relatedness need satisfaction in the workplace. This aligns with previous meta-analytical evidence demonstrating that older workers generally experience higher levels of autonomy and competence need satisfaction (Van den Broeck et al., 2016). Further, our moderation analyses revealed relatedness-supportive

Table 6 Summary of Fig. 2 Indirect and Conditional Indirect Effects (20,000 bootstraps)

Indirect and Conditional Indirect Effects	90% CI[a]		
	Estimate	LL	UL
Autonomy HR --> Autonomy Need --> Motivation --> Performance	.0092	.0050	.0141
Autonomy HR --> Autonomy Need --> Motivation --> Thriving: Learning	.0316	.0171	.0474
Autonomy HR --> Autonomy Need --> Motivation --> Thriving: Vitality	.0414	.0223	.0623
Autonomy HR --> Autonomy Need --> Motivation --> Org Commit	.0395	.0215	.0590
Autonomy HR --> Autonomy Need --> Motivation --> Turnover	-.0175	-.0265	-.0093
Competence HR --> Autonomy Need --> Motivation --> Performance	.0143	.0100	.0192
Competence HR --> Competence Need --> Motivation --> Performance	.0010	.0001	.0020
Competence HR --> Relatedness Need --> Motivation --> Performance	.0035	.0015	.0059
Competence HR --> Autonomy Need --> Motivation --> Thriving: Learning	.0492	.0351	.0647
Competence HR --> Competence Need --> Motivation --> Thriving: Learning	.0033	.0005	.0068
Competence HR --> Relatedness Need --> Motivation --> Thriving: Learning	.0122	.0051	.0201
Competence HR --> Autonomy Need --> Motivation --> Thriving: Vitality	.0643	.0461	.0843
Competence HR --> Competence Need --> Motivation --> Thriving: Vitality	.0043	.0006	.0088
Competence HR --> Relatedness Need --> Motivation --> Thriving: Vitality	.0158	.0066	.0262
Competence HR --> Autonomy Need --> Motivation --> Org Commit	.0613	.0438	.0804
Competence HR --> Competence Need --> Motivation --> Org Commit	.0041	.0006	.0085
Competence HR --> Relatedness Need --> Motivation --> Org Commit	.0152	.0063	.0249
Competence HR --> Autonomy Need --> Motivation --> Turnover	-.0272	-.0366	-.0190
Competence HR --> Competence Need --> Motivation --> Turnover	-.0018	-.0037	-.0003
Competence HR --> Relatedness Need --> Motivation --> Turnover	-.0067	-.0113	-.0028
Relatedness HR --> Autonomy Need --> Motivation --> Performance	-.0051	-.0091	-.0015
Relatedness HR --> Competence Need --> Motivation --> Performance	-.0008	-.0017	-.0001
Relatedness HR --> Autonomy Need --> Motivation --> Thriving: Learning	-.0174	-.0308	-.0049
Relatedness HR --> Competence Need --> Motivation --> Thriving: Learning	-.0027	-.0057	-.0003
Relatedness HR --> Autonomy Need --> Motivation --> Thriving: Vitality	-.0229	-.0403	-.0067
Relatedness HR --> Competence Need --> Motivation --> Thriving: Vitality	-.0035	-.0075	-.0004
Relatedness HR --> Autonomy Need --> Motivation --> Org Commit	-.0218	-.0384	-.0062
Relatedness HR --> Competence Need --> Motivation --> Org Commit	-.0033	-.0071	-.0004
Relatedness HR --> Autonomy Need --> Motivation --> Turnover	.0097	.0028	.0172
Relatedness HR --> Competence Need --> Motivation --> Turnover	.0015	.0002	.0032
Relatedness HRxCA --> Autonomy Need --> Motivation --> Performance	*-.0005*	*-.0009*	*-.0001*
Relatedness HRxCA --> Autonomy Need --> Motivation --> Thriving: Learning	*-.0016*	*-.0031*	*-.0003*
Relatedness HRxCA --> Autonomy Need --> Motivation --> Thriving: Vitality	*-.0022*	*-.0041*	*-.0004*
Relatedness HRxCA --> Autonomy Need --> Motivation --> Org Commit	*-.0021*	*-.0039*	*-.0004*
Relatedness HRxCA --> Autonomy Need --> Motivation --> Turnover	*.0009*	*.0002*	*.0017*

Note. Conditional indirect effects are *italicized.* CI = confidence interval; Autonomy HR = autonomy-supportive HR practices; Competence HR = competence-supportive HR practices; Relatedness HR = relatedness-supportive HR practices; Autonomy Need = autonomy need satisfaction; Competence Need = competence need satisfaction; Relatedness Need = relatedness need satisfaction; Motivation = autonomous motivation; Org Commit = affective organizational commitment; Turnover = turnover intentions; CA = chronological age

[a] The indirect and conditional indirect effects were also significant at 95% CI

practices had a significantly stronger detrimental effect on the autonomy need satisfaction of older workers. This finding may be explained by the selection, optimization, and compensation theory (SOC; Baltes & Baltes, 1990), which proposes that individuals adapt to functional losses associated with aging by developing strategies to perform job tasks effectively. Previous research has highlighted the role of autonomy in facilitating the use of such strategies (Rudolph, 2016). It is plausible that HR systems containing numerous non-performance-related practices restrict the freedom of older workers, impacting their ability to exercise discretion in carrying out their job tasks.

