

Uncertainty in Work-Related Transitions over the Life Course

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Uncertainty in Work-Related Transitions over the Life Course**Abstract**

Many aspects of one's life are uncertain due to missing information about situations, probabilistic events, and decision outcomes. In this article, we argue and show that diverse perspectives from lifespan development as well as work and organizational psychology can be integrated into a fuller picture of individuals' experiences of work-related transitions over the life course through the lens of uncertainty. Drawing from a panel discussion among several of the authors and the literature in aging, career, work, and retirement research, we develop an integrative conceptual framework that differentiates between exogenous and endogenous sources of uncertainty and highlights macro-, meso-, and micro-level sources of individuals' experience of uncertainty as they navigate work-related transitions. Moreover, we discuss sources of uncertainty in perceptions, evaluations, and decisions during work-related transitions. Based on our framework, we propose a roadmap with recommendations for future research, which include (1) the conceptualization and operationalization of uncertainty based on perspectives common in aging, career, work, and retirement research, (2) the understanding of why and when aspects of uncertainty in work-related transitions can be challenges yet also provide new opportunities, and (3) organizational and policy measures that can help individuals successfully manage these uncertainties over the life course.

Keywords: uncertainty, lifespan, career stages, job change, decision-making

Uncertainty in Work-Related Transitions over the Life Course

Many aspects of our lives are uncertain. The concept of uncertainty describes a ubiquitous, pervasive state that can relate to the environment or the self, including our careers as we work, age, and retire. In the most general sense, uncertainty can be defined as “any departure from absolute determinism, pointing to unpredictability as the core of uncertainty” (Griffin & Grote, 2020, p. 747). Uncertainty is represented by a general state of “not knowing for sure” due to a lack of information or ambiguous information about situations and/or consequences of one’s own and others’ decisions and behaviors (Grote, 2009; Lipshitz & Strauss, 1997; Weinhardt & Schaefer, 2022). In a state of uncertainty, the number, likelihood, and/or magnitude of probabilistic outcomes are unknown.¹ Based on this definition, most, if not all, aspects regarding transitions related to one’s aging, career, work, and retirement entail uncertainty, from the development of physical and mental health, personal interests, goals, and identity, to job and career changes, work tasks and roles, to retirement timing and options. We define work-related transitions broadly as any change occurring during one’s work life as well as during the transitions into and out of paid work (Akkermans et al., 2024; Fouad & Bynner, 2008).

¹Uncertainty can manifest in several ways. Two of the most common ways in which uncertainty about probabilistic outcomes manifests are captured by the related yet distinct concepts risk and ambiguity. Risk refers to situations where the true outcome is unknown but the probabilities of each possible outcome are known or easily estimated (e.g., flipping a coin). Ambiguity refers to situations where both the true outcome *and* the probabilities of outcomes are unknown (e.g., the probability of getting a job or not after a job interview). While some researchers consider ambiguity and risk as different from uncertainty (for a discussion, see Weinhardt & Schaefer, 2022), others think of uncertainty as a broader term that includes both ambiguity and risk as different *forms* of uncertainty (Frank & Seaman, 2023) because uncertainty also describes situations where information about the number, likelihood, *and/or* magnitude of probabilistic outcomes is unknown (e.g., the probability and magnitude of a flight being delayed). In practice and everyday life, the differentiation between uncertainty, ambiguity, and risk may often be blurred (e.g., instead of getting a job or not, an applicant may be offered another job position, that is, a third possibility is added). Uncertainty in its most general form may be much more common in our daily lives than risk or ambiguity because the exact likelihood of outcomes and the number of potential outcomes often remain unknown. In this article, we refer to uncertainty as the broader term.

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To date, an impressive amount of aging and lifespan development research has documented age-related differences in judgment and decision-making under uncertainty (for an overview, see Frank & Seaman, 2023; Hess et al., 2015; Mata et al., 2011). However, this research has rarely explicitly discussed the sources of uncertainty in aging, work, career, and retirement in real life. Further, the existing knowledge has not been sufficiently applied to better understand how individuals can successfully navigate uncertainties arising from work-related transitions over the life course. A commentary by Grote and Pfrombeck (2020) highlighted the potential of considering the role of uncertainty more thoroughly in aging and lifespan research. Likewise, work, career, and retirement research has seldom applied an uncertainty lens to investigate work-related transitions over the life course—for an exception, see a recent special issue in *Work, Aging, and Retirement* (Zaniboni et al., 2025). Given the ubiquitous presence and relevance of uncertainty to aging and the current state of research in these interrelated fields, it is timely to systematically discuss and conceptualize uncertainty in work-related transitions over the life course by integrating aging, career, work, and retirement research perspectives to show how explicitly considering the role of uncertainty can improve our understanding of work-related transitions over the life course.

We integrate insights from the aging, career, work, and retirement literature in our article because these four research areas are relevant to work-related transitions over the life course. *Aging* refers to the process of intra-personal changes that evolve over time and in interaction with the environment that both impacts aging processes and, at the same time, is shaped by the individual and their development. Aging starts at conception and continues throughout the entire lifespan until death. *Careers* are the sequence of activities associated with work roles over the course of one's lifespan (Arthur & Lawrence, 1984). *Work* refers to the content of tasks and the

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3 design of jobs, including both employed work embedded in and shaped by organizational
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5 settings as well as self-employment and gig work. *Retirement* refers to an individual's exit from
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7 the workforce and its aftermath. It is a process of psychological and behavioral detachment from
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9 work-related activities and often a transformative experience that affects various aspects of an
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11 individual's life, including their identity, social relationships, and psychological well-being
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13 (Wang & Huang, 2024; Wang & Shi, 2014). Figure 1 shows a conceptual map of topics in the
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15 aging, career, work, and retirement literatures relevant to uncertainty in work-related transitions
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17 over the life course, highlighting retirement and work as part of a person's career, embedded in a
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19 person's development over time. This map identifies how many sources of uncertainty in these
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21 research domains may be naturally intertwined. This map also provides an integrative view based
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23 on these four research domains to advance our understanding of the role of uncertainty in work-
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25 related transitions over the life course.
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31 --- INSERT FIGURE 1 ABOUT HERE ---
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33 The present article aims to provide a reflective discussion of how uncertainty is often
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35 implied in the disparate yet interrelated research traditions of aging, careers, work, and
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37 retirement. Specifically, we develop an integrative conceptual framework to stimulate future
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39 research that generates new research questions and theories to improve our understanding of
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41 work-related transitions over the life course by explicitly considering the role of uncertainty.
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44 Using a panel discussion format in the first part of the present article, four experts in the
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46 aging and lifespan, career, work, and retirement literatures address six questions about the
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48 sources of uncertainty in work-related transitions over the life course. Specifically, the panelists
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50 discuss how uncertainty at (1) the macro-, (2) meso-, and (3) the micro-level relates to life course
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52 transitions, and (4) how these sources of uncertainty at different levels are interrelated. Further,
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3 the panel discusses (5) how individuals can successfully regulate uncertainty in work-related
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5 transitions over the life course as well as (6) what organizations and policy makers can do to
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7 support individuals in their efforts.² In the second part, we develop an integrative conceptual
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9 framework of uncertainty in work-related transitions guided by the panel discussion and a review
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11 of prior research that explicitly considers the role of uncertainty in aging, career, work, and
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13 retirement. Furthermore, we offer a roadmap for future research guided by our framework.
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A Panel Discussion on Uncertainty in Work-Related Transitions over the Life Course**Question 1: What are the sources of uncertainty in work-related transitions over the life course at the macro-level?***Alexandra M. Freund*

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26 Our semantic understanding of age is shaped by culture and society. Uncertainty is
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28 already present when we reflect on what we mean by “aging at work” or “older workers”. In the
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30 work context, the terms often refer to people in their 50ies or early 60ies (Zacher & Rudolph,
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32 2023), whereas aging researchers would define “older adulthood,” as beginning after retirement,
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34 roughly around the age of 65. Many of the processes associated with old age and aging, such as
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36 physical or cognitive declines that significantly impact performance on a variety of tasks, are
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38 only *starting* to affect functioning in “older workers” in their 50ies and early 60ies (Baltes et al.,
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40 2006). Thus, the definition and categorization of individuals as “older workers” may itself be
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42 problematic and a source of uncertainty—not only for researchers, but also for society,
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44 policymakers, organizations, and individuals themselves with implications also for self-
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54 ² We originally organized a panel discussion on this topic at the 7th Age in the Workplace Meeting in Vilnius,
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56 Lithuania. The panel discussion had a hybrid format with two panelists joining virtually and two in person. The final
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58 questions and answers presented in this paper, as well as their order, have been adjusted to enhance the consistency,
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60 coherence, and flow of the discussion.

