Age-related differences in cognition and affect at work: the impact of mindfulness

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Age-related Differences in Cognition and Affect at Work: The Impact of Mindfulness

by

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ABSTRACT

The present research examined job-related affective and cognitive processes across ages, and the role of trait mindfulness as a mechanism that influences the strength of these relationships. Specifically, job-related affective well-being, job satisfaction, and fluid intelligence were investigated as they relate to dynamics of aging. Participants on Amazon’s Mechanical Turk (N = 174) completed a two-time longitudinal survey separating individual difference tests of trait mindfulness and fluid intelligence at Time 1 from self-report assessments of job satisfaction and job-related affective well-being at Time 2. Overall, the results from this study provide strong evidence that age and mindfulness both play an important role in predicting important work-relevant constructs, including well-being, job satisfaction, and fluid intelligence, with older, more mindful individuals reaping the benefits; however, trait mindfulness did not emerge as a significant moderator of any of these relationships. It is hoped that this study will inform practitioners about considering trait mindfulness as a tool to facilitate healthy aging in working adults and create a starting point for researcher to build upon.
INTRODUCTION

By 2024 the Bureau of Labor Statistics (2017) projects that the labor force will grow to include 41 million employees ages 55 and older – of whom about 13 million employees are expected to be 65 and older. With this rapid growth of older employees in the workforce, it is important to understand the dynamics of age-related differences at work and how they change over the lifespan. Two of these important dynamics are the influence of age on cognitive and affective experiences at work. It is well established that cognitive and affective processes influence a variety of important work outcomes. It is also well understood that there are age-related changes in cognitive abilities and affective states. For example, a longitudinal study found that cognitive ability at age 12 had a correlation of .51 with occupational level between 41 and 50 years of age (Judge, Higgins, Thoresen, & Barrick, 1999). In addition to these cognitive processes, emotional processing also plays an important role at work. Over time, individuals accumulate expertise in regulating emotions (Charles, 2010) and as people age, they seek out experiences that increase positive affect and decrease negative affect (Morgan & Scheibe, 2014). Because affective well-being changes with age, it is important to get the most out of age-related changes in these processes. In order to benefit from the age-related changes in cognitive and affective processes, it is important to develop a deeper understanding of what other mechanisms may influence these outcomes. Thus, this research will investigate whether trait mindfulness plays a role in mitigating cognitive decline and/or accentuating affective well-being.

As previously mentioned, cognitive processes tend to fluctuate with age. Cognitive abilities have been categorized into two broad groups: (1) fluid intelligence, referred to as “Gf”, and (2) crystallized intelligence, referred to as “Gc” (Cattell, 1987). Gf is associated with a number of more specific cognitive abilities including working memory, attention, and abstract
reasoning (Beier, Villado, & Randall, 2017), while Gc is associated with general knowledge and verbal comprehension. Research suggests that Gc increases with age (Cattell, 1987), however, fluid intelligence tends to peak sometime in the early twenties and decline gradually over time (Salthouse, 2004; Salthouse, 2009; Schaie, 1996; Wechsler, 1944). Although older workers experience a decline in Gf, increases in Gc facilitate job performance, such that older workers still perform as well as their younger counterparts (Waldman & Avolio, 1986). Although older employees do not experience decreases in job performance despite declines in Gf, they are likely to expend more cognitive resources than younger employees in order to maintain an optimal level of performance. Concerns with cognitive decline due to age have spurred an influx of research and public intervention efforts to try and address these challenges (Kanfer & Ackerman, 2004).

In addition to cognitive processes, affective processes also change over the course of one’s lifespan. According to socioemotional selectivity theory (SST; Cartensen, 1991), as individuals age, they change the ways in which they invest resources (i.e., time and energy) to the activities they engage in and this results from changing one’s view of life from “time lived” to “time left”. Empirical evidence suggests that older adults have greater affective well-being than younger adults, as reported by higher levels of positive affect and lower levels of negative affect (Bruine de Bruin, Parker, & Strough, 2016; Cartensen, Pasupathi, Mayr, & Nesselroade, 2000; Dahling & Perez, 2010). The change in emotional regulation and experiences of older adults might influence important work outcomes like job satisfaction and job-related affective well-being (Weiss & Cropanzano, 1996). Because emotions influence attitude development and affect fluctuates with age, age should influence the development of job satisfaction. However, the current literature on job satisfaction change across age is inconsistent at best (Glenn, Taylor,
This research aims to develop a deeper understanding of the dynamics of affective processes across ages in order to make the most of the aging workforce.