Further elaborating on the nature of our interaction effect: Figure 1 showed that older workers experienced

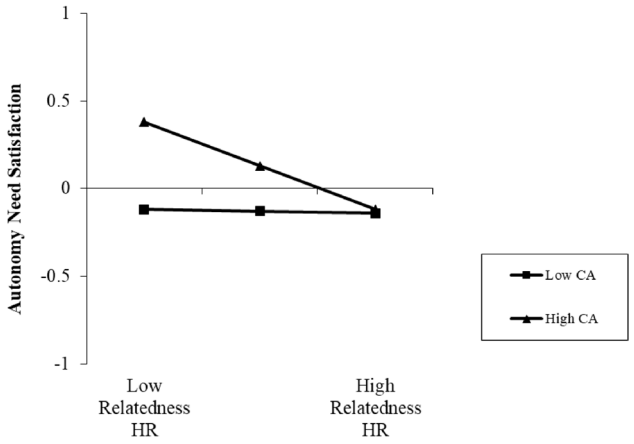

Fig. 3 The Moderating Effect of Chronological Age on the Relationship Between Relatedness-Supportive HR Practices and Autonomy Need Satisfaction at Work. *Note.* Relatedness HR = Relatedness-supportive HR practices; CA = chronological age. Values based on standardized regression coefficients: +/- 1 standard deviation

higher autonomy need satisfaction when relatedness-supportive HR practices were *low*—faring better than younger workers. However, this pattern changed when relatedness-supportive HR practices were high, leading to a decline in autonomy need satisfaction among older workers, mirroring the levels observed in younger workers. Considering that SOC strategy use involves dedicating *additional* time, energy, and effort to optimize performance (Baltes & Baltes, 1990), prioritizing the *removal* of barriers to autonomy—such as reducing relatedness-supportive HR practices—should be a key consideration for older employees. This adjustment is pivotal as it suggests that older workers are better positioned to leverage autonomy when the HR system is saturated with autonomy- and competence-supportive practices—indicating their responsiveness to organizational cues in managing their time effectively. To explore this idea further and overcome some of the measurement and methodological constraints of our study, future research should explore the dynamics between age, relatedness-supportive HR practices, and autonomy need satisfaction using qualitative methods. For instance, employee-based semi-structured interviews could provide valuable insights into the subjective experiences and perceptions of older workers regarding autonomy and the seemingly counterproductive influence of relatedness-supportive HR practices.

Overall, our results are consistent with the findings of Pak et al. (2021), who found that developmental HR practices were positively associated with perceived work ability, while non-developmental HR practices (maintenance, utilization, and accommodative) were negatively associated with perceived work ability. In our supplemental SME classification, relatedness-supportive practices consisted of non-developmental age-inclusive categories, while competence-supportive practices were primarily developmental in nature. Thus, our findings are consistent with the existing literature showing both positive and negative HR practice effects (Pak et al., 2021).

Reevaluating the Significance of SDT in Prominent HR Studies

In the earlier sections of this paper, we discussed three influential HR studies that yielded different results regarding the support for SDT theorizing - one study found support (e.g., Gardner et al., 2011), another found no support (e.g., Hong et al., 2016), and a third found mixed support (e.g., Ng & Feldman, 2015). This diversity of findings highlights a prevailing trend in the HR literature. However, a key concern we identified is that these studies did not measure basic psychological needs in conjunction with motivation, which has hindered the comprehensive understanding and advancement of SDT within the HR domain. Our research addresses this gap and provides valuable insights that contribute significantly to the understanding of the relationships between HR practices, basic psychological needs, and motivation. In light of our findings, we re-examine these earlier papers to demonstrate the unique contributions of our work to the existing body of literature.

Example HR Study 1 Revisited: Support for SDT

In the case of our first example study by Gardner et al. (2011), which found support for SDT theorizing, we can analyze their HR practice items and compare them to the 58-items used in our own study. By doing so, we can infer the probable SDT pathways through which aggregate turnover is impacted. Gardner et al.'s (2011) HR items related to motivation, empowerment, and skill-enhancement practices primarily align with being competence-supportive. For instance, a sample item from their study, "Employees in this job have the opportunity to earn individual bonuses (or commissions) for productivity, performance, or other individual-performance outcomes," overlaps with one from our research (Gardner et al., 2011, p. 331). Based on our empirical data, we can deduce that the likely SDT pathways for Gardner et al.'s (2011) HR schemes involve satisfying all three basic psychological needs and increasing autonomous motivation, leading to reduced aggregate turnover.

Example HR Study 2 Revisited: Failure to Support SDT

In the context of the second example study conducted by Hong et al. (2016), where they found no support for SDT

theorizing on the relationship between initiative-enhancing HR practices and personal initiative, a comparison of their HR items with ours sheds light on the potential reasons for the lack of support. Hong et al.'s (2016) initiative-enhancing practices encompass HR strategies that emphasize forward-looking, independent thinking, self-starting, and persistence (p. 701). These practices align more closely with being autonomy-supportive when considered in the context of our SDT-based HR conceptualizations. Drawing from our study, it is plausible to infer that the probable SDT pathway from initiative-enhancing HR practices to personal initiative involves autonomy need satisfaction and autonomous motivation. However, Hong et al.'s (2016) HR system, centered around fostering personal initiative at work, lacks a strong focus on supporting and rewarding acquired competencies. As a result, it is possible that only one of the three basic psychological needs—autonomy needs—was adequately satisfied, limiting workers' intrinsic motivation to take personal initiative.

Example HR Study 3 Revisited: Mixed Support for SDT

In the case of the third study conducted by Ng and Feldman (2015), which provided mixed support for SDT theorizing while evaluating the moderating effects of age between job autonomy and work outcomes, we find that job autonomy aligns with our SDT conceptualization of autonomy-supportive practices. Based on our study, it is plausible to infer that job autonomy primarily influences work outcomes through autonomy need satisfaction and autonomous motivation, and job autonomy should equally satisfy the autonomy needs of both older and younger workers. Furthermore, considering that Ng and Feldman (2015) observed varying relationships between job autonomy and work outcomes for older workers, our study proposes that older workers may be more susceptible to feeling their autonomy needs are being frustrated compared to younger workers. This insight could provide a plausible explanation for the mixed results in Ng and Feldman's (2015) study. As such, our research directly addresses their call to investigate the interplay of chronological age and basic psychological needs.