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3 categorization and social identity (Dossinger & Beaver, 2024). Some countries introduced a legal
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5 definition of “older workers”. For example, persons 40 years of age or older are protected by the
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7 Age Discrimination in Employment Act in the United States. However, people might not feel
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9 “ready” to self-categorize as older worker at that threshold, contributing to a definitional
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11 discrepancy creating uncertainty. Moreover, the term “older worker” also creates “younger
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13 workers” as their counterparts, and, as it highlights the difference between “young” and “old,”
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15 might contribute to the generalization of age stereotypes (e.g., being less productive; Posthuma
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17 & Campion, 2009). In this way, age, which by its nature is a continuous variable, can be a source
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19 of uncertainty for self and social categorization, perhaps more so than for other diversity
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21 attributes.
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26 *Donald M. Truxillo*

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28 The new economy is shaped by technological changes, climate change, migration, and
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30 the growth of gig work and algorithmic management (Fraccaroli et al., 2024), all of which can be
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32 sources of uncertainty.
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36 Technological changes in work can lead to uncertainty for older workers and require
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38 adaptation (Fazi et al., 2025). Artificial intelligence (AI) can cause jobs to be eliminated entirely
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40 or changed so substantially as to essentially be a new job (Fraccaroli et al., 2024). This can have
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42 a strong impact across the work life span in terms of uncertainty in employment. Uncertainty
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44 related to AI can also stem from the use of AI tools and their outcomes (Magni et al., 2024).
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46 However, technology can also be a boon for older workers (e.g., Demerouti, 2022; Fang et al.,
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48 2025), for instance, in supporting or eliminating some physically challenging aspects of work.
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50 The introduction of an AI assistant, for instance, might be off-putting to many older workers
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52 (and other workers as well) if it is seen as an intrusion on employee privacy; however, to the
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3 extent that employees see AI as a way to simplify mundane and time-wasting tasks, such
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5 technologies are more likely to be accepted (Bidwell et al., 2023). Given some types of age-
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7 related changes (e.g., physical, cognitive) that may affect employee performance in certain types
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9 of jobs, such supportive technologies could facilitate workers aging successfully in their roles.

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12 Moreover, climate change will likely affect not only workplaces (locations and times of
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14 work), but also home lives as well. Worker migration may become necessary to adapt to climate
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16 and economic change, which may be especially difficult for older employees.

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19 Another source of uncertainty for workers is the growth of gig work and algorithmic
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21 management. An Uber driver does not deal with a live manager and works at the behest of
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23 customer needs; such employees work under stressful performance management systems, where
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25 they may be evaluated through seemingly arbitrary or even malicious customer ratings (O'Shea
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27 et al., 2023; Shao et al., 2024). This lack of autonomy and job control, combined with the loss of
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29 interpersonal connection and support, could be especially difficult for older workers due to age-
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31 related motivational changes (Inceoglu et al., 2012; Kooij et al., 2011).

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35 The new economy will also lead to changes in the patterns of work, including short-term
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37 unemployment and job insecurity, with significant effects on uncertainty. Although this is a
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39 source of stress for all workers, it may be particularly challenging for younger workers beginning
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41 their careers, as well as for older workers who may have greater financial obligations, experience
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43 longer re-employment times after job loss (e.g., Wanberg et al., 2016), or who may be less
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45 motivated to undertake significant job training late in their career (Ng & Feldman, 2012).
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Growney et al. (2024) caution that uncertainty about one's occupational future might reduce age-related prosociality at work and induce competition among age-diverse employees, as they found

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3 that uncertainty about one's occupational future was negatively associated with a preference for
4 emotionally meaningful (vs. career-advancing) work tasks for older employees.
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8 Notably, these profound economic changes that characterize the new economy (e.g., rises
9 and falls in the economic environment) add complexity to the retirement decision-making
10 process. However, the new economy may also lead to changes that reduce the effects of
11 uncertainty. The use of AI and increased productivity could lead to shortened workweeks and
12 perhaps the adoption of a universal basic income, relieving much of the stress and financial
13 uncertainty for older workers. Taken together, the uncertainty about the nature of work can
14 simultaneously be a challenge and an opportunity for employees at different career stages.
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24 *Jutta Heckhausen*
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26 From a career perspective, there are specific macroeconomic challenges at different
27 career stages. At career entry, the school-to-work transition is a challenging period imbued with
28 ubiquitous uncertainties affecting goal striving and achievement (Hamm et al., 2013). In
29 different countries, we see very different transitions between school and work life, especially for
30 those who are not going through college, and through a higher education path. In some countries
31 like Germany, Poland, and Switzerland, there are apprenticeships that are highly structured and
32 allow the individual to follow a clear path that does not require a lot of regulatory agencies
33 (Schoon & Heckhausen, 2019). In other countries, transitions may be very unstructured to the
34 point that these youths are talked about as the 'Forgotten Half,' (Heckhausen, 2007). Here, the
35 uncertainty becomes so overwhelming that most youth flounder and have pretty bad outcomes.
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49 In mid-career transitions, a critical question is how permeable career tracks are, whether
50 they allow switches over to a different career or a jump into a higher position later on in a career.
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54 If that is possible, vocational systems and institutional regulations allow this more or less in
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3 different ways across countries. High permeability implies more potential for the individual to be
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5 agentic and make a difference in their life courses (Heckhausen & Buchmann, 2019; Wang &
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7 Wanberg, 2017). Another aspect to consider in mid-career is work-life conflicts that are partly
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9 shaped by societal and institutional structures (e.g., regulations for parental leave, annual leave,
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11 family care options). The individual has to be able to juggle multiple developmental goals (e.g.,
12
13 short- and long-term goals) on a daily basis (Noppeney et al., 2024). A third aspect to consider in
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15 mid-career is the time of deadlines set by institutional systems, when opportunities may
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17 diminish, and opportunities to switch careers become more constrained.
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22 In late-career transition and retirement, individuals need to deal with the experience of a
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24 plateau or decline, and they have to deal with that in some productive fashion to stay healthy and
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26 maintain their well-being (Kooij et al., 2020; Zacher et al., 2021). The question of when to retire
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28 is often not a matter of free choice but more of a financial need or financial ability to retire,
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30 especially in countries like the US that have less financial security and less developed pension
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32 systems. This often leads to mixed forms of retirement, for example, people retire from one job
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34 but then work in another lower-level job (Wang & Huang, 2024; Wang & Shultz, 2010).
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38 *Mo Wang*
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41 At the macro-level, retirement support systems and legislation, cultural values, social
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43 norms, and economic and labor market conditions shape the individual retirement process
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45 (Szinovacz, 2013; Wang & Shi, 2014). These factors can generate a sense of uncertainty, which
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47 can manifest as both challenges and opportunities. First, retirement support systems, including
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49 pensions, healthcare benefits, and social security, are fundamental in determining the financial
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51 stability of retirees. The variability and potential instability of these systems can create
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53 significant uncertainty by affecting the reliability of pension plans or healthcare benefits, leading
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UNCERTAINTY IN WORK-RELATED TRANSITIONS

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1
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3 to anxiety about financial security during retirement. However, the uncertainty in support
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5 systems can also motivate individuals to take proactive steps in financial planning, seek
6
7 additional income streams, or invest in long-term care insurance, thereby turning potential
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9 challenges into opportunities for greater financial independence.

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12 Cultural values and social norms around retirement influence how individuals perceive
13
14 and approach this life stage (Freund et al., 2009). In cultures where retirement is seen as a well-
15
16 deserved rest after years of hard work, the transition might be viewed positively, but it can also
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18 create pressure to conform to this expectation, generating uncertainty for those who may still
19
20 want to remain active in the workforce or pursue new ventures. Conversely, in cultures that value
21
22 continuous productivity, retirees may feel uncertain about their role in society, leading to
23
24 potential identity crises. However, these uncertainties can also open up opportunities to challenge
25
26 societal norms, redefine what retirement means, and explore new identities, roles, and activities
27
28 that align with personal values and aspirations.

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31 The broader economic environment and labor market conditions can significantly
32
33 influence retirement decisions and experiences as well. Economic downturns, inflation, or
34
35 unstable job markets can lead to uncertainty about retirement timing and the adequacy of
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37 retirement savings. Such uncertainty can be stressful, especially if it forces individuals to delay
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39 retirement or re-enter the workforce. However, these challenges can also create opportunities to
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41 diversify income sources, invest in new skills, or explore alternative forms of employment, such
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43 as part-time work or consulting, which can provide both financial and psychological benefits in
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45 retirement (Cabib et al., 2024). By taking an uncertainty regulation perspective to interpret life
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47 story interviews of older workers in Chile, Cabib and colleagues (2024) found that extended
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UNCERTAINTY IN WORK-RELATED TRANSITIONS

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working lives are shaped by complex processes involving both expansive and adaptive individual agency in which people engaged throughout their life course.

Question 2: What are the sources of uncertainty in work-related transitions over the life course at the meso-level?

Donald M. Truxillo

Organizational changes and job factors can be sources of uncertainty at the meso-level. Organizational changes are often initiated by organizations in response to macro-level trends. It may be necessary for adaptability, innovation, and the long-term survival of the organization, but it can also be a source of uncertainty for employees who may fear layoffs and downsizing (e.g., Bordia et al., 2004; Rafferty & Griffin, 2006). Organizational change may also lead to a person-environment misfit—perhaps particularly for older workers used to established forms of work. Harris and colleagues (2024) found that a person-environment misfit can create uncertainty about one's work ability for older workers. Yet this uncertainty is not necessarily negative, as they showed. Through engagement in opening strategies at work (e.g., focusing on achieving new goals), uncertainty in work ability was positively related to senior entrepreneurship and bridge employment intentions and negatively related to retirement intentions. Thus, organizational change may also be a catalyst to achieve a better person-environment fit for older workers.