Mindfulness may be one way to understand and account for age-related differences in cognitive and affective processing so that organizations are capitalizing on the aging workforce. Mindfulness is conceptualized as the conscious, nonjudgmental awareness to the present moment, which involves naturally occurring mindfulness (i.e., trait mindfulness or dispositional mindfulness; Brown & Ryan, 2003) and mindfulness that varies from moment to moment and can be enhanced through practice (i.e., state mindfulness; Brown & Ryan, 2003). Research suggests there are age-related differences in mindfulness, such that older adults reported greater awareness of being in the present moment (Shook, Ford, Strough, Delaney, & Barker, 2017). Researchers have also investigated potential consequences of mindfulness in the workplace. Mindfulness might be associated with increased job performance by widening one’s attentional breadth (Dane, 2011) and foster well-being in the workplace by allowing individuals to notice emotional reactions without connecting meaning to them, thus reducing potential stress or anxiety (Good et al., 2016). In summary, mindfulness has the potential to influence important work outcomes and may be relevant to age-related processes.

This research aims to investigate the relationships between age, mindfulness and three dependent variables, (1) fluid intelligence, (2) affective well-being at work, and (3) job satisfaction. Along with the direct relationships between these variables, this research will also examine trait mindfulness as a mechanism that influences the strength of the relationships between age and these outcomes. This will allow us to evaluate whether mindfulness may help to partially explain age-related differences in these attitudes and cognitions that are important for
work and life. It is important for researchers to consider the potential effect of mindfulness on age-related influences of affective and cognitive processes at work for a number of reasons. First, the rapidly growing number of older employees in the workforce requires researchers to develop a thorough understanding of possible mechanisms that may influence affective and cognitive processes that change over the lifespan. Second, cognitive and affective processes influence a number of outcomes in the workplace. For example, these processes affect workplace outcomes such as faster acquisition of job-relevant knowledge (Schmidt & Hunter, 2004), absenteeism (Bono, Glomb, Shen, Kim, & Koch, 2013), job performance (Kaplan, Bradley, Luchman, & Haynes, 2009), and organizational commitment (Fisher, 2002). By developing a thorough understanding of the age-related dynamics of these processes in organizations, employees stand to benefit from possible workplace interventions that increase well-being and job satisfaction or attenuate natural declines in fluid intelligence, which may in turn lead to beneficial organizational outcomes.

THEORETICAL CONTRIBUTIONS

Age and Affective Well-Being

One important workplace outcome affected by age is affective well-being. Affective well-being refers to the experience of positive and negative emotions and moods (Warr, 1990). Specifically, when referring to the context of work, employee well-being has been defined as “the overall quality of an employee’s experience and functioning at work” (Grant, Christianson, & Price, 2007, p. 52. Baltes and Baltes (1990) describe a “well-being paradox” as the ability of older adults to maintain well-being despite negative age-related changes. This paradox may be explained by socioemotional selectivity theory (SST; Cartensen, 1991), which posits that as people age, they change the ways in which they invest resources (i.e., time and energy) into the
activities they engage in. This results in evaluative differences among age groups in their perceptions of well-being. Further, this theory suggests that adults have two key goals in life: (a) knowledge acquisition and (b) emotional regulation. While younger adults prioritize knowledge acquisition, older adults prioritize emotional regulation. According to SST, this change in priorities evolves from changes in one’s perceptions of time. As adults shift their perspective of time from “time lived” to “time left”, they begin to seek out experiences in pursuit of emotionally gratifying interactions. In contrast, younger adults are concerned with learning and building social relationships that will benefit them in the future. Additionally, an extension of SST, strength and vulnerability integration theory (SAVI; Charles, 2010) posits that over time, individuals accumulate expertise in regulating emotions. In fact, evidence from cross-sectional research suggests that there is a positive association between age and affective well-being at work, as reflected by increases in positive affect and decreases in negative affect (Charles, 2010; Morgan & Scheibe, 2014). Therefore, I predict that:

\textit{Hypothesis 1a:} There is a positive relationship between age and affective well-being at work.

\textbf{The Role of Mindfulness in Affective Well-Being}

There is a substantial amount of empirical support for the benefits of trait mindfulness regarding affective well-being. People with higher levels of trait mindfulness report less anxiety, depression, and stress as well as greater subjective well-being, self-esteem, and self-actualization (Brown & Ryan, 2003; Kiken & Shook, 2012). In a meta-analysis, Giluk (2009) found trait mindfulness was related to all Big Five personality traits in addition to being associated with trait affect. Specifically, mindfulness was positively related to positive affect, agreeableness, and conscientiousness while being negatively related to negative affect. Individuals with higher
levels of trait mindfulness are more effective at regulating emotions, likely because they refrain from attaching any evaluation to the emotions, rather, they observe them without judgment (Good et al., 2016). This process of emotion regulation as proposed by Gross (1998) involves changing cognitive reactions to the emotions we experience, which is the essence of mindfulness. Additionally, mindfulness has been linked with an individual’s ability to accept emotional states and repair negative states (Brown, Ryan, & Creswell, 2007). Thus, I hypothesize:

*Hypothesis 1b:* There is a positive association between mindfulness and affective well-being at work.