Practical Implications

How HR Systems Maximize Human Capital Across the Lifespan through Supporting Basic Psychological Needs and Lifespan Developmental Needs

Building on our understanding of how HR practices motivate employees at work, we pivot to their impact on supporting retention amidst the challenges posed by biological decline inherent to aging. Our integration of the lifespan developmental perspective not only provides a deeper understanding of SDT but also marks the first empirical study to showcase the intersection between basic psychological needs and lifespan developmental needs. In what follows, we present key insights derived from integrating these two perspectives.

Highlighting the Developmental Focus of Competence-Supportive HR Practices The main practical contribution of our study lies in assessing the impact of competence-supportive HR practices. A dominance analysis revealed that competence-supportive practices had the strongest predictive power for all three basic psychological needs compared to autonomy- and relatedness-supportive practices. Competence-supportive HR practices were the only scheme to show a significant indirect effect on all work outcomes—individual performance, affective organizational commitment, turnover intentions, and thriving—through all indirect pathways, encompassing basic psychological needs and autonomous motivation.

Among the 22 competence-supportive practices outlined in Table 3, a substantial majority (72.7%) were identified as developmental, aligning with the lifespan developmental need for growth, while the remaining practices were classified as maintenance-oriented. These HR practices serve a dual function from a workforce retention standpoint, enhancing individuals' abilities to meet job demands as they age while offsetting age-related declines. Our lack of interactive effects between chronological age and competence-supportive practices suggests that prioritizing the development of workers and their competencies holds equal importance across age groups. This importance of developing all age groups holds true even when considering that older workers may sometimes perform worse than younger ones when offered developmental opportunities like training (Davenport et al., 2022). Consequently, organizations should communicate a clear message of growth orientation to employees of all ages to maximize motivation and retention efforts (Boehm et al., 2021), especially since age does not affect core task performance (Ng & Feldman, 2008).

Highlighting the Predominantly Accommodative Nature of Autonomy-Supportive HR Practices It is crucial not only to prioritize development but also to embrace autonomy-supportive practices from a lifespan developmental standpoint. This sentiment aligns with the understanding that organizations must not only foster development (gains) but also recognize and support individuals coping with psychophysiological declines (losses), as "no developmental change during the life course is pure gain" (Baltes, 1987, p. 616).

Among the 19 autonomy-supportive practices (Table 2), the majority (57.9%) were identified as accommodative, reflecting the lifespan developmental need to regulate losses.

The remainder comprised maintenance (21.1%), utilization (10.5%), and developmental (10.5%) practices. Autonomy-supportive practices not only offer freedom of choice, but they emerge as an effective means to support those who need to function at lower levels due to age-related declines. The importance of this overlap cannot be overstated for two key reasons: first, autonomy is a fundamental aspect of autonomous motivation (Deci & Ryan, 2000) as well as SOC strategy use (Rudolph, 2016); second, as individuals age, external environmental factors play an increasingly pivotal role in their success, with losses in adaptive capacity outweighing gains (Baltes, 1987; Baltes et al., 1999). Combined, this underscores that autonomy-supportive practices offer the best prospects for older workers to be *motivated* to successfully regulate losses and maintain their presence in the workforce. Since the SDT-based schemes are inherently age-inclusive (or age-neutral), they avoid stigmatizing older workers grappling with loss regulation. While older employees appreciate accommodations, it is crucial to ensure they feel included rather than singled out and stigmatized (Hennekam & Herrbach, 2015). Therefore, making autonomy-supportive practices universally available allows for loss regulation accommodations in a manner that avoids singling out and stigmatizing older workers.

Not All Non-Developmental Practices are Bad Among the 17 relatedness-supportive practices (Table 4), we identified that a large majority (70.6%) were maintenance-oriented, with the remaining practices being developmental (17.6%) and utilization-oriented (11.8%). In our study, we observed that autonomy- and relatedness-supportive practices were both primarily non-developmental, and competence-supportive practices were nearly a quarter non-developmental. While Pak et al. (2021) recommends that organizations offer developmental practices instead of accommodative, utilization, and maintenance ones, our study introduces insights that provide boundary conditions to this perspective—beyond waiting for older workers to face problems at work before offering non-developmental practices.

Autonomy- and competence-supportive practices demonstrated a positive influence on basic psychological needs, while relatedness-supportive practices exhibited a negative influence on basic psychological needs. This observation underscores that certain types of non-developmental practices can be acceptable, especially when they align with being autonomy- and competence-supportive—providing insights into when practices that cater to lifespan needs will be most beneficial. Although age-inclusive human resource management (HRM) is a nascent field of research (Boehm et al., 2021; Kooij et al., 2014; Pak et al., 2021), our study contributes not only to the discourse on developmental practices (Boehm et al., 2021) but also sheds light on the intricate interplay between non-developmental practices and specific psychological needs. This understanding is crucial for organizations seeking a balanced approach to supporting employees' autonomy, competence, and relatedness needs, while implementing practices that effectively cater to their lifespan developmental needs.

Summary Organizations optimize human capital by employing HR systems that positively influence basic psychological needs through autonomy- and competence-supportive practices. Simultaneously, these systems largely address individuals' lifespan developmental needs for growth and the regulation of age-related losses—fostering longevity and retention. The outcome is an age-diverse workforce driven by autonomous motivation, higher performance, commitment to their roles, and a heightened enthusiasm for continuous learning. Through the collective efforts of employees, in unison with organizational goals as signaled through the HR system, the strategic objectives of organizations have the highest probability of being achieved (Gagné, 2018).