Certain job characteristics and work itself can also involve uncertainty, in particular knowledge characteristics (e.g., job complexity, problem-solving, information processing). Knowledge characteristics that allow for the application of accumulated job skills and knowledge may lead to increased satisfaction and engagement for older workers (Truxillo et al., 2012). Zacher and colleagues (Zacher et al., 2010; Zacher & Frese, 2011) demonstrated that complex jobs can provide opportunities for older workers to perform to their fullest by capitalizing on

UNCERTAINTY IN WORK-RELATED TRANSITIONS

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1
2
3 their crystallized knowledge (i.e., age-related gains in experiential knowledge). Relatedly,
4
5 Rudolph and Zacher (2024) reasoned that older employees may be in an advantageous position
6
7 to manage increases in work uncertainty effectively and turn them into beneficial outcomes due
8
9 to their accumulated experience. Work uncertainty describes employees' perception of work-
10
11 related resources, tasks, and input/output uncertainty (Leach et al., 2013). Rudolph and Zacher
12
13 (2024) found that increases in work uncertainty could partially buffer the negative association
14
15 between age and occupational future time perspective.
16
17

18
19 *Alexandra M. Freund*
20

21
22 Misperceptions in the workplace about aging may be another source of uncertainty,
23
24 especially for older workers. Most people expect cognitive decline across adulthood (Mustafić &
25
26 Freund, 2012), leading to the uncertainty of whether older workers are still up to their tasks,
27
28 particularly when also considering age-related expectations related to physical and sensory
29
30 functioning. Minor mistakes might be erroneously attributed to age-related declines in cognitive,
31
32 sensory, and physical functioning in older workers. When internalized by older workers, such
33
34 misconceptions might undermine their self-efficacy and contribute to a hesitancy to apply for
35
36 and get access to continued training and education for older workers (Lee et al., 2008). This, in
37
38 turn, might increase older workers' feelings of being left behind when it comes to skills, such as
39
40 those related to new technologies, and may increase self-uncertainty (Hogg, 2007) and self-doubt
41
42 in aging workers regarding their work ability. Note that these expectations are not veridical, as
43
44 meta-analyses show that older workers are no less productive and do not have more sick days
45
46 than younger workers (e.g., Ng & Feldman, 2012).
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52 The misperception of older workers as being less competent—and the fear of the older
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54 workers being perceived in this way—might also manifest in uncertainty in social interactions,
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UNCERTAINTY IN WORK-RELATED TRANSITIONS

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3 and lead to a tendency to avoid interactions with older workers (or of older workers with social
4 partners who might perceive them as such). Related to that, Pfrombeck and colleagues (2023)
5 found that older employees' knowledge-seeking from younger coworkers can have positive
6 effects on their learning, but also negative emotional effects by triggering embarrassment as
7 older workers might have image concerns about appearing incompetent and violating age norms.
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14
15 *Mo Wang*

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17 At the meso-level, retirement processes can be influenced by the work context (i.e.,
18 organizational and job factors) and the nonwork life context (i.e., family and social network
19 factors). For the work context, factors such as company retirement policies, job demands, and
20 workplace culture can introduce uncertainty regarding when and how to retire (Wang & Huang,
21 2024; Wang & Shi, 2014; Wang & Shultz, 2010; Zhan et al., 2023). In particular, uncertainty
22 arises when organizations undergo restructuring, downsizing, or policy changes that might affect
23 job security, benefits, or retirement timelines. On the one hand, employees may feel pressured to
24 retire earlier than planned due to organizational shifts, creating anxiety about their readiness for
25 retirement. Additionally, high job demands or a lack of succession planning may lead to
26 uncertainty about how to transition out of the workforce smoothly, especially for those in
27 leadership roles or specialized positions. On the other hand, organizations that actively support
28 phased retirement or provide opportunities for mentoring and knowledge transfer can transform
29 uncertainty into a positive experience. Employees may explore new roles within the
30 organization, such as part-time positions, consulting, or mentorship programs, allowing them to
31 gradually transition into retirement while staying engaged and financially secure. Furthermore,
32 supportive workplace cultures that value work-life balance can reduce stress and help employees
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UNCERTAINTY IN WORK-RELATED TRANSITIONS

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3 plan for retirement more effectively, turning potential challenges into opportunities for a
4
5 smoother transition.
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8 The nonwork life context is equally likely to introduce uncertainty during the retirement
9
10 process (Froidevaux et al., 2018; Wang, 2007). Family responsibilities, such as caregiving for
11
12 aging parents or supporting adult children, can create uncertainty about the timing and financial
13
14 feasibility of retirement. Retirees may feel conflicted between personal desires and family
15
16 obligations. Additionally, changes in marital status, such as divorce or the loss of a spouse, can
17
18 disrupt retirement plans, creating uncertainty about living arrangements, financial stability, and
19
20 emotional well-being. However, family and social ties can also help mitigate uncertainty and
21
22 enhance the retirement experience. Supportive family relationships can provide a safety net,
23
24 allowing retirees to take calculated risks that may be associated with uncertainty, such as
25
26 relocating or pursuing new interests. Social networks, including friendships and community
27
28 involvement, offer opportunities for retirees to stay socially active and engaged, reducing the
29
30 sense of isolation that often accompanies retirement.
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35 **Question 3: What are the sources of uncertainty in work-related transitions over the life**
36
37 **course at the micro-level?**
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39
40 *Alexandra M. Freund*
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42 Aging implies changes over time, occurring long before entering old age and affecting
43
44 the functioning of late middle-aged or “older” workers even before facing retirement. These
45
46 changes may impact feelings of uncertainty. One of the most prominent age-related changes
47
48 across adulthood occurs in cognitive functioning. Specifically, fluid cognitive abilities decline,
49
50 such as speed of processing, and related kinds of cognitive abilities. However, knowledge-based
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52 cognitive abilities are fairly stable or may continue to increase, compensating very easily for
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UNCERTAINTY IN WORK-RELATED TRANSITIONS

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3 losses in fluid abilities (Li et al., 2004). Most jobs and professions rely strongly on knowledge-
4 based skills, and accumulated work-related experiences likely compensate for declines in fluid
5 functions. However, the *expectation* of lower capabilities might contribute to uncertainty about
6 older workers' performance.
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12 Moreover, although work motivation does not decrease with age in general (Posthuma &
13 Campion, 2009), motivation changes with regard to the content of personal goals, which could
14 be a source of uncertainty for individuals. According to Super (e.g., 1980), young adults explore
15 primarily which kind of work and career promises fit their interests and abilities best, then focus
16 on establishing themselves in this career when moving towards middle adulthood, and when
17 approaching retirement, it becomes important to disengage from work-related goals and roles.
18 Super's career model converges with age-related theoretical frameworks (e.g., Kanfer &
19 Ackerman, 2004) and the empirical research on motivational orientation that demonstrates a shift
20 from a primary growth orientation in younger adulthood towards an increasingly stronger
21 orientation towards maintenance and the avoidance of losses across adulthood (e.g., Ebner et al.,
22 2006; Gong & Freund, 2022; Horn & Freund, 2021). This shift in motivational orientation seems
23 adaptive: a stronger loss-avoidance orientation is related to better subjective well-being,
24 persistence in pursuing tasks, and learning processes in older adulthood (Freund, 2006; Freund &
25 Keil, 2021; Gong & Freund, 2024). Thus, one of the sources of uncertainty for workers
26 approaching retirement might be deciding on which projects and goals to focus on, especially
27 since the experience of shortening future time perspective might lead to a sense of urgency to
28 prioritize the most important goals and focus on achieving them over less important ones
29 (Riediger & Freund, 2006). On the one hand, one might want to prioritize projects that have a
30 high likelihood of being completed in the remaining time at work so as to achieve closure and a
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UNCERTAINTY IN WORK-RELATED TRANSITIONS

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3 sense of accomplishment (Koo & Fishbach, 2012; see also “goal gradient effect”, Hull, 1932; or
4
5 “goal looms larger” effect, Brendl & Higgins, 1996). On the other hand, the attainable projects
6
7 are not necessarily the most personally important ones. There is some evidence that people feel
8
9 more committed to goals that align with their implicit motives (Job & Brandstätter, 2009; Roch
10
11 et al., 2017), and that the pursuit of motive-congruent goals is associated with higher emotional
12
13 well-being (Brunstein et al., 1998) and job satisfaction (Thielgen et al., 2015). Although Valero
14
15 et al. (2015) found that a shorter future time perspective leads to a stronger activation of implicit
16
17 motives, people are, by definition, not aware of their implicit motives, contributing to the
18
19 uncertainty in the goal selection process. The anticipated regret (Zeelenberg, 2018) of choosing
20
21 to prioritize the wrong project in the remaining time before retirement is likely exacerbated
22
23 because the shrinking time until the end of work renders course corrections more and more
24
25 difficult (Roese & Summerville, 2005). Neglecting interindividual differences in (implicit)
26
27 motives and preferences, Socio-emotional Selectivity Theory (Carstensen et al., 1999) predicts
28
29 that the impending ending is associated with a higher motivation to prioritize meaningful social
30
31 relations at work over work projects. Note, however, that the results by Valero et al. (2015)
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33 contradict this prediction as they found that, although the motive to affiliate increased, so did the
34
35 achievement and the power motives with shorter time horizons.
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42 *Mo Wang*

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45 At the individual level, retirement processes are very much influenced by two large
46
47 categories of age-related changes, cognitive decline and physical health decline (Wang & Huang,
48
49 2024; Wang & Shultz, 2010; Zhan et al., 2023), both of which can give rise to uncertainty.
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51 Cognitive decline can impair decision-making abilities, making it harder for older adults to
52
53 navigate complex financial decisions. This creates uncertainty, leading to anxiety about making
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UNCERTAINTY IN WORK-RELATED TRANSITIONS