**Mindfulness as a Moderator of the Age – Affective Well-being Relationship**

Beyond examining the simple main effects of age and mindfulness on work-related affective well-being, I am interested in the possibility that these two predictors may interact, with older, more mindful workers experiencing the highest levels of well-being compared to younger and less mindful individuals. As highlighted previously, older individuals are more likely to experience greater affective well-being at work than younger individuals (Scheibe, Yueng, & Doerwald, 2018). However, fluctuations in affective well-being may result from stressors (e.g., changes in the work role or environment) regardless of one’s age (Beal & Ghandour, 2011). Mindfulness may be useful for retaining higher levels of affective well-being during extended periods of heightened stressful events. By refraining from attaching judgment to stressors, the negative effect of the prolonged buildup of strain on affective well-being should be reduced. Additionally, a key component of mindfulness is an awareness to the present moment. Because older individuals are more likely to seek out positive experiences and avoid negative experiences than younger individuals (Cartensen, 1991; Morgan & Scheibe, 2014), increased levels of
mindfulness may lead to an increased awareness of the more positive emotions and experiences older individuals are more likely to encounter. Additionally, the increased emotion regulation skills of older adults (Charles, 2010; Gross, 1998) may be further enhanced by mindfulness, which helps to shield individuals from the potential harm of negative experiences (Brown et al., 2007), resulting in experiencing fewer negative, more positive emotions. Taken together, these pieces of evidence suggest an interaction: that older, more mindful individuals are disproportionately more effective in minimizing the effects of negative emotions, thus leading them to be more likely to experience positive well-being compared to both younger and less mindful individuals. Therefore, I propose that:

Hypothesis 1c: Mindfulness moderates the relationship between age and affective well-being at work, such that older employees who are more mindful will experience greater affective well-being at work, compared to their younger, less mindful counterparts.

Age and Job Satisfaction

According to Eagly and Chaiken (1993), an attitude is a psychological evaluation to favor or disfavor an entity. Therefore, an attitude is comprised of an affective component (feelings of favor or disfavor) as well as a cognitive component (evaluation of a certain entity). Job satisfaction, an attitude about a job, is a psychological evaluation of the feelings of favor or disfavor towards one’s job. Range of affect theory (Locke, 1976) posits that individuals create attitudes based on the discrepancy between what they want and what they have, thus leading to the evaluation of the entity. Individuals of all ages evaluate this discrepancy when making judgements of favor or disfavor. However, as previously mentioned, SST may explain evaluative differences across ages regarding job satisfaction in two ways. First, by focusing on “time left” as opposed to “time lived”, older adults are more likely to seek out and engage in
experiences that facilitate positive emotions (Cartensen, 1991). By doing so, older employees are more likely to have higher perceptions of job satisfaction, in comparison to younger employees who seek out experiences for future benefit. Second, SST has often been the theoretical explanation for increased levels of well-being in older adults. Research suggests that employees with higher mean levels of affective well-being display more positive job attitudes, as the effects of affective well-being accumulate over time (Spector, 1997). In addition to SST, researchers have found support for a direct positive relationship between age and: (a) agreeableness and (b) conscientiousness (Roberts & Mroczek, 2008). This suggests that across the life-span, individuals experience increases in these traits, which may also explain the association between age and job satisfaction. Specifically, agreeable individuals have greater motivation to achieve interpersonal intimacy, which may translate into increased job satisfaction and conscientiousness represents a general tendency toward work involvement that leads to an increased likelihood of receiving satisfying work rewards (Organ & Lingl, 1995). Thus, I predict that:

_Hypothesis 2a_: There is a positive relationship between age and job satisfaction.

**The Role of Mindfulness in Job Satisfaction**

According to affective events theory (AET; Weiss & Cropanzano, 1996), individuals experience affective reactions in response to events that occur. These affective reactions then lead to feelings of favor or disfavor towards an entity, or in this case, job satisfaction. Because the very essence of mindfulness is a nonjudgmental awareness to the present moment, responses to affectively charged negative events may be dampened as the mindful person refrains from attaching meaning to such events, thus leading to more positive evaluations about one’s job. Bono and colleagues (2013) suggest that by nature, individuals tend to react more strongly to
negative events and emotions than to positive events and emotions. It is important to consider that mindfulness does not always lead people to experience more positive emotions and fewer negative ones, rather, the effects of mindfulness may be stronger when dampening the negative effects of negative events as opposed to dampening the positive effects of positive events. Thus, mindfulness may be an effective tool for dampening negative emotions more than positive emotions. Furthermore, Glomb and colleagues (2011) suggest that mindfulness promotes self-determined behavior by reducing one’s automaticity and attending to present experiences. Self-determined behavior involves behaviors that are in line with one’s needs and values (Brown & Ryan, 2003; Deci & Ryan, 1985). These behaviors stem from mindfulness because the reduced automaticity and present awareness allows individuals to better understand their basic needs and values. Over the course of a mindful individual’s life, they may select into jobs and roles that better suit them and in turn, evaluate them more favorably. Therefore, I propose that:

_Hypothesis 2b: Mindfulness is positively associated with job satisfaction._

**Mindfulness as a Moderator of the Age – Job Satisfaction Relationship**

Job satisfaction fluctuates over the course of an individual’s career for many reasons. Mobley’s (1982) theory of turnover proposes that job satisfaction changes as a function of (re)evaluations of job conditions and characteristics. Additionally, job attitudes may change in response to events that “shock” the employee, according to the unfolding model of turnover (Lee et al., 1996). As previously mentioned, SST explains why older employees may subconsciously seek out positive experiences, as their mentality shifts to “time left” (Cartensen, 1991). Thus, older employees are more likely to seek out jobs and experiences that lead to positive affect. However, external events may compromise positive job attitudes whether or not they are outside of the employee’s control. For example, a close friend of an employee may be terminated or
retire, leading to negative evaluations of one’s job. Mindfulness may be a mechanism to help buffer older employees from negative events at work by allowing them to refrain from attaching meaning to the negative emotions that may be associated with negative events (Brown et al., 2007). Therefore, as the effects of positive work experiences (Spector, 1997) and the harmful influence of “shocks” or negative events at work both accumulate with age, more mindful individuals may be better equipped to prevent the more negative experiences from harming their attitudes about work, resulting in higher levels of job satisfaction. Thus, I predict that:

*Hypothesis 2c*: Mindfulness will moderate the relationship between age and job satisfaction, such that older employees who are more mindful will experience greater levels of job satisfaction than younger employees who are less mindful.

**Age and Fluid Intelligence**

The negative relationship between age and fluid intelligence—a trait associated with a number of more specific cognitive abilities, including working memory, attention, and abstract reasoning (Beier et al., 2017)—has been well documented (Salthouse, 2004; Salthouse, 2009; Wechsler, 1944). In contrast to this decline, crystallized intelligence—broad aspects of knowledge, vocabulary, and verbal comprehension (Beier et al., 2017)—tends to grow with age, and then remain relatively stable (Cattell, 1987). In a standard cognitive ability test, fluid intelligence is generally measured by figural analogy, classification, and matrix problems (Sternberg, 2008). On the other hand, crystallized intelligence is examined by means of vocabulary and general information. As Sternberg (2008, p. 6791) states: “Fluid intelligence comprises the set of abilities involved in coping with novel environments and especially in abstract reasoning; crystallized intelligence is the product of the application of these processes.” Theory about neural degeneration is beyond the scope of this paper, but research consistently
shows that around age 60, fluid intelligence begins to decline (Salthouse, 2004; Salthouse, 2009; Schaie, 1996; Wechsler, 1944). Employees experiencing declines in fluid intelligence often seek out jobs and tasks that place higher emphasis on crystallized intelligence (Baltes & Baltes, 1990), as those who stay in positions that require high fluid intellectual abilities will expend more cognitive effort while achieving less than they could at a younger age. Kanfer and Ackerman (2004) suggest that the increased effort needed to compensate for this decline may have negative consequences if performance continues to decline, such that self-efficacy and self-concept may be negatively impacted. In order to replicate past work regarding the negative influence of age on fluid intelligence, and to set up predictions of an interactive effect with mindfulness, I predict that:

_Hypothesis 3a_: There is a negative association between age and fluid intelligence.

**The Role of Mindfulness in Fluid Intelligence**

Mindfulness may have a direct effect on cognitive processes. Researchers have specifically investigated the role of state mindfulness, through meditational practice, in working memory, executive functions, and ability to sustain attention (Zeidan, Johnson, Diamond, David, & Goolkasian, 2010). In fact, participants experienced significant improvements in these cognitive processes after completing one short mindfulness meditation a day over the course of four days. Neuroimaging research supports the assertion that mindfulness meditation positively affects cognitive-related brain function and structure (Hölzel, Carmody, Vangel, Congleton, Yerramsetti, Gard, & Lazar, 2011; Pagnoni, 2012). Regions of gray matter associated with learning and memory processes were larger in meditation-naive participants who participated in an 8-week mindfulness intervention, compared to the control group. Although this evidence suggests an effect of state mindfulness interventions, I would expect that, as trait mindfulness
represents a generalized tendency or aggregate level of engaging in state mindfulness across situations (Brown & Ryan, 2003), that there would similarly be positive effects of trait mindfulness on fluid intelligence. Thus, I propose that:

Hypothesis 3b: There is a positive relationship between mindfulness and fluid intelligence.

Mindfulness as a Moderator of the Age – Fluid Intelligence Relationship

Although there is a possibility of a relationship between crystallized intellectual abilities and mindfulness, studying the relationship between fluid intellectual abilities and mindfulness is more relevant due to the attention and working memory component of both constructs. Preliminary evidence suggests meditation could slow the cognitive decline that people experience as they age (Gard, Hölzel, & Lazar, 2014). Additional preliminary evidence suggests that mindfulness training may even reverse age-related brain degeneration (Luders, Cherbuin, & Kurth, 2015), as observed in fewer age-related degradations in the neural tissue of experienced meditators. Gard and colleagues (2014) confirmed a correlation between mindfulness and fluid intelligence, while also correlating mindfulness to measures of network resilience and network integration, thereby proposing mindfulness as a mechanism to slow cognitive and neural decline. Although there is growing theory about the effects of mindfulness training on neural decline, trait mindfulness has yet to be investigated in this realm. To investigate whether trait mindfulness is capable of slowing cognitive decline, I decided to pose a research question as fluid intelligence is less dynamic than the other criteria being examined and would require a longer longitudinal study. Thus, I ask:

Research Question 1: Do individuals higher in trait mindfulness experience a slower decline in fluid intelligence?
In order to examine these hypotheses, I conducted a longitudinal survey using Amazon’s Mechanical Turk service to recruit working adults with a wide age range. Assessments of the focal predictor variables: age and trait mindfulness, as well as outcome variables: affective well-being, job satisfaction, and fluid intelligence were administered online in one of two survey occasions in order to examine both main effects and interactive effects of age and mindfulness on the selected affective and cognitive outcomes.

METHOD

Sample and Procedure

An a priori power analysis determined that 156 participants were needed to test my hypotheses, given the desired effect size of $d = .30$, as observed in previous research (Gulik, 2009; N.G & Feldman, 2010). In order to account for the attrition common in longitudinal studies, a sample of 367 participants were recruited on Amazon’s Mechanical Turk (MTurk) and completed the time 1 survey. 268 respondents also completed the time 2 survey. Participant responses that were excluded from analysis: (a) were unemployed, (b) did not finish the survey, (c) failed to complete the time 2 survey, (d) failed to correctly respond to more than three of the six random check items (indicating careless responding), or (e) completed the survey more than one time. Thus, we observed an effective retention rate of 63% and the remaining sample ($N = 170$) used in all analyses ranged in age from 18 to 74 years ($M = 37.10$, $SD = 12.38$), and was 51.8% male. More than half of the sample (56.7%) had been in their current occupation for more than 3 years. Originally, we had set MTurk participant qualifications at (a) 97% HIT approval rate, (b) 500 HITs approved, and (c) located in the United States, as suggested by Peer, Vosgerau, & Acquisti (2014). Having qualifications that require high approval rates and percentages is one way to ensure the sample is attentive to the survey. However, after one week
of pilot testing, we decided to relax all qualifications for the time 1 survey, except the location requirement. The time 2 survey also included the location requirement, although we added a custom qualification that required participants to complete the time 1 survey first.

Following suggestions from Cheung, Burns, Sinclair, and Sliter (2016), attention check questions were added to the assessment battery to mitigate any potential threat to data quality. Six attention check questions total were added to the self-report measures. Participants who missed 3 or more of the attention check questions were excluded from analysis.

Upon logging into the time 1 survey on MTurk, participants were presented with the informed consent and then completed a demographic survey, followed by the short form of the Raven Advanced Progressive Matrices. The following three self-report measures assessing trait mindfulness, job satisfaction, and affective well-being were counterbalanced to account for possible testing effects. The full assessment battery was administered at time 1, while only the three self-report measures (mindfulness, affective well-being, job satisfaction) were administered during the time 2 survey. The time 2 survey was not accessible to participants until at least 24 hours later than time 1 in order to temporally separate, to the extent possible, predictors from outcomes in an effort to partially account for potential common method bias and concerns with causal inference (Podsakoff, Mackenzie, Lee, & Podsakoff, 2003; Raudenbush, 2001. Upon completion of the time 1 survey participants were awarded $0.20, and after completing time two, respondents received an additional $0.80, for a total payment of $1.00.

**Measures**

Descriptive statistics and reliability estimates (Spearman-Brown test-retest and cronbach’s alpha) for all study variables are presented in Table 1.
Demographics. Demographic variables were assessed through self-report. The variables assessed were age, gender, race, level of educational attainment, employment status, industry of employment, and income.

Fluid Intelligence. Fluid intelligence was measured with a short form of the Raven’s Advanced Progressive Matrices (APM; Arthur & Day, 1994) at time 1. Participants are given 12 items of increasing difficulty, each presented with one missing piece. The possible missing pieces are displayed below each item, with eight possible answer choices. The short form of the APM was able to be finished in less than ten minutes ($M = 8.79$, $SD = 14.45$). Correct answers were coded 1 and incorrect answers were coded 0. Total scores were summed, with higher scores indicating higher levels of fluid intelligence.

Mindfulness. Trait mindfulness was measured at time 1 with the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003). Respondents answered 15 items asking them to describe their feelings and behaviors on a 6-point Likert-type scale ($1 = \text{almost always}$; $6 = \text{almost never}$). The measure contains items such as: “I find it difficult to stay focused on what’s happening in the present” and “I do jobs automatically, without being aware of what I’m doing”. Because of the consistent negative wording in the scale, higher raw scores indicated lower levels of mindfulness. Thus, to aid interpretation, responses to all items were reversed scored and then averaged to form a mindfulness score for each participant. High values indicate high levels of trait mindfulness.