Limitations and Future Directions

The present study has several limitations. First, the self-report nature of the data may lead to common-method bias. However, the longitudinal design helps minimize this problem (Podsakoff et al., 2012). Moreover, the only other study to evaluate HR practice perceptions and basic psychological need satisfaction was cross-sectional (Marescaux et al., 2013); therefore, the ability to model between- and within-person effects in an MSEM framework is a major contribution of this work. Nevertheless, a future study should attempt to replicate our findings using an organizational sample and use archival data for dependent variables where appropriate (e.g., performance).

Second, the stem of our autonomous motivation measure could be improved. Specifically, before the MWMS, SDT-based measures of motivation typically inquired, "Why do you do your job?" without explicitly mentioning "effort" in the stem (Gagné et al., 2015, p. 180). This approach was considered problematic as many respondents might attribute their work to monetary exchange (e.g., doing one's job for money), without necessarily reflecting on their own efforts at work (Gagné et al., 2015). To remedy this, Gagné et al. (2015) intentionally designed the MWMS to align with SDT's notion that motivational processes (i.e., the reasons "why") regulate effort expenditure. They modified the stem to inquire about both actual ("do") and intended ("would") efforts, aiming "to more fully capture people's motives (both actual and latent) to do their job" (p. 180). While the MWMS improved the SDT-based measurement of motivation by directly referencing "efforts" in the stem, asking people why they "would or do" put efforts may blur the distinction between actual and intended effort expenditure. Thus, future studies should use a stem that focuses on one aspect of effort expenditure.

Third, our study focused solely on chronological age as a moderator in the relationship between HR practices and basic psychological needs. However, there exist other age-related constructs, such as tenure (i.e., time spent in an organization) and experience (i.e., skills acquired over time), which merit consideration (North & Shakeri, 2019). It is plausible that individuals, as they accumulate experience and tenure, may develop strategies for meeting their needs independently of HR systems. Consequently, they might be less susceptible to the influence of specific HR practices compared to their less experienced and tenured (younger) counterparts. Thus, future studies should explore tenure and experience as potential additional moderators to shed light on the sometimes contradictory or unexpected results observed in the interplay between HR practices, chronological age, basic psychological needs, and various work outcomes.

Fourth, HR practice perceptions were only assessed at T1; therefore, they could not be modeled at the within-person level of analysis. For this design, HR perceptions were theorized to be fairly stable over 3 months, which means that measuring HR practice perceptions at one time point was appropriate. Under ideal circumstances, HR practice perceptions would have been captured at least 3 times over a longer period of time. Therefore, a future study should collect multi-wave HR practice perception data. Despite this limitation, our mixed methods approach and findings represent a significant contribution to SDT within the HR domain.

Finally, we presented initial evidence of content validity for our SDT-based HR schemes; however, further psychometric investigation is necessary for refining the measure. Our aim was to combine HR measures under the SDT framework while preserving the integrity of well-established measures as much as possible. As such, we consciously avoided making extensive changes to the items to maintain comparability with studies employing these items (e.g., see Gardner et al., 2011, p. 331 for a direct comparison). A downside of this approach is that it resulted in a mix of HR practices with varying levels of detail within each SDT category; therefore, a future study should reduce the number of items and streamline the language, where appropriate. Further, we used an additive index, which puts equal weight on HR practice items to arrive at a sum that represents the level of each HR scheme. Although this is consistent with existing HR measures (e.g., Kehoe & Wright, 2013; Kooij et al., 2014), it does not account for that fact that some HR practices vary in importance and intensity. Thus, a future study should consider the use of a Likert scale for the three SDT-based HR categories.

It is worth noting that our approach represents an improvement over many HR studies, which face criticism for predominantly utilizing idiosyncratic sets of entirely custom-made items rather than pre-existing scales (Beijer et al., 2021). The reporting of initial content validity, reliability, and psychometric properties for the SDT schemes further distinguishes our work from other HR studies that have lacked such transparency (Beijer et al., 2021). Notably, our strategy for developing the SDT-based HR schemes aligns with recent research. For example, Jiang et al. (2022) employed Anderson and Gerbing's content validity procedure along with subject matter experts (SMEs) to categorize existing HR items under a new scheme before evaluating a more extensive theoretical model. Limitations aside, our study marks the first attempt to map HR practices according to SDT, providing valuable theoretical development of SDT in the HR domain, where such work has been lacking.

Conclusion

We established the complete mediational pathway of SDT within the HR practice literature, providing an empirical basis for more comprehensive and nuanced SDT theorizing in the HR domain. Through systematically evaluating chronological age as a moderator, we found that older workers are more susceptible to feeling like their autonomy needs are being frustrated. Overall, our findings suggest that competence- and autonomy-supportive practices are the most beneficial for workers regardless of their career stage, and these practices are best suited for supporting lifespan developmental needs for growth and the regulation of losses.

Appendix 1

Subject Matter Expert (SME) Instructions

According to self-determination theory, people have 3 innate psychological needs. These needs are autonomy, competence, and relatedness

The need for **autonomy** refers to the need to act with a sense of volition or freedom. An **HR practice that supports autonomy** is one that provides employees with the *opportunity to feel independent at work* or feel as if they have a choice in how they engage with work.

The need for **competence** refers to the need to feel capable of achieving success in an environment, and the drive for intellectual growth. An **HR practice that supports competence** provides employees with the *opportunity to feel effective at work* or believe they have the ability to meet job demands.