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1
2
3 the right choices regarding investments, healthcare, and daily living arrangements. Cognitive
4 decline can also lead older adults to become more dependent on family members or caregivers.
5
6 This reliance can create uncertainty about who will take on these responsibilities and whether
7
8 they will act in the retiree's best interest. The loss of autonomy and the need to trust others with
9
10 critical decisions can be a source of stress and fear. Additionally, cognitive decline may lead to
11
12 social withdrawal, making it difficult for older adults to access the support they need.
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17 Nonetheless, the recognition of cognitive decline can serve as a catalyst for proactive
18
19 planning. Knowing that cognitive abilities may decrease over time, individuals can take steps
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21 early in the retirement process to establish clear legal and financial plans. For example, setting
22
23 up a durable power of attorney, creating a comprehensive estate plan, and making decisions
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25 about long-term care in advance may induce uncertainty first, but can reduce uncertainty and
26
27 provide peace of mind in the long run. Engaging in these activities can help older adults maintain
28
29 a sense of control over their future, even as their cognitive abilities change. Increased reliance on
30
31 others can also bring about opportunities for greater social connection and support. Finally, as
32
33 cognitive decline may limit the ability to engage in certain activities, it can also prompt retirees
34
35 to explore new routines matching their changing abilities. This shift can open up new
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37 opportunities for personal growth and fulfillment in retirement, helping to maintain a sense of
38
39 purpose and well-being.
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45 Uncertainty about one's future health can also lead to indecision regarding retirement
46
47 timing and lifestyle choices. Unanticipated health changes and care needs may require
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49 adjustments in retirement plans, such as altering living arrangements or changing financial
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51 strategies to accommodate potential medical expenses. Relatedly, rising costs of healthcare can
52
53 add a layer of uncertainty to retirement planning. Individuals may struggle to predict future
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UNCERTAINTY IN WORK-RELATED TRANSITIONS

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3 medical expenses and how these will impact their financial stability. Considering increasing life
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5 expectancy and advancements in medical treatments can make these predictions even more
6
7 complex. The uncertainty surrounding whether and when care needs will arise can complicate
8
9 retirement planning.
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12 On the bright side, the potential for health-related changes encourages retirees to build
13
14 flexibility into their plans. This adaptability can lead to creative solutions and alternative paths,
15
16 such as exploring new hobbies or volunteer opportunities that accommodate varying health
17
18 conditions. It can also motivate individuals to engage in proactive health behaviors, which may
19
20 include adopting healthier lifestyles, participating in preventive care, and staying informed about
21
22 advances in medical technology and healthcare services. Finally, facing health-related
23
24 uncertainties can prompt individuals to reevaluate their priorities and make meaningful changes
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26 ahead. This might involve pursuing long-held dreams or interests that align with their current
27
28 health status, ultimately leading to a more fulfilling retirement.
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33 **Question 4: How are the sources of uncertainty in work-related transitions over the life**
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35 **course at different levels interrelated?**
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37
38 *Jutta Heckhausen*
39

40 According to the Motivational Theory of Lifespan Development (Heckhausen et al.,
41
42 2010), life course and careers are a joint product of biology, society, and the individual. The
43
44 interplay between society structuring (e.g., societal institutions, educational, and corporate and
45
46 state-based institutions) and individual agency is a key aspect in determining developmental
47
48 outcomes (Burger, 2021; Hamm et al., 2020; Heckhausen et al., 2019; Heckhausen, 2021;
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50 Heckhausen & Buchmann, 2019; Kooij et al., 2020; Poulin & Heckhausen, 2007).
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UNCERTAINTY IN WORK-RELATED TRANSITIONS

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3 The regulation of career and life courses in general (and of the related uncertainty) is a
4 zero-sum game between societal structuring and individuals. On the one hand, too little societal
5 structuring (e.g., in an educational or vocational career) shifts the load of the regulation
6
7 exclusively on the individual. With too much uncertainty, the risk is that the individual does not
8
9 have the scaffold needed to regulate (Heckhausen & Buchmann, 2019; Heckhausen & Wrosch,
10
11 2016). On the other hand, extensive societal structuring can create too many constraints and
12
13 block social mobility for individuals, especially when it comes to social inequality and accessing
14
15 transitions (Heckhausen, 2016). In general, the more transitions you have, the more decision
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17 points, the more revision opportunities in a career or an educational or vocational career, and the
18
19 more chances you have for individual agency. And if you have a very tight structure, the
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21 individual can exert less agency. Therefore, a key question is whether there is an optimal degree
22
23 of societal structuring of careers.
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31 *Donald M. Truxillo*
32

33 Event System Theory (Morgeson et al., 2015) might provide a useful lens for
34 understanding how sources of uncertainty in work-related transitions over the life course at
35 different levels are interrelated. Accordingly, events that create uncertainty might happen at the
36
37 individual, team, organizational, or broader environmental levels. Events can have effects on the
38
39 same, higher, and lower levels at which they occur, and they can function as predictors of
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41 behaviors or features, or as a moderator.
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46
47 *Mo Wang*
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49 From the vantage point of cumulative (dis)advantage (Dannefer, 2003), the interrelation
50
51 of uncertainty sources in work-related transitions can be understood as a path-dependent process
52
53 unfolding across the life course. At the individual level, early experiences of instability—such as
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UNCERTAINTY IN WORK-RELATED TRANSITIONS

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1
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3 entering the labor market during an economic downturn, beginning in precarious or temporary
4 jobs, or facing systemic discrimination—establish a foundation of uncertainty that constrains
5 opportunities for skill development, networking, and career advancement. These early
6 disadvantages have long-term reverberations by shaping how organizations perceive and sort
7 workers. Within organizational contexts, individuals with fragmented or uncertain employment
8 histories are often deemed less reliable or promotable, leading to reduced career development
9 opportunities. In these ways, organizational gatekeeping can magnify the uncertainty already
10 carried by individuals and solidify trajectories of disadvantage.

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At the societal level, institutional structures such as pension systems, healthcare access, and labor protections exacerbate these cumulative processes. In countries with weak safety nets, early career disruptions leave enduring scars, as fragmented work histories undermine eligibility for retirement benefits or limit access to long-term security; in contrast, stronger protections can dampen the extent to which early disadvantages cascade into later life stages.

Crucially, these levels are not independent but deeply intertwined. Over time, this interconnected web produces a temporal chain in which early disadvantages accumulate, increasing vulnerability to mid-career job loss, heightening insecurity in late-career employment, and narrowing possibilities for retirement transitions. Thus, from the cumulative (dis)advantage perspective, uncertainty across levels is interrelated as each level channels and amplifies prior experiences, resulting in either buffered or compounded trajectories of uncertainty.

Questions 5 & 6: How can individuals successfully regulate uncertainty in work-related transitions over the life course, and what can organizations and policymakers do to support individuals in their efforts?

Alexandra M. Freund

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As the *actual* changes in cognitive, social, and motivational functioning most older workers experience do not strongly affect work performance (Posthuma & Campion, 2009; Ng & Feldman, 2012), the best way to address uncertainties stemming from these erroneous age-related expectations and stereotypes might lie in actively counteracting them with interventions.

Donald M. Truxillo

Regarding technological change in the work context, a key point is to involve older workers in technology-related job redesign (Bidwell et al., 2023), perhaps treating such involvement as a form of job crafting. Further, training employees and decision-makers on ways to adapt to technological change (rather than just focusing on training new job skills) would go a long way to helping workers adapt to new technology (Parker & Grote, 2022) and should aid in reducing negative outcomes associated with uncertainty in the face of new or redesigned jobs (e.g., job insecurity, resistance to change). Embracing the uncertainty that comes with technological changes by involving and training employees may help deal with it effectively and identify new opportunities to support employees in their daily work.

Jutta Heckhausen

To answer this, we need to understand the part played by the individual and key individual differences when dealing with uncertainty in careers. In the following, we reflect on three key aspects.

One key aspect to consider is what we call '*smart heuristics*' for choosing career-related goals (Heckhausen et al., 2010, 2019). Heuristic techniques are pragmatic methods that help solve complex problems and make difficult decisions under uncertainty (Gigerenzer & Gaissmaier, 2011), such as setting career goals. First, the individual should consider timing, onset, and deadline to reach certain goals (e.g., promotions). This may be more important earlier

UNCERTAINTY IN WORK-RELATED TRANSITIONS

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1
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3 in careers and get less and less important as the time horizon shrinks later in careers. The second
4
5 smart heuristic is to consider costs and benefits for other life domains (e.g., work-family
6
7 conflicts). The third smart heuristic is having a Plan B. For example, massive technological
8
9 change may increase uncertainty in one's career, whether one can stay on that path or has the
10
11 opportunity or the need to switch to something else. Having a Plan B works better with a broader
12
13 educational base that is transferable to other careers (Heckhausen et al., 2017; Shane &
14
15 Heckhausen, 2012). And lastly, it is about the values and the intrinsic motives an individual has
16
17 about a career (Heckhausen et al., 2010, 2019). Early on in one's career, individuals have to
18
19 think about the financial payoff more, but this may become less important as they age, and they
20
21 may focus more on aspects that they truly value and like.
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26 A second key aspect to consider is the goal adjustment capacity (Heckhausen et al.,
27
28 2021). Under uncertain conditions, being able to adjust goals is essential, such as not giving up
29
30 but lowering one's aspirations if needed. Also important is the ability to stretch one's timeline
31
32 and allow for more time to reach one's goal (e.g., promotion or changing jobs). Furthermore,
33
34 focusing on a subset of skills or demands in a given goal that one excels in has better potential in
35
36 the long term. Finally, one should avoid defeat and self-blame if things do not work out, so as
37
38 not to impair one's future goal pursuit based on earlier failure (Heckhausen et al., 2010).
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42 The third key aspect of individual differences is about volition and volitional self-
43
44 management for goal commitment (i.e., how to volitionally self-manipulate or self-mobilize for
45
46 goal commitment). This works through enhancing the evaluation of a goal, the perceived control
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48 and competence in a given goal, and not getting distracted by alternatives or by other life
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50 domains when it is essential to pursue a given goal (Heckhausen & Wrosch, 2016; Hommelhoff
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52 et al., 2020; Shane & Heckhausen, 2012).
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UNCERTAINTY IN WORK-RELATED TRANSITIONS

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Mo Wang

Successfully regulating uncertainty in work-related transitions requires individuals to develop adaptive strategies to cope with both the unpredictability of change and the long-term demands of career development. At the individual level, one key pathway is cultivating psychological flexibility—the capacity to adjust goals, strategies, and expectations when circumstances shift (Doorley et al., 2020; Kashdan, 2010). Workers who practice proactive career self-management (e.g., continuous skill updating, networking, or seeking feedback; Chiaburu et al., 2006) can transform uncertainty into a source of opportunity rather than a threat. Developing identity flexibility is equally important, as individuals who maintain multiple role identities (professional, familial, civic) often find it easier to reconfigure their sense of self when a single role is disrupted (Sinnott, 2017). Finally, resilience is strengthened through the use of social support networks, reflective practices, and meaning-making strategies that help individuals sustain motivation and well-being in the face of ambiguous futures.