Job-related Affective Well-being. Affective well-being was assessed at time 2 with the 20-item Job-related Affective Well-being Scale (JAWS; Katwyk, Fox, Spector & Kelloway, 1999). Participants indicated the extent to which any part of their job has made them feel a certain emotion within the past 30 days on a 5-point Likert-type scale ($1 = \text{never}$; $5 = \text{extremely}$
often). Sample items include “My job has made me feel excited” and “My job makes me feel anxious”. Scores were summed to form one affective well-being score for each participant, with high values indicating high levels of affective well-being.

**Job Satisfaction.** Job satisfaction was measured at time 2 with the 36-item Job Satisfaction Survey (JSS; Spector, 1985). Participants indicated the extent to which the item reflects their attitude towards their job on a 6-point Likert-type scale (1 = disagree very much; 6 = agree very much). Sample items are “I like doing the things I do at work” and “I am satisfied with my chances for promotion”. Scores were summed to form one score for job satisfaction, with higher values indicating higher levels of job satisfaction.

**Analysis Strategy**

Study hypotheses were evaluated using both Pearson product-moment correlation coefficients (for main effects) and moderated multiple regression (for interactions), and all analyses were conducted using SPSS. Preliminary analyses were also conducted to evaluate the assumptions of regression prior to analysis.

**RESULTS**

Reliability estimates, descriptive statistics, and standard deviations are reported in Table 1. Intercorrelations between measures are reported in Table 2. In line with Cohen’s (1988) recommendation, correlation coefficients were interpreted as follows: weak (.10 to .23), moderate (.24 to .37), and strong (.37 or above).
Table 1
Reliability and Descriptive Statistics of Variables

<table>
<thead>
<tr>
<th></th>
<th>α</th>
<th>Spearman-Brown</th>
<th>M</th>
<th>SD</th>
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<tr>
<td>Age</td>
<td></td>
<td></td>
<td>37.10</td>
<td>12.38</td>
</tr>
<tr>
<td>Fluid Intelligence</td>
<td>.59</td>
<td></td>
<td>4.23</td>
<td>2.79</td>
</tr>
<tr>
<td>Trait Mindfulness</td>
<td>.94</td>
<td></td>
<td>3.72</td>
<td>.08</td>
</tr>
<tr>
<td>Affective Well-being</td>
<td>.90</td>
<td></td>
<td>3.22</td>
<td>.05</td>
</tr>
<tr>
<td>Job Satisfaction</td>
<td>.93</td>
<td></td>
<td>3.78</td>
<td>.06</td>
</tr>
</tbody>
</table>

*Note. N = 170.*

Table 2
Pearson’s Product-moment Correlations Between Variables

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Trait Mindfulness</td>
<td>.37**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Well-being</td>
<td>.29**</td>
<td>.31**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Job Satisfaction</td>
<td>.16*</td>
<td>.37**</td>
<td>.74**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5. Fluid Intelligence</td>
<td>.23**</td>
<td>.28**</td>
<td>.02</td>
<td>.18*</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note. N = 170. *p < .05, **p < .01

I evaluated regression assumptions by examining homoscedasticity, univariate outliers, and normal distribution for each variable. Despite some evidence of skew for the variables of age and fluid intelligence, none of the assumptions seemed to be strongly violated. However, there was evidence of multicollinearity between age and mindfulness, as assessed by a VIF of 15.50. Although a controversial suggestion (Dalal & Zickar, 2012), Cronbach (1987) suggests that centering may help address issues of multicollinearity. Thus, all variables in the regression analyses were mean centered to attempt to reduce multicollinearity (VIF), weaken the correlation between the interaction term and independent variables, improve prediction, and to generally aid in the interpretation of moderation effects.

**Hypothesis Analyses**
Hypotheses of direct relationships were investigated by conducting Pearson’s product moment correlations. Hypothesis 1a predicted a positive association between age and affective well-being. The results demonstrated a statistically significant, moderate positive correlation between age and job-related affective well-being, $r(168) = .29, p < .01$, thus supporting Hypothesis 1a. Hypothesis 1b, predicting a positive association between mindfulness and affective well-being, was also significant and of a moderate size, $r(168) = .31, p < .01$, providing support for Hypothesis 1b. Hypothesis 2a predicted a positive relationship between age and job satisfaction. This hypothesis was also supported with a weak but significant positive correlation, $r(169) = .16, p < .05$. Hypothesis 2b, predicting a positive relationship between mindfulness and job satisfaction, was also supported, with results demonstrating a significant, moderate positive relationship, $r(164) = .29, p < .01$. Hypothesis 3a predicted a negative association between age and fluid intelligence. Contrary to this hypothesis, there was a statistically significant moderate, positive relationship between age and fluid intelligence, $r(170) = .23, p < .01$, suggesting that older employees in this sample had higher levels of fluid intelligence. Thus, Hypothesis 3a was not supported. Finally, Hypothesis 3b, that the association between mindfulness and fluid intelligence would be positive, was significant, in the expected direction, and was of moderate size, $r(169) = .28, p < .01$, thus providing support for Hypothesis 3b.