Table 7 Dominance analysis comparing different operationalizations of HR practice measures

Dependent Variable	Predictor	Estimate (*b*)	Raw RW	RS RW
Autonomy Need, $R^2 = .215$				
	Autonomy HR	0.160	0.037	17.20%
	Competence HR	0.158	0.053	24.70%
	Relatedness HR	-0.137	0.021	9.92%
	High Commitment HR	-0.008	0.036	16.72%
	High Performance HR	0.291	0.068	31.46%
Competence Need, $R^2 = .049$				
	Autonomy HR	0.004	0.003	6.70%
	Competence HR	0.004	0.011	21.18%
	Relatedness HR	-0.169	0.008	16.20%
	High Commitment HR	0.008	0.004	7.68%
	High Performance HR	0.299	0.024	48.26%
Relatedness Need, $R^2 = .169$				
	Autonomy HR	0.142	0.023	13.41%
	Competence HR	0.574	0.063	37.32%
	Relatedness HR	-0.088	0.018	10.53%
	High Commitment HR	-0.110	0.032	18.93%
	High Performance HR	-0.123	0.034	19.81%

Note. RS = rescaled; RW = relative weight; Autonomy HR = autonomy-supportive HR practices; Competence HR = competence-supportive HR practices; Relatedness HR = relatedness-supportive HR practices

The need for **relatedness** refers to the need to feel connected to others or part of a community. An **HR practice that supports relatedness** provides employees with the opportunity to build or strengthen relationships with co-workers

Lifespan developmental researchers propose that the needs or goals of aging workers may be addressed through HR practices that fall into 4 classifications:

A **development HR practice** is one that *targets individuals* and gives aging workers the *opportunity to reach higher levels of functioning* or improve their abilities at work.

A **maintenance HR practice** is one that *targets individuals* and gives aging workers the *opportunity to sustain their performance* at work when faced with challenges.

A **utilization HR practice** is one that *changes the nature of work* and gives aging workers the opportunity to *utilize existing knowledge* or other abilities to remain employed.

An **accommodative HR practice** is one that *changes the nature of work* and gives aging workers the *opportunity to remain employed through functioning at lower levels* in the face of adversity.

Data Transparency Table

The data reported in this manuscript were collected as part of a larger data collection. So far, no publications have come from this data; however, portions of this work have been

Table 8 Self-determination theory item classifications by subject matter experts

Item	Correct Category	Next Most Frequent	Psa	Csv	Psa Significant (if ≥ 22 Correct)	Csv significant	Change Made if Next Most Frequent category is significant (≥ 22)
1	46[a]	2[b]	.96	.92	Y	Y	
2	45[a]	2[b]	.94	.90	Y	Y	
3	46[a]	2[c]	.96	.92	Y	Y	
4	48[a]	0	1.00	1.00	Y	Y	
5	45[a]	2[c]	.94	.90	Y	Y	
6	42[a]	3[bc]	.88	.81	Y	Y	
7	43[a]	3[c]	.90	.83	Y	Y	
8	43[a]	3[b]	.90	.83	Y	Y	
9	41[a]	6[b]	.85	.73	Y	Y	
10	45[b]	2[a]	.94	.90	Y	Y	
11	39[a]	5[b]	.81	.71	Y	Y	
12	**14[a]**	**27[b]**	**.29**	**-.27**	**N**	**N**	**autonomy to competence**
13	48[b]	0	1.00	1.00	Y	Y	
14	**19[a]**	**28[b]**	**.40**	**-.19**	**N**	**N**	**autonomy to competence**
15	47[b]	1[a]	.98	.96	Y	Y	
16	48[b]	0	1.00	1.00	Y	Y	
17	38[b]	10[a]	.79	.58	Y	Y	
18	46[b]	2[a]	.96	.92	Y	Y	
19	27[a]	20[b]	.56	.15	Y	N	
20	**12[c]**	**28[b]**	**.25**	**-.33**	**N**	**N**	**relatedness to competence**
21	37[a]	9[b]	.77	.58	Y	Y	
22	38[b]	9[a]	.79	.60	Y	Y	
23	33[a]	9[c]	.69	.50	Y	Y	
24	47[b]	1[a]	.98	.96	Y	Y	
25	46[b]	1[ac]	.96	.94	Y	Y	
26	25[c]	14[a]	.52	.23	Y	N	
27	**11[c]**	**28[a]**	**.23**	**-.35**	**N**	**N**	**relatedness to autonomy**
28	30[c]	16[b]	.63	.29	Y	N	
29	36[b]	11[a]	.75	.52	Y	Y	
30	48[b]	0	1.00	1.00	Y	Y	
31	28[b]	18[c]	.58	.21	Y	N	
32	**10[b]**	**28[a]**	**.21**	**-.38**	**N**	**N**	**competence to autonomy**
33	48[b]	0	1.00	1.00	Y	Y	
34	41[b]	7[a]	.85	.71	Y	Y	
35	42[a]	5[b]	.88	.77	Y	Y	
36	47[b]	1[c]	.98	.96	Y	Y	
37	46[b]	2[c]	.96	.92	Y	Y	
38	48[b]	0	1.00	1.00	Y	Y	
39	40[c]	7[b]	.83	.69	Y	Y	
40	34[a]	11[c]	.71	.48	Y	Y	
41	25[c]	17[a]	.52	.17	Y	N	
42	20[c]	16[b]	.42	.08	N	N	
43	35[b]	12[a]	.73	.48	Y	Y	
44	46[c]	1[ab]	.96	.94	Y	Y	
45	34[c]	8[a]	.71	.54	Y	Y	
46	44[c]	3[b]	.92	.85	Y	Y	
47	16[c]	17[a]	.33	-.02	N	N	
48	35[c]	10[a]	.73	.52	Y	Y	
49	40[c]	7[a]	.83	.69	Y	Y	