Organizations can reinforce individual strategies by creating structures that enhance workers' sense of security and agency. Transparent communication during periods of change, opportunities for lifelong learning and reskilling, and the provision of flexible work arrangements help employees manage transitions with greater confidence. Equally important are supportive leadership practices that normalize uncertainty as a shared challenge.

Policymakers can strengthen these efforts by embedding resilience into the broader labor market and social safety net. Accessible retraining programs, portable benefits, and policies that reduce penalties for career interruptions (e.g., parental leave or mid-career retraining) enable individuals to reenter the labor market without disproportionate disadvantage. Furthermore, policies that incentivize organizations to invest in employee development and protect against

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2
3 extreme precarity ensure that uncertainty does not spiral into long-term disadvantage. By
4
5 aligning individual, organizational, and policy strategies, societies can build an adaptive
6
7 ecosystem that not only equips individuals to regulate uncertainty but also empowers them to
8
9 view transitions as opportunities for renewal rather than sources of chronic insecurity.
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12 **Integrating Past Research on Aging, Career, Work, and Retirement Uncertainty**

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15 In addition to the panel discussion, we consider prior research in the domains of aging,
16
17 career, work, and retirement that has explicitly conceptualized and investigated uncertainty for
18
19 the development of our framework. In the aging literature, Fowler et al. (2015) define
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21 uncertainty about aging as “feeling uncertain about what getting older entails” (p. 438). They cite
22
23 the fundamental ambiguity surrounding one’s future existence as source of uncertainty about
24
25 aging, which includes health and mortality, finances, the availability, form, and quality of care,
26
27 loneliness, loss, the impact of retirement, the purpose of later life, identity, and how to behave as
28
29 an older adult, as also discussed in various prior articles (e.g., Ågren, 1998; Carstensen, 2009;
30
31 Fischer et al., 2008; Kemper et al., 2005; Neikrug, 2003; Nuttman-Shwartz, 2004). These aspects
32
33 have also been mentioned by our panelists.
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38 Career-related uncertainty has been defined by Tien et al. (2005, p. 164) as “any factors
39
40 that make individuals feel uncertain of their career future.” In their study, they asked students
41
42 open-ended questions about what kind of experiences make them feel uncertain about their
43
44 future career, and they extracted three major categories from their responses: internal/personal
45
46 sources of career uncertainty (such as ambiguous personal career goals), environmental/external
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48 sources (such as changes in the labor market), and the interactions between personal and
49
50 environmental factors (such as influence from significant others). Others have restricted the
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52 definition of career-related uncertainty to negative aspects, such as perceptions of growing
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3 difficulties in career planning and a lack of job opportunities (Körner et al., 2015; Tomasik &
4 Silbereisen, 2009). In addition, career shocks, defined as disruptive events caused by factors
5 outside of the individual's control (Akkermans et al., 2018), and serendipitous career
6 development events, defined as positive events that are not planned or predictable but
7 significantly influence one's career (Betsworth & Hansen, 1996), might be considered sources of
8 career uncertainty. Overall, we note some variability in how career uncertainty is defined in the
9 literature. Conceptualized as external events, career shocks and serendipitous career events
10 would not include sources of career uncertainty related to the self (e.g., uncertainty as a result of
11 the reevaluation of personal abilities or one's own actions). Although Tien et al.'s (2005) study is
12 based on a student sample, the conceptualization of career uncertainty is fairly broad (including
13 internal and external sources and their interaction) and neutral, and thus more reconcilable with
14 our perspective.

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31 Regarding uncertainty related to the work context, Leach et al. (2013) define work
32 uncertainty narrowly around employees' job tasks, including uncertainty related to resources to
33 complete tasks, task processes, and input/output of tasks. Other studies focused on uncertainty
34 related to organizational change (e.g., Bordia et al., 2004) or the organization in general (Colquitt
35 et al., 2012). Both uncertainty arising from the job and from organizational change have been
36 discussed by our panelists. In addition, the panel discussed macro-level trends, such as
37 technological changes, and their interaction with individual factors, such as abilities and skills,
38 which can provoke uncertainty (e.g., uncertainty about work ability or fit with the job).

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49 In the retirement literature, uncertainty has been examined in relation to retirement age,
50 timing, and planning (e.g., Ekerdt et al., 2001; Gignac et al., 2019; Moffatt & Heaven, 2017), as
51 well as in relation to fluctuations in the economy (e.g., McDaniel et al., 2013; Yorgason et al.,
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2020). Dossinger and Beaver (2024) adopted the concept of self-uncertainty to retirement. Our panelists have complemented these macro-level and individual-level sources of uncertainty related to retirement by meso-level factors, stemming from both the work context (i.e., organizational and job factors) and the nonwork life context (i.e., family and social network factors).

Overall, we notice that prior research on uncertainty in the aging, career, work, and retirement domains is relatively scarce. The identified studies resonate with ideas expressed by the panelists, although there are variations in how broadly uncertainty is conceptualized. As informed by the panel discussion and prior research on aging, career, work, and retirement, we attempted to develop an integrative conceptual framework capturing sources of uncertainty in work-related transitions.

An Integrative Conceptual Framework of Uncertainty in Work-Related Transitions

Our aim is to develop a framework that is both integrative, by accounting for insights from aging, career, work, and retirement research, and conceptual, by contributing to a better understanding of uncertainty in work-related transitions over the life course.

Multi-Level Sources of Uncertainty in Work-Related Transitions

Informed by the panel discussion and existing aging, career, work, and retirement research, we develop a framework that highlights macro-, meso-, and micro-level characteristics, states, events, and changes (summarized as factors) that can function as *sources* of uncertainty in work-related transitions over the life course (see Figure 2). For example, at the *macro-level*, uncertainty can stem from global, national, institutional, cultural, and societal factors (e.g., climate change, healthcare systems, cultural values). At the *meso-level*, the organizational and social contexts, such as the employer, work teams, and people's private and professional

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3 networks are sources of uncertainty. At the *micro-level*, characteristics of the self (e.g., identity,
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5 goals, motives, financial resources, abilities, health) can be sources of uncertainty in work-
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7 related transitions.
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10 --- INSERT FIGURE 2 ABOUT HERE ---
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12 Furthermore, our framework illustrates that sources of uncertainty in work-related
13 transitions are interrelated, as discussed by the panelists. Structure is largely determined by the
14 macro- and meso-level factors. Hence, structural uncertainty can be described as uncertainty
15 stemming from the macro- and meso-level. In contrast, agency is an individual-level
16 characteristic or state. Agency refers to a focus on the self, perceived control, motivation, and
17 action (e.g., Brandtstädter & Rothermund, 2002; Freund & Baltes, 2000; Heckhausen et al.,
18 2010, 2019). The two opposing arrows in Figure 2 indicate that individual agency and structure
19 interact. In fact, the macro-, meso-, and micro-level factors can be situated along the dimension
20 of personal control/agency, from more exogenous sources of uncertainty at the macro-level (i.e.,
21 uncertainty in the broader environment (external), over which individuals have little direct
22 control) to more endogenous sources of uncertainty at the micro-level (i.e., uncertainty
23 individuals experience within themselves (internal) or in their immediate environment, over
24 which they have more control). This conceptual distinction delineates (1) the *location* of
25 uncertainty relative to the individual and (2) the *degree of controllability* of the uncertainty by
26 the individual (Griffin & Grote, 2020).³ More endogenous uncertainty is influenced by more
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53 ³The conceptual distinction between exogenous and endogenous uncertainty is useful for two reasons. First, it
54 provides structure and is yet parsimonious, more accurate, and complete than other distinctions, which are conflated
55 in concepts, such as perceived uncertainty or internal uncertainty as mere reflections of the environment (for a
56 discussion, see Griffin & Grote, 2020). Second, as we will outline in our roadmap for future research, individual
57 agency may play an important role in understanding successful regulation of uncertainty.
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3 exogenous uncertainty. However, individuals can also exert some control through psychological
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5 processes.
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8 **Psychological Processes as a Source and Regulator of Uncertainty in Work-Related**
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10 **Transitions**

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12 Psychological processes (i.e., perceptions, evaluations, and decision-making) are
13 included at the micro-level in Figure 2. Psychological processes may play a key role in
14 determining what sources of uncertainty are, as essentially any aspect of work-related transitions
15 that individuals think is not certain can be considered a source of uncertainty, based on our
16 earlier definition. Individuals must be aware of the uncertainty (*perception*), and it must be
17 relevant to the self (*evaluation*) to have an impact on their intentions, timing, and planning
18 (*decision-making*). Perception, evaluation, and decision-making are elements rooted in theories
19 on general perception (Cutting, 1987), social information processing (Salancik & Pfeffer, 1978),
20 lay beliefs (Molden & Dweck, 2006), the theory of planned behaviors (Ajzen, 1991), and social
21 cognitive theory (Bandura, 2001). Common to these theories is that they describe how
22 individuals perceive the environment, evaluate it, and form intentions and decisions that can lead
23 to behavior. Perception refers to the salience of uncertainty based on the receptivity to cues and
24 signals from the self or environment, the magnitude of uncertainty based on the frequency and
25 intensity of these cues and signals, and the meaning-making attached to them. Evaluation refers
26 to the number and characteristics of potential outcomes, preferences formed by prior
27 experiences, expectations, and affect. Evaluation also includes relevance, or the centrality and
28 urgency to oneself, as a defining feature for the experience of uncertainty. Decision-making
29 includes the formation of intentions, timing, and planning.
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These psychological processes are influenced by individual factors, such as attitudes, personality, motives, interests, past experiences, and expectations (Rau et al., 2021) as well as the more proximal social environment (meso-level) and the broader context (e.g., culture; Shao et al., 2022) at the macro-level. Importantly, in addition to allowing individuals to control some uncertainty, these psychological processes can also be sources of uncertainty in their own right. For example, one can be uncertain about one's perception of whether environmental cues signal age discrimination or not; one can also be uncertain about career preferences, priorities, and decisions, and retirement planning and timing.