Hypotheses 1c and 2c, and Research Question 1 all predicted interaction effects, so these predictions were examined using moderated multiple regression. First, a multiple regression was conducted to determine whether or not the addition of the interaction of age and trait mindfulness strengthened the relationship between age and job-related affective well-being. This was conducted in a hierarchical fashion with Time 2 affective well-being as the dependent variable. Block 1 of this regression included age as the sole predictor. Block 2 added trait mindfulness to
examine its incremental utility in predicting well-being. Finally, the interaction term was added in Block 3 to examine whether mindfulness moderated the effect of age on well-being. This interaction term was created by multiplying mean-centered age with mean-centered mindfulness. All results from this analysis are presented in Table 3. In Block 2, a main effect was found for both age ($\beta = .20 = .19$, $p < .01$) and trait mindfulness ($\beta = .24$, $p < .01$), meaning older and more mindful individuals reported higher levels of affective well-being, $F(2, 162) = 12.59$, $p < .001$, $R^2 = .14$. In Block 3, the addition of the interaction term was not significant, however, $\beta = .34$, $p = .249$, suggesting age and mindfulness do not interact to predict affective well-being at work. Hypothesis 1c was not supported.

Table 3
Hierarchical Multiple Regression Predicting Job-related Affective Well-being

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<th>Models and variables</th>
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<th>Adj. $R^2$</th>
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<td>.12 9.52*</td>
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<td>.249</td>
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</table>

Note. $N = 165$. * $p < .05$, ** $p < .01$

To investigate the moderating effect of trait mindfulness on the relationship between age and job satisfaction (Hypothesis 2c), I conducted a hierarchical moderated multiple regression in the same manner as used to test Hypothesis 1c. Results of this analysis are presented in Table 4. In Block 2, a main effect for mindfulness was found ($\beta = .35$, $p < .001$), suggesting more mindful individuals reported higher levels of job satisfaction, $F(2, 165) = 12.88$, $p < .001$, $R^2 = .14$. 

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However, the main effect for age was nonsignificant, $\beta = .03, p = .669$, suggesting it was not as strong of a predictor of job satisfaction as trait mindfulness. In Block 3, the interaction term was also nonsignificant, $\beta = .20, p = .676$, suggesting that mindfulness does not alter the strength of the relationship between age and job satisfaction, as expected. Hypothesis 2c was not supported.

Table 4
Hierarchical Multiple Regression Predicting Job Satisfaction

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Note. $N = 168$. ** $p < .01$

To evaluate the moderating effect of trait mindfulness on the relationship between age and fluid intelligence (Research Question 1), I conducted a hierarchical moderated multiple regression in the same manner as used to test Hypotheses 1c and 2c. Results of this analysis are presented in Table 5. In Block 2, a main effect was found for mindfulness ($\beta = .23, p < .05$), suggesting more mindful individuals reported higher levels of fluid intelligence, $F(2,166) = 8.78$, $p < .001, R^2 = .10$. However, the main effect for age was nonsignificant, $\beta = .14, p = .088$, suggesting it was not as strong of a predictor of fluid intelligence as trait mindfulness. In Block 3, the interaction term was also nonsignificant, $\beta = -.39, p = .194$. 

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Table 5
Hierarchical Multiple Regression Predicting Fluid Intelligence

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<td>.004</td>
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<td>.05**</td>
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Note. \( N = 169. \) * \( p < .05, ** p < .01 \)

DISCUSSION

This research investigated age-related cognitive and affective processes at work, and the role of mindfulness on these processes. Overall, the results from this study provide strong evidence that age and mindfulness both play an important role in predicting important work-relevant constructs, including well-being, job satisfaction, and fluid intelligence, with older, more mindful individuals reaping the benefits.

Consistent with previous research, age and mindfulness were both associated with job-related affective well-being. Findings suggest that older employees reported greater levels of job-related affective well-being, and individuals with higher levels of trait mindfulness also reported higher levels of job-related affective well-being. This supports theories about aging, that older individuals tend to seek out more positive experiences and are more effective at regulating their emotions (Cartensen, 1991; Charles, 2010). It also supports mindfulness theory, that nonjudgmental acceptance and awareness of the present moment may allow individuals to experience more positive well-being (Brown & Ryan, 2003). However, results further suggested that higher levels of trait mindfulness did not influence the relationship between age and
affective well-being. In other words, the interactive or multiplicative effect of age and mindfulness did not predict variability in work-related well-being more than the simple main effects for age and mindfulness. This could potentially mean that the benefits of age and mindfulness on well-being are relatively independent of each other, or are merely additive, rather than multiplicative in nature. Alternatively, perhaps this could mean that age and mindfulness operate through similar mechanisms when influencing well-being, so that interactive influences are harder to detect. Indeed, given the strong correlations between age and mindfulness, and some evidence of multicollinearity, this is a possibility, as multicollinearity tends to widen the confidence intervals of regression coefficients, leading to difficulty in rejecting the null hypothesis. Regardless, both age and mindfulness positively predict work-related well-being.