Table 8 (continued)

Item	Correct Category	Next Most Frequent	Psa	Csv	Psa Significant (if ≥ 22 Correct)	Csv significant	Change Made if Next Most Frequent category is significant (≥ 22)
50	26[c]	15[a]	.54	.23	Y	N	
51	41[c]	5[b]	.85	.75	Y	Y	
52	39[c]	8[a]	.81	.65	Y	Y	
53	26[b]	13[c]	.54	.27	Y	N	
54	16[c]	17[a]	.33	-.02	N	N	
55	**9[b]**	**37[a]**	**.19**	**-.58**	**N**	**N**	**competence to autonomy**
56	**16[b]**	**27[a]**	**.33**	**-.23**	**N**	**N**	**competence to autonomy**
57	**20[b]**	**24[a]**	**.42**	**-.08**	**N**	**N**	**competence to autonomy**
58	16[b]	21[a]	.33	-.10	N	N	
59	42[c]	4[a]	.88	.79	Y	Y	
60	9[c]	20[b]	.19	-.23	N	N	

Note. Psa is the percentage correct; Csv = substantive validity coefficient; a = autonomy; b = competence, c = relatedness; Y = Yes; N= No

Items 1-23 are from Kooij et al. (2014); Items 24-38 are from Kehoe and Wright (2013); Items 39-54 are primarily from organizations; Items 55-60 are adapted from Wilkens et al. (2021)

Table 9 Age-Inclusive item classifications by subject matter experts

Item	Correct Category	Next Most Frequent	Psa	Csv	Psa Significant (if ≥ 18 Correct)	Csv significant	Change Made if Next Most Frequent category is significant (≥ 18)
1	40^{g}	5^{f}	.83	.73	Y	Y	
2	23^{g}	15^{f}	.48	.17	Y	N	
3	21^{g}	16^{f}	.44	.10	Y	N	
4	19^{g}	14^{f}	.40	.10	Y	N	
5	33^{g}	10^{e}	.69	.48	Y	Y	
6	29^{g}	8^{ef}	.60	.44	Y	Y	
7	34^{g}	7^{e}	.71	.56	Y	Y	
8	35^{g}	6^{ef}	.73	.60	Y	Y	
9	26^{g}	11^{e}	.54	.31	Y	N	
10	30^{d}	16^{e}	.63	.29	Y	N	
11	**15^{e}**	**18^{g}**	**.31**	**-.06**	**N**	**N**	**maintenance to accommodative**
12	27^{e}	8^{d}	.56	.40	Y	Y	
13	22^{d}	24^{e}	.46	-.04	Y	N	
14	35^{d}	7^{e}	.73	.58	Y	Y	
15	41^{d}	4^{e}	.85	.77	Y	Y	
16	27^{d}	18^{e}	.56	.19	Y	N	
17	37^{g}	8^{e}	.77	.60	Y	Y	
18	39^{d}	5^{e}	.81	.71	Y	Y	
19	24^{f}	11^{e}	.50	.27	Y	N	
20	37^{d}	7^{f}	.77	.63	Y	Y	
21	41^{g}	3^{ef}	.85	.79	Y	Y	
22	**16^{f}**	**23^{d}**	**.33**	**-.15**	**N**	**N**	**utilization to developmental**
23	**15^{f}**	**20^{d}**	**.31**	**-.10**	**N**	**N**	**utilization to developmental**
24	**10^{d}**	**21^{e}**	**.21**	**-.23**	**N**	**N**	**developmental to maintenance**
25	18^{e}	15^{df}	.38	.06	Y	N	
26	21^{d}	21^{f}	.44	.00	Y	N	
27	29^{e}	10^{f}	.60	.40	Y	Y	
28	27^{d}	11^{f}	.56	.33	Y	N	
29	39^{d}	4^{ef}	.81	.73	Y	Y	
30	21^{d}	26^{e}	.44	-.10	Y	N	
31	27^{e}	16^{d}	.56	.23	Y	N	
32	20^{f}	14^{d}	.42	-.13	Y	N	
33	38^{d}	8^{e}	.79	.63	Y	Y	
34	40^{d}	4^{ef}	.83	.75	Y	Y	
35	**16^{f}**	**21^{d}**	**.33**	**-.10**	**N**	**N**	**utilization to developmental**
36	30^{d}	11^{f}	.63	.40	Y	Y	
37	25^{d}	18^{e}	.52	.15	Y	N	
38	36^{d}	10^{e}	.75	.54	Y	Y	
39	20^{e}	13^{f}	.42	.15	Y	N	
40	23^{g}	17^{e}	.48	.13	Y	N	
41	28^{e}	12^{g}	.58	.33	Y	N	
42	24^{e}	11^{d}	.50	.27	Y	N	
43	35^{d}	7^{e}	.73	.58	Y	Y	
44	24^{f}	10^{de}	.50	.29	Y	N	
45	24^{e}	15^{d}	.50	.19	Y	N	
46	18^{e}	21^{d}	.38	-.06	Y	N	
47	22^{e}	16^{g}	.46	.13	Y	N	
48	23^{e}	17^{f}	.48	.13	Y	N	
49	17^{f}	16^{e}	.35	.02	N	N	

Table 9 (continued)