A Roadmap for Future Research

By drawing on our framework and the panel discussion, we highlight three avenues for future research on uncertainty in work-related transitions over the life and summarize actionable suggestions with research questions and potential methodologies in Table 1.

Conceptualization and Operationalization of Uncertainty in Aging, Career, Work, and Retirement Research

We have argued that uncertainty should be explicitly considered in aging, career, work, and retirement research. Our framework provides a starting point for the kinds of uncertainty researchers may want to examine. The intricacies of studying uncertainty in work-related transitions are far more involved than what we could capture in our framework. To have an impact on any individual, they must be aware of the uncertainty as a state of not knowing for sure, and it must be relevant to the self—aspects reflected in the psychological processes of our framework. Thus, when examining uncertainty related to aging, career, work, and retirement, it is important for researchers to first understand under which circumstances and at what age or life phases different types of uncertainty are particularly relevant and salient to individuals. For

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3 instance, Ekerdt et al. (2001) argued that age raises the social salience and topicality of
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5 retirement plans and showed that uncertainty regarding retirement plans decreases with age but
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7 not uncertainty about retirement timing. Once retirement starts (assuming it is a binary decision
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9 for the sake of simplicity of this example), uncertainty about retirement timing will be zero, but
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11 other sources of uncertainty, such as questions related to identity as mentioned by Wang, might
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13 peak. This example highlights the importance of taking a more nuanced approach and focusing
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15 on specific factors and processes that are sources of uncertainty rather than applying global
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17 measures. Future research might investigate which factors and processes are the most salient and
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19 sizable sources of uncertainty in different kinds of work-related transitions. Moreover, research
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21 should investigate whether the salience and magnitude of one uncertainty factor trigger the
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23 salience and magnitude of another uncertainty factor in the same or a different domain (aging,
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25 career, work, retirement; refer also to Figure 1) or at a different level. Research should also
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27 examine how different sources of uncertainty (in the same or across domains) interact when
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29 perceived at the same time.
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35 This article highlights the interrelatedness of uncertainty in aging, career, work, and
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37 retirement. It may be difficult to clearly differentiate between aging, career, work, and retirement
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39 uncertainty conceptually. In the end, uncertainty related to these domains concerns oneself (i.e.,
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41 one's capabilities, opportunities, resources, identity, etc.) as one experiences and manages a
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43 variety of work-related transitions. Thus, our recommendation for future research is two-fold. On
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45 the one hand, researchers should measure fine-grained factors or processes as sources of
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47 uncertainty rather than applying global measures of aging, career, work, or retirement
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49 uncertainty. Investigating specific sources of uncertainty allows for differentiation that can
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51 advance our understanding and enable the development of targeted interventions. On the other
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3 hand, we encourage future research to undertake efforts to understand the underlying
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5 commonalities of these sources of uncertainty and their interactions. The field needs both sense-
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7 making through theory-building and empirical research to test these theories. Perhaps the linkage
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9 between sources of uncertainty and experienced uncertainty is analogous to the conceptual
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11 coupling of the stressor-strain relations, where stressors come from various sources and
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13 psychological distress or strain captures the reactions to stressors.
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17 Applying a resources-demands perspective to categorize sources of uncertainty may also
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19 be plausible. For example, at its very core, some sources of uncertainty may represent resources,
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21 whereas others represent demands. Additionally, applying Event System Theory (Morgeson et
22
23 al., 2015) may be a useful starting point by offering a focus on change, dynamics, and
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25 longitudinal phenomena toward work-related transitions, as highlighted by Truxillo. According
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27 to this theory, events (e.g., a job change) do not occur in a vacuum. Events at the macro-, meso-,
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29 and micro-level can have effects on features of the environment, behaviors, trigger other events,
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31 or alter the strength of associations between behaviors and features on the same and across
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33 levels. This emphasizes the dynamics and connectedness of events that affect how uncertainty
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35 may be perceived, evaluated, and how individuals make decisions, as reflected in the micro-level
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37 processes highlighted in our framework.
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42 Regarding the operationalization of individuals' perception, evaluation, and decisions
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44 toward uncertainty, researchers should note that there may be a range of differences in the ways
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46 in which uncertainty can manifest. To illustrate, while there are few age-related changes in risky
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48 decision-making (Frank & Seaman, 2023), a study on ambiguous decision-making found that
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50 older adults demonstrated less ambiguity aversion (Sproten et al., 2018). In another study with
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52 decisions involving risky and certain options, older adults showed more risk-seeking than
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3 younger adults in loss conditions (i.e., greater avoidance of sure losses), and more risk-aversion
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5 in gain conditions (Mather et al., 2012). The varying degree of age-based differences between
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7 risky, ambiguous, and certain choices across different studies indicates that individuals'
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9 perception, evaluation, and decisions might depend on the way uncertainty manifests, or at least,
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11 how it is experienced by the individual. When specifically looking at risk, Frank and Seaman
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13 (2023) also pointed to discrepancies in the literature on self-report and behavioral data. While
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15 self-reported risk tolerance decreases with age, there is little evidence of actual age-related
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17 changes in risky behavior (Frank & Seaman, 2023; Frey et al., 2021).

21 **Understanding Why and When Aspects of Uncertainty in Work-Related Transitions are** 22 **Challenges and Opportunities**

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26 Most research implicitly or explicitly assumes that uncertainty is negative, stressful, and
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28 unwanted (e.g., Bordia et al., 2004; Körner et al., 2015; Lechner et al., 2016). However, as the
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30 panelists highlighted, this view may be unnecessarily narrow. This is in line with conceptual and
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32 empirical work suggesting that a more balanced and differentiated view of uncertainty is
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34 warranted, as uncertainty also entails motivational potential through opportunities that allow for
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36 growth, exploration, and serendipitous events (Alquist & Baumeister, 2024; Cabib et al., 2024;
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38 Dweck, 2017; Gelatt, 1989; Griffin & Grote, 2020; Harris et al., 2024; Kruglanski et al., 2025;
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40 Mitchell et al., 1999; Rigotti et al., 2014; Rudolph & Zacher, 2024). Therefore, understanding
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42 why and when aspects of uncertainty in work-related transitions are evaluated as challenges and
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44 opportunities is an important question.
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49 Research suggests a key element is individual uncertainty preference, which is the level
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51 of uncertainty a person feels comfortable with (Afifi & Weiner, 2004; Gasiorek et al., 2019;
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53 Griffin & Grote, 2020; Grote & Pfrombeck, 2020). Preferences are part of the evaluation process
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3 in our framework. If a person's preferred level of uncertainty corresponds to their experienced
4 level of it (or is higher), they are expected to feel comfortable with the current uncertainty or
5 even seek more uncertainty. In contrast, if the preferred level of uncertainty is lower than the
6 currently experienced level, individuals feel uncomfortable and aim to reduce it. These
7 propositions imply a more positive evaluation of uncertainty if the discrepancy between
8 preferred and experienced levels is positive and a more negative evaluation if the discrepancy is
9 negative. But what defines individuals' uncertainty preferences and evaluations? Based on our
10 framework, which depicts that uncertainty preferences and evaluations are shaped by macro-,
11 meso-, and micro-level factors, we outline three avenues to examine this question.

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24 First, timing might indirectly influence uncertainty evaluations by shaping uncertainty
25 perception processes. Timing can be considered a macro-level aspect captured by social norms in
26 our framework because timing defines normative transitions (e.g., school-to-work transition in
27 one's 20s) and non-normative transitions (work-to-school transition in one's 50s). Timing likely
28 affects the perception of uncertainty sources (i.e., salience, magnitude, and meaning) because
29 normative transitions can be more accurately predicted (Akkermans et al., 2024). Time is also an
30 important resource at the individual level that allows one to control and shape uncertainty and
31 maximize the realization of desired goals, as also mentioned by Heckhausen. For instance, if
32 more time lies ahead of an anticipated organizational change, it may allow for better preparation
33 and planning to deal with that uncertainty, and thus, uncertainty may be perceived less as a
34 challenge and more as an opportunity.