Also consistent with previous research, age and mindfulness were both positively related with job satisfaction. Findings suggest that older employees reported higher levels of job satisfaction, and employees with higher levels of trait mindfulness also reported greater levels of job satisfaction. As previously stated, this supports theories about aging, that older individuals are likely to seek out positive experiences (Cartensen, 1991) and may benefit from age-related increases in agreeableness and conscientiousness that are tied to job satisfaction (Organ & Lingl, 1995). It also supports mindfulness theory, that a nonjudgmental awareness to the present moment may allow individuals to experience increased levels of job satisfaction (Brown & Ryan, 2003). However, results further suggested that trait mindfulness was not a significant moderator of the relationship between age and job satisfaction. The regression model provided evidence that there is a significant main effect for mindfulness, but not age or the interaction of age and mindfulness, suggesting that mindfulness is a stronger predictor of job satisfaction than age. Put differently, the multiplicative effect of age and mindfulness did not predict variability in job satisfaction.
satisfaction over and above the main effect of mindfulness. This could mean that age and mindfulness operate in a similar manner when influencing job satisfaction, such that the interactive effects are difficult to observe. In fact, given the strong correlation between age and mindfulness and evidence of multicollinearity, this seems likely. Nonetheless, trait mindfulness seems to predict job satisfaction.

Although it was hypothesized that older employees would exhibit lower levels of fluid intelligence compared to their younger counterparts, this was not the case. The age range in the sample was 18 years to 74 years, however, 91.1% of the sample included participants from ages 18 to 55. As previously mentioned, fluid intelligence tends to peak between 20 and 30 years of age and remain relatively stable until it declines around age 60. Because only 15 participants were ages 60 through 74, there are concerns of range restriction influencing the results of the relationship between age and fluid intelligence. However, in line with the hypothesized relationship, higher levels of trait mindfulness were associated with greater levels of fluid intelligence. Thus, it seems likely that individuals possessing more trait mindfulness may fare better during tasks that involve more abstract reasoning, working memory, or attention. Mindfulness did not appear to significantly moderate the relationship between age and fluid intelligence, such that higher levels of fluid intelligence were observed in older employees compared to younger employees, regardless of one’s level of trait mindfulness.

Overall, it is noteworthy that mindfulness was more strongly related to all three of the dependent variables of interest than age was; moreover, mindfulness was the only consistently significant predictor in all three of the regression models. Thus, mindfulness appears to account for more of the variance observed in job-related affective well-being, job satisfaction, and fluid intelligence across working adults than age does.
LIMITATIONS, IMPLICATIONS, AND FUTURE RESEARCH

Limitations

Although this research provided some insight to age-related cognitive and affective processes at work, it is not without limitations. The first limitation stems from the age characteristics of the sample. 91.1% of the participants were between the ages of 18 and 55, thus creating a range restriction issue. This ratio of younger to older employees may be generalizable to some organizations, however, more employees over age 60 would be needed to appropriately draw conclusions from the data with respect to the dynamic processes investigated in this research, as most of the changes in job-related affective well-being, job satisfaction, and fluid intelligence occur after age 60. Additionally, because the data was collected through Amazon’s Mechanical Turk, participants may not be as invested in providing accurate responses or taking enough time to fully consider the available options when completing the Ravens Advanced Progression Matrices short form. In fact, the participants may be more concerned with completing surveys as quickly as possible to maximize financial gain. Another limitation observed in this research involves the multicollinearity between age and trait mindfulness. Multicollinearity between the independent variables causes confidence intervals of the coefficients to become widened, and the coefficient statistic becomes small. Thus, it becomes difficult to reject the null hypothesis when multicollinearity is present, leading to nonsignificant regression models. Another limitation in this study involves the measurement of job satisfaction. Although data was collected at two different times, there was only a 24-hour gap between time 1 and time 2 and job satisfaction tends to fluctuate over the course of time. Researchers suggest conflicting relationships between age and job satisfaction. In fact, a comprehensive review of job attitudes suggests that relationships among demographic variables (e.g., age) are inconsistent
at best and theoretical explanations for why differences occur were not common (Judge, Weiss, Kammeyer-Mueller, & Hulin, 2017). There are many factors that influence how satisfied an individual is with their job and a longer longitudinal study would have been more appropriate to appropriately assess job satisfaction. However, due to time restraints of completing a master’s thesis, a longer longitudinal study was not feasible. Because a longer longitudinal study was not conducted here, we are not able to draw causal conclusions.

**Implications**

Despite the limitations in this study, there are strengths that are worth mentioning. First, the findings that trait mindfulness may be a stronger predictor of affective and cognitive processes than age is insightful. Although attitudes and cognitive abilities fluctuate with age, there are other mechanisms that influence these dynamics. Over the course of one’s life, there are many experiences that influence how we think, react, and behave. However, within different age groups, there is still a considerable amount of variance in affective and cognitive processes. Thus, organizations would benefit from developing a deeper understanding of the dynamics within older employees and the dynamics within younger employees. This research