Item	Correct Category	Next Most Frequent	Psa	Csv	Psa Significant (if ≥ 18 Correct)	Csv significant	Change Made if Next Most Frequent category is significant (≥ 18)
50	29[e]	8[d]	.60	.44	Y	Y	
51	**9[e]**	**18[df]**	**.19**	**-.19**	**N**	**N**	**maintenance to developmental**
52	26[e]	11[g]	.54	.31	Y	N	
53	24[e]	11[g]	.50	.27	Y	N	
54	30[e]	12[g]	.63	.38	Y	Y	
55	29[e]	7[dg]	.60	.46	Y	Y	
56	26[e]	10[g]	.54	.33	Y	N	
57	**16[d]**	**23[e]**	**.33**	**-.15**	**N**	**N**	**developmental to maintenance**
58	27[e]	14[d]	.56	.27	Y	N	
59	26[e]	15[d]	.54	.23	Y	N	
60	23[e]	19[d]	.48	.08	Y	N	

Note. Psa is the percentage correct; Csv = substantive validity coefficient; d = developmental; e = maintenance; f = utilization; g = accommodative; Y = Yes; N= No

Items 1-23 are from Kooij et al. (2014); Items 24-38 are from Kehoe and Wright (2013); Items 39-54 are primarily from organizations; Items 55-60 are adapted from Wilkens et al. (2021)

Table 10 Data transparency table

Variables in the Complete Dataset	MS 1 (STATUS = current manuscript)	MS 2 (STATUS = planned manuscript)	MS 3 (STATUS = planned manuscript)	CONFERENCE SUBMISSION 1 (STATUS = already presented)	CONFERENCE SUBMISSION 2 (STATUS = planned)	CONFERENCE SUBMISSION 3 (STATUS = planned)	CONFERENCE SUBMISSION 4 (STATUS = Planned)
Subject Matter Expert HR Practice Classifications	X			X			
pre-screen: employment status							
pre-screen: industry							X
pre-screen: job title							X
pre-screen: job description							X
pre-screen: organization size	X						
pre-screen: WorkTime scale							X
pre-screen: chronological age							
pre-screen: gender							
pre-screen: race							
pre-screen: education							
pre-screen: jobtype							
pre-screen: tenure							
pre-screen: hours worked							
pre-screen: days worked							
pre-screen: income							
T1: Work-related Basic Psychological Need satisfaction	X			X			
T1: Multidimensional Work Motivation Scale	X						
T1: HR Practices	X			X			
T1: Work Role Performance	X						
T1: Age Diversity Climate	X						
T1: Thriving	X						

Table 10 (continued)

Variables in the Complete Dataset	MS 1 (STATUS = current manuscript)	MS 2 (STATUS = planned manuscript)	MS 3 (STATUS = planned manuscript)	CONFERENCE SUBMISSION 1 (STATUS = already presented)	CONFERENCE SUBMISSION 2 (STATUS = planned)	CONFERENCE SUBMISSION 3 (STATUS = planned)	CONFERENCE SUBMISSION 4 (STATUS = Planned)
T1: Absenteeism							X
T1: Affective Organizational Commitment	X						
T1: Turnover Intentions	X						
T1: Age-inclusive HR practices (Boehm et al., 2014)							
T1: HR Attributions							
T1: Single-item subjective age							
T1: Multi-item subjective age							
T1: Work Ability							
T1: Job Demands							X
T1: Gender	X						
T1: Chronological Age	X						
T1: Race	X						
T1: Still working at same job?							
T1: Education	X						
T1: Job Type							
T1: Work Hours	X						
T1: Tenure							
T1: Days Worked							
T1: Other Jobs							
T2: Work-related Basic Psychological Need satisfaction	X						
T2: Multidimensional Work Motivation Scale	X						
T2: Work Role Performance	X						
T2: Age Diversity Climate	X						
T2: Thriving	X						
T2: Absenteeism							X

Table 10 (continued)

Variables in the Complete Dataset	MS 1 (STATUS = current manuscript)	MS 2 (STATUS = planned manuscript)	MS 3 (STATUS = planned manuscript)	CONFERENCE SUBMISSION 1 (STATUS = already presented)	CONFERENCE SUBMISSION 2 (STATUS = planned)	CONFERENCE SUBMISSION 3 (STATUS = planned)	CONFERENCE SUBMISSION 4 (STATUS = Planned)
T2: Affective Organizational Commitment	X						
T2: Turnover Intentions	X						
T2: Age-inclusive HR practices (Boehm et al., 2014)							
T2: Single-item subjective age							
T2: Multi-item subjective age							
T2: Work Ability							
T2: Job Demands							X
T2: Gender							
T2: Chronological Age							
T2: Still working at same job?	X						
T2: Job Type							
T2: Work Hours							
T2: Tenure							
T2: Days Worked							
T2: Other Jobs							
T3: Work-related Basic Psychological Need satisfaction	X						
T3: Multidimensional Work Motivation Scale	X						
T3: Work Role Performance	X						
T3: Age Diversity Climate	X						
T3: Thriving	X						X
T3: Absenteeism							X
T3: Affective Organizational Commitment	X						
T3: Turnover Intentions	X						

Table 10 (continued)

Variables in the Complete Dataset	MS 1 (STATUS = current manuscript)	MS 2 (STATUS = planned manuscript)	MS 3 (STATUS = planned manuscript)	CONFERENCE SUBMISSION 1 (STATUS = already presented)	CONFERENCE SUBMISSION 2 (STATUS = planned)	CONFERENCE SUBMISSION 3 (STATUS = planned)	CONFERENCE SUBMISSION 4 (STATUS = Planned)
T3: Age-inclusive HR practices (Boehm et al., 2014)							
T3: Single-item subjective age							
T3: Multi-item subjective age							
T3: Work Ability							
T3: Job Demands							X
T3: Chronological Age							
T3: Still working at same job?	X						
T3: Job Type							
T3: Work Hours							
T3: Tenure							
T3: Days Worked							
T3: Other Jobs							
T4: Work-related Basic Psychological Need satisfaction						X	
T4: Multidimensional Work Motivation Scale					X		
T4: Work Role Performance						X (diff subscale)	
T4: Age Diversity Climate							
T4: Thriving							
T4: Absenteeism						X	X
T4: Affective Organizational Commitment							
T4: Turnover Intentions							
T4: Single-item subjective age			X				
T4: Multi-item subjective age			X				
T4: Workplace Age Discrimination Scale			X				