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49 Second, uncertainty-related individual differences, such as uncertainty avoidance,
50 uncertainty orientation, tolerance for ambiguity, intolerance of uncertainty, need for cognitive
51 closure, self-concept clarity, and curiosity may play a key role in defining individuals'

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3 uncertainty preferences. These individual differences vary in valence, locus, and degree of
4 contextualization (Gerlach & Pfrombeck, 2025). Laguerre and Barnes-Farrell (2024) measured
5 intolerance of uncertainty as an indicator of an individual's difficulty in tolerating uncertainty
6 and tendency to interact positively or negatively with it. Based on Grote and Pfrombeck's (2020)
7 proposition that those who are more tolerant of uncertainty would engage in more opening
8 behaviors (e.g., actions aimed at fostering learning, exploration, and personal growth), Laguerre
9 and Barnes-Farrell found that intolerance of uncertainty was negatively associated with
10 motivation to continue working and financial risk tolerance toward retirement via general future
11 time perspective, and negatively associated with work ability via occupational future time
12 perspective. Additionally, the personality traits of openness to experience (and its facets of
13 inquisitiveness, creativity, and unconventionality) and neuroticism (and its facets of fearfulness
14 and anxiety) may be relevant for forming uncertainty preferences (Ashton & Lee, 2009). Finally,
15 researchers may consider the role of the uncertainty mindset (Magni et al., 2025), which assesses
16 individuals' implicit theories (i.e., lay beliefs) about uncertainty. It combines both an active
17 perceptual meaning-making component about the malleability of uncertainty and an evaluative
18 component of whether it is appraised as a threat or opportunity.
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40 Third, based on our framework, we discuss individual agency as a potential factor
41 determining uncertainty preferences and evaluations. Prior research has highlighted the
42 importance of personal agency for work-related transitions (De Vos et al., 2021; Fouad &
43 Bynner, 2008), but not with an uncertainty lens. Individual agency orients the individual to the
44 self, one's own goals, mastery of skills, competence, achievement, and a feeling of personal
45 control (Abele & Wojciszke, 2007; Heckhausen et al., 2019). Individuals with more resources,
46 power, and status tend to have a greater sense of advantage, which in turn creates a sense of
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3 agency; this agency allows those individuals to approach their environment differently compared
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5 to people with lower agency (Rucker et al., 2018). A sense of agency is also important for
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7 uncertainty regulation (Griffin & Grote, 2020), as it defines the differentiation between
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9 exogenous and endogenous uncertainty, as highlighted by our framework. Compared to high-
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11 agency individuals, low-agency individuals may perceive a narrower sphere of endogenous
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13 uncertainty that makes them feel more constrained by and exposed to exogenous uncertainty. In
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15 other words, individuals with a higher sense of agency may perceive uncertainty as more
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17 controllable and thus evaluate uncertainty more favorably, or even as an opportunity. Future
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19 research may also investigate whether a sense of agency predicts uncertainty mindsets.
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24 This focus on agency is tied to seminal theories in the aging and lifespan literature.
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26 According to the selection, optimization, and compensation theory (Baltes, 1997; Freund &
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28 Baltes, 2000), abundant resources activate elective selection of growth (agency), whereas
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30 declining resources and lifetime perspective activate loss-based selection and compensation
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32 strategies. Relatedly, the motivational theory of lifespan development (Heckhausen et al., 2010)
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34 proposes that successful development and aging are based on maximizing the extent to which a
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36 person has influence (i.e., primary control/agency) across the multiple major domains of life in a
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38 way that is synchronized with age-related changes characteristic of human development.
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42 To summarize, we suggest timing, uncertainty-related individual differences, and
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44 personal agency as three avenues to advance our understanding of why and when uncertainty in
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46 work-related transitions is evaluated as a challenge and opportunity. The connection of lifespan
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48 developmental concepts with uncertainty through individual agency underlines the potential of
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50 explicitly considering uncertainty in future aging, career, work, and retirement research.
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Actions at the Policy, Organizational, and Individual Levels to Support Uncertainty

Regulation

Building on the previous section, agency might be at the core of the perception and evaluation processes of uncertainty, which likely affects individuals' decision-making and ability to generate benefits from it in work-related transitions. As pointed out by Heckhausen and integrated into our framework, structure and agency are interrelated. A macro- and meso-level context that is loosely structured is likely to create more uncertainty. While allowing a higher degree of flexibility and possibilities, a lack of structure and increased uncertainty may also foster inequalities because those with lower agency (due to lower financial resources, power, socioeconomic status, etc.) may be less able to generate benefits out of that uncertainty. However, reducing individual agency by maximizing structure to promote equality in society may not be feasible either because uncertainty cannot fully be eliminated. Paradoxically, policies that reduce some sources of uncertainty can also increase uncertainty in other ways. For example, a fixed retirement age reduces retirement timing uncertainty to a minimum. However, it can induce much uncertainty for individuals in relation to their identity and purpose in life as they experience a complete change in their daily routines from one day to another (Bimrose & Brown, 2009). Therefore, to enable better uncertainty regulation, organizational and policy measures should focus on conveying a sense of agency to individuals, especially to those with a lower sense of agency due to fewer financial and other resources.

At the macro-level, research should examine what societies can do to support inclusive and equitable education and lifelong learning, which is also one of the UN Sustainable Development Goals (United Nations, 2024). Education and lifelong learning can create individual agency and allow proactive adaptation for workers of all ages as jobs disappear or

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3 change or new jobs become available due to macroeconomic factors and processes, such as
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5 technological advancements, the emergence of the new economy, and climate change (Beier et
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7 al., 2025; Bimrose & Brown, 2009; Fouad & Bynner, 2008; Heckhausen et al., 2019).

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10 At the meso-level, employers can also vary the structure they provide. More flexible
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12 human resource structures may provide opportunities for more individual agency, but flexible
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14 structures can also create more uncertainty. Organizations need to ensure that flexible programs
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16 are equally accessible and available to employees regardless of their hierarchical rank, age,
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18 gender, race, or other potential basis for discrimination. Research might investigate the effects of
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20 flexible work arrangements, phased retirement, and mentorship programs, and whether they may
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22 foster employee agency and support the psychological and social adjustment of employees in
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24 work-related transition.
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29 Similarly, job crafting interventions deserve further consideration, as mentioned by
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31 Truxillo, as they provide employees with agency to change their jobs. Job crafting interventions
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33 have been found to be differentially helpful for workers of different ages (e.g., Kooij et al.,
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35 2017). Moreover, focusing on the job demands and resources (JD-R; Bakker & Demerouti, 2017)
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37 should support the job design of workers in uncertain contexts. The JD-R model has proved to be
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39 a useful lens for understanding work ability (one's ability to meet the requirements of one's job;
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41 Brady et al., 2020; Cadiz et al., 2019), a marker for successful aging, and a predictor of well-
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43 being, performance, disability, and retirement (Brady et al., 2020). Work ability's multiple
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45 dimensions—physical, cognitive, interpersonal, and emotional (McCarthy et al., 2024)—each
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47 deserve attention depending on the particular job involved and its design. Because adaptation is
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49 implicit in theories of lifespan development, these theories can also provide a solid foundation
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51 for understanding the design of work in later work life (Truxillo et al., 2012; Zaniboni et al.,
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2013). Individuals who have a sense of agency and are able to adapt to the factors and processes that pose sources of uncertainty will be more likely to experience successful aging at work.

At the individual level, the motivational theory of lifespan development suggests utilizing specific heuristics for making decisions about which goals to pursue or disengage from at a given point in life, with the ultimate goal of successful lifespan development (Heckhausen et al., 2010, 2019). Heuristics are decision rules that acknowledge the incompleteness of information and thus the presence of uncertainty in real-life decisions (Gigerenzer & Gaissmaier, 2011). Contrary to common misperceptions, heuristics do not imply second-best or suboptimal results (Gigerenzer, 2008). As pointed out by Heckhausen, these heuristics may also prove useful in dealing with uncertainty because their purpose is to optimize goal choice in such a way as to maximize primary control capacity (i.e., agency) across the life span. From an uncertainty perspective, the heuristic of matching goals to opportunities and pursuing goals at the peak of their attainability can require risk-taking and increasing uncertainty at the right time—an aspect also reflected in planned happenstance theory on how to capitalize on unexpected career opportunities (Mitchell et al., 1999) and in the form of expansive agency in uncertainty regulation theory (Griffin & Grote, 2020).

In addition, selective secondary control strategies—meta-volitional strategies, including perceptions of enhanced control over goal attainment, elevated valuation of aimed-for goals, anticipated positive emotions with goal attainment, and avoidance of distraction—can help an individual stay committed to a chosen goal and enhance primary control (i.e., agency) (Heckhausen et al., 2010, 2019). A better understanding of these dynamics from an uncertainty perspective should facilitate the development of interventions that help individuals manage uncertainty arising in work-related transitions. For example, a self-affirmation exercise might

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3 strengthen motivation and persistence in the face of uncertainty, for example, when experiencing
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5 job loss and unemployment (Pfrombeck, Galinsky, et al., 2023). Persistence and enhanced effort
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7 are essential motivational resources for successful agency in development (Heckhausen et al.,
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9 2019), and this may also hold for agency to successfully manage uncertainty in work-related
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11 transitions.
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15 Lastly, one way to address uncertainties related to aging and workplace fit may lie in
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17 actively counteracting age-related expectations and stereotypes with interventions targeting
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19 erroneous perceptions, as mentioned by Freund. Clarifying misperceptions about age-related
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21 declines and stereotypes might also strengthen a sense of agency among older workers (Liu et
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23 al., 2021).
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26 Conclusion

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28 Based on a panel discussion reflecting on how uncertainty is often implied in aging-,
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30 career-, work-, and retirement-related topics, we developed an integrative conceptual framework
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32 of sources of uncertainty that individuals may experience in work-related transitions. We hope
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34 our framework and roadmap will stimulate future research on uncertainty to advance our
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36 understanding and enable individuals' successful mastery of work-related transitions over the life
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38 course.
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Figure Legends List

Figure 1. A Conceptual Map of Topics in the Aging, Career, Work, and Retirement Literature Relevant to Uncertainty in Work-Related Transitions Over the Life Course

Figure 2. An Integrative Conceptual Framework of Macro-, Meso-, and Micro-Level Sources of Uncertainty in Work-Related Transitions Over the Life Course

Note. The framework depicts macro-, meso-, and micro-level factors (i.e., characteristics, states, events, changes) as potential sources of uncertainty in work-related transitions. The macro- and meso-level form structural sources of uncertainty. Micro-level sources of uncertainty are endogenous because they reside within individuals or in their immediate environment, over which they experience some control (a sense of agency). In contrast, macro- and meso-level sources of uncertainty are more exogenous, over which individuals have less or no direct control. The double-arrow on the left indicates that the differentiation between exogenous and endogenous uncertainty is continuous. Structure and agency in work-related transitions interact (as depicted by the two opposing arrows). The psychological processes on the individual level highlight that uncertainty in work-related transitions is experienced through, and also caused by, perceptions (including salience, magnitude, and meaning), evaluations (including preferences, relevance, and potential outcomes), and decision processes (including intentions, planning, and timing).

Recommendation	Actions for future research	Example	
		Research questions	Methods
Conceptualization and operationalization of uncertainty in aging, career, work, and retirement research	<ul style="list-style-type: none"> - Measure specific states, changes, events, or processes as sources of uncertainty rather than applying global measures of aging, career, work, or retirement uncertainty - Examine how different sources of uncertainty in work-related transitions (within and across domain) affect each other - Consider the potential impact of uncertainty operationalizations in study design: self-report vs. behavioral data, risk vs. ambiguity, loss vs. gain framing - Theoretical integration of uncertainty in work-related transitions (e.g., using a job demands-resources or events systems perspective) 	<i>How is work uncertainty (i.e., task-related, input/output, and resource uncertainty) related to uncertainty about one's work ability? Is job autonomy a moderator?</i>	E.g., cross-lagged panel model to examine reciprocal relationship; use objective measures of job autonomy or work uncertainty if possible
Understanding why and when aspects of uncertainty in work-related transitions are challenges and opportunities	<ul style="list-style-type: none"> - Investigate the predictors of individual uncertainty preferences and evaluations at the macro-, meso-, and micro-level: timing, uncertainty-related individual differences, sense of agency - Examine how individual uncertainty preferences and experienced uncertainty interact and influence decision-making and behavioral outcomes 	<i>Does the experience of job insecurity in one's early career stage have lasting effects on intolerance of uncertainty, which in turn affects late career stage and retirement planning?</i>	E.g., mediation model with intolerance of uncertainty as mediator; use longitudinal data (e.g., from public panel data base)
Actions at the policy, organizational, and individual levels to support uncertainty regulation	<ul style="list-style-type: none"> - Focus on factors/develop interventions that promote a sense of agency (e.g., education and lifelong learning) - Consider implications of individuals' varying level of endogenous uncertainty for social equity and fairness - Consider the structure and degree of flexibility of work arrangements, phased retirement, and mentorship programs and their relationship with personal agency 	<i>Does flexibility of human resource structures induce uncertainty about their availability, affecting their utilization depending on employees' sense of agency, and subsequently influence employee job satisfaction and stress?</i>	E.g., moderated mediation model with perceived uncertainty of HR practice use as mediator; measure sense of agency with core-self evaluations; use scenario-based experimental study design

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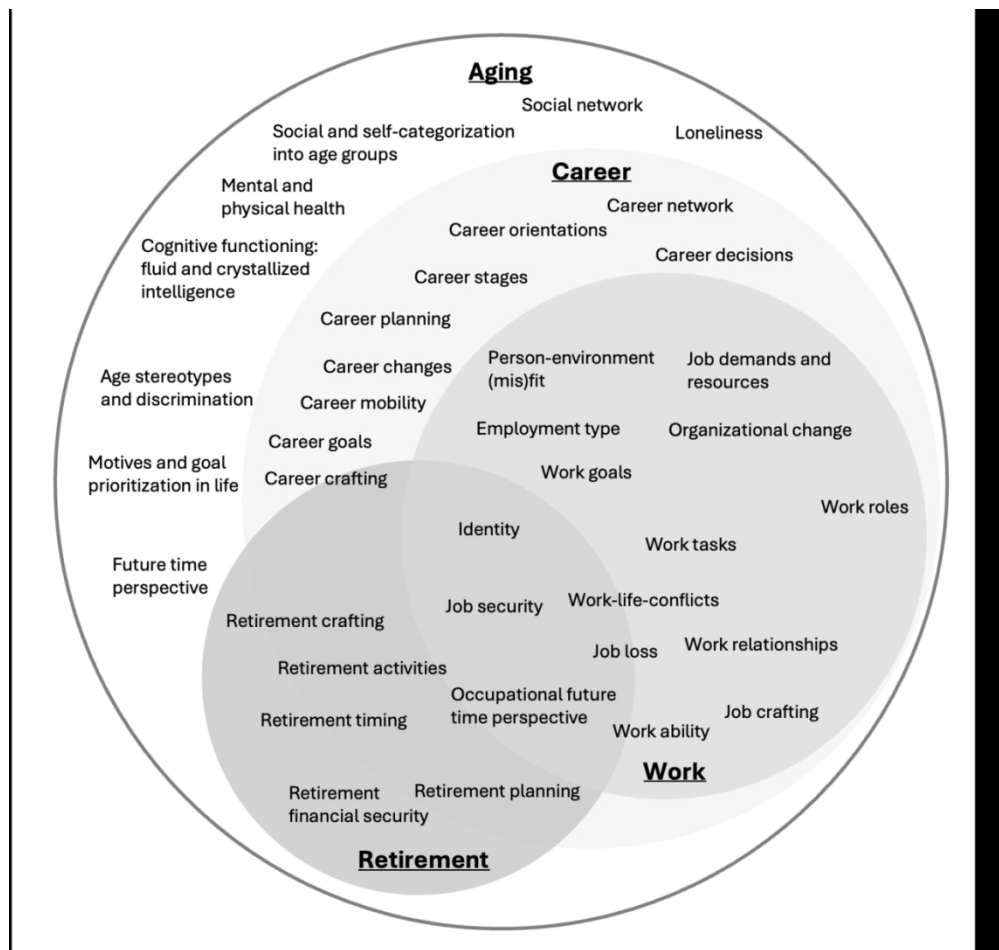


Figure 1. A Conceptual Map of Topics in the Aging, Career, Work, and Retirement Literature Relevant to Uncertainty in Work-Related Transitions Over the Life Course

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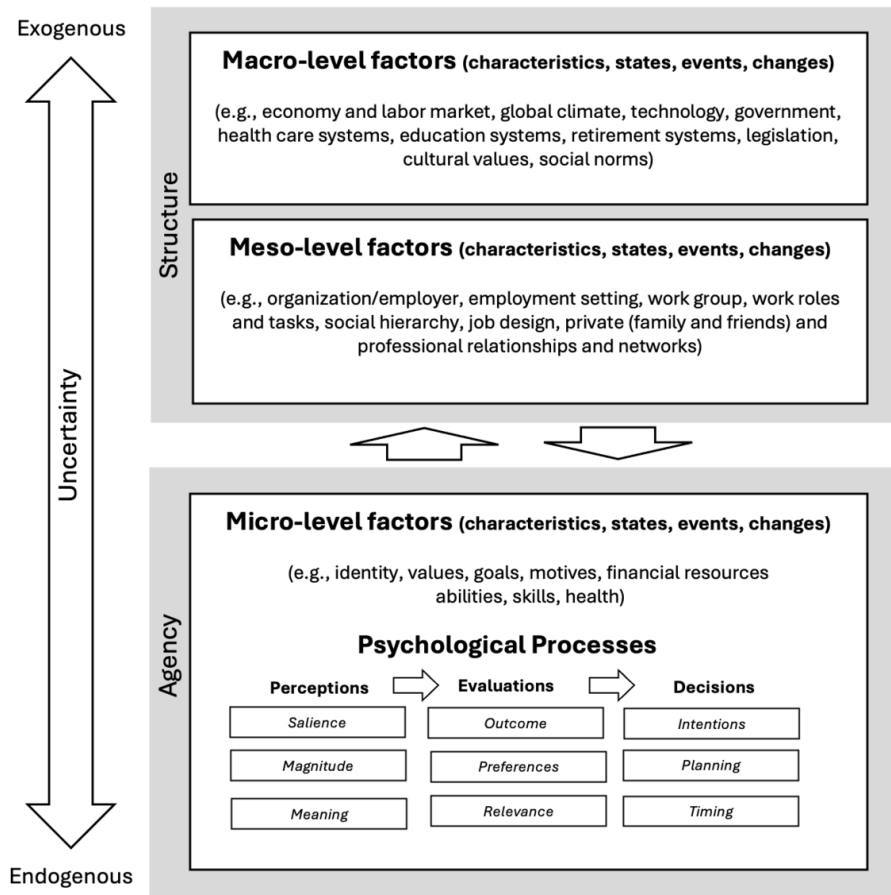


Figure 2. An Integrative Conceptual Framework of Macro-, Meso-, and Micro-Level Sources of Uncertainty in Work-Related Transitions Over the Life Course

Note: The framework depicts macro-, meso-, and micro-level factors (i.e., characteristics, states, events, changes) as potential sources of uncertainty in work-related transitions. The macro- and meso-level form structural sources of uncertainty. Micro-level sources of uncertainty are endogenous because they reside within individuals or in their immediate environment, over which they experience some control (a sense of agency). In contrast, macro- and meso-level sources of uncertainty are more exogenous, over which individuals have less or no direct control. The double-arrow on the left indicates that the differentiation between exogenous and endogenous uncertainty is continuous. Structure and agency in work-related transitions interact (as depicted by the two opposing arrows). The psychological processes on the individual level highlight that uncertainty in work-related transitions is experienced through, and also caused by, perceptions (including saliency, magnitude, and meaning), evaluations (including preferences, relevance, and potential outcomes), and decision processes (including intentions, planning, and timing).

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