Table 10 (continued)

Variables in the Complete Dataset	MS 1 (STATUS = current manuscript)	MS 2 (STATUS = planned manuscript)	MS 3 (STATUS = planned manuscript)	CONFERENCE SUBMISSION 1 (STATUS = already presented)	CONFERENCE SUBMISSION 2 (STATUS = planned)	CONFERENCE SUBMISSION 3 (STATUS = planned)	CONFERENCE SUBMISSION 4 (STATUS = Planned)
T4: Age Metastereotypes Scale			X				
T4: Late-career Work Disengagement			X				
T4: Self-perceived Employability			X				
T4: Job Insecurity							
T4: Occupational Future Time Perspective		X					
T4: Psychological Need Thwarting Scale						X	
T4: Intolerance of Uncertainty Scale		X					
T4: Mini International Personality Inventory Pool							
T4: Core Self-Evaluations			X				
T4: Chronological Age		X	X				
T4: Still working at same job?							
T4: Job Type							
T4: Work Hours		X					
T4: Tenure		X					
T4: Days Worked							
T4: Other Jobs							
T5: Work-related Basic Psychological Need satisfaction						X	
T5: Multidimensional Work Motivation Scale							
T5: Work Role Performance						X (diff subscale)	
T5: Age Diversity Climate							
T5: Thriving						X	

Table 10 (continued)

Variables in the Complete Dataset	MS 1 (STATUS = current manuscript)	MS 2 (STATUS = planned manuscript)	MS 3 (STATUS = planned manuscript)	CONFERENCE SUBMISSION 1 (STATUS = already presented)	CONFERENCE SUBMISSION 2 (STATUS = planned)	CONFERENCE SUBMISSION 3 (STATUS = planned)	CONFERENCE SUBMISSION 4 (STATUS = Planned)
T5: Absenteeism							X
T5: Affective Organizational Commitment							
T5: Turnover Intentions							
T5: Single-item subjective age			X				
T5: Multi-item subjective age			X				
T5: Work Ability		X			X		
T5: Job Demands							X
T5: Age Metastereotypes Scale			X				
T5: Late-career Work Disengagement			X				
T5: Self-perceived Employability			X				
T5: Job Insecurity			X				
T5: Occupational Future Time Perspective		X					
T5: Psychological Need Thwarting Scale						X	
T5: Intolerance of Uncertainty Scale		X					
T5: Chronological Age							
T5: Still working at same job?							
T5: Job Type							
T5: Work Hours							
T5: Tenure							
T5: Days Worked							
T5: Other Jobs							
T6: Work-related Basic Psychological Need satisfaction						X	

Table 10 (continued)

Variables in the Complete Dataset	MS 1 (STATUS = current manuscript)	MS 2 (STATUS = planned manuscript)	MS 3 (STATUS = planned manuscript)	CONFERENCE SUBMISSION 1 (STATUS = already presented)	CONFERENCE SUBMISSION 2 (STATUS = planned)	CONFERENCE SUBMISSION 3 (STATUS = planned)	CONFERENCE SUBMISSION 4 (STATUS = Planned)
T6: Multidimensional Work Motivation Scale							
T6: Work Role Performance						X (diff subscale)	
T6: Age Diversity Climate							
T6: Thriving							
T6: Absenteeism						X	X
T6: Affective Organizational Commitment							
T6: Turnover Intentions							
T6: Single-item subjective age			X				
T6: Multi-item subjective age			X				
T6: Work Ability		X			X		
T6: Job Demands							X
T6: Age Metastereotypes Scale			X				
T6: Late-career Work Disengagement			X				
T6: Self-perceived Employability			X				
T6: Job Insecurity			X				
T6: Occupational Future Time Perspective		X					
T6: Psychological Need Thwarting Scale						X	
T6: Intolerance of Uncertainty Scale		X					
T6: Chronological Age							
T6: Still working at same job?							
T6: Job Type							
T6: Work Hours							

Table 10 (continued)

Variables in the Complete Dataset	MS 1 (STATUS = current manuscript)	MS 2 (STATUS = planned manuscript)	MS 3 (STATUS = planned manuscript)	CONFERENCE SUBMISSION 1 (STATUS = already presented)	CONFERENCE SUBMISSION 2 (STATUS = planned)	CONFERENCE SUBMISSION 3 (STATUS = planned)	CONFERENCE SUBMISSION 4 (STATUS = Planned)
T6: Tenure							
T6: Days Worked							
T6: Other Jobs							

presented at a conference. The table below indicates where each variable appears in the current manuscript, as well as the intended use of variables for planned manuscripts and conference presentations (from the larger data collection effort). The majority of the variables in this manuscript will not be used for future projects.

Author Note The subject matter expert data for this work was analyzed and presented at the 6th Age in the Workplace Small Group Meeting (AWM) in Groningen, Netherlands. The hypothesized model was analyzed and presented at the 38th annual meeting of the Society for Industrial and Organizational Psychology (SIOP) in Boston, MA, United States. Audience feedback during each respective conferences' question and answer period aided in strengthening the manuscript presented here.

Funding This research did not receive funding from any public, commercial, or not-for-profit agencies.

Data Availability Data are available from the first author upon request.

Declarations

Conflicts of interest We have no known conflicts of interest to disclose.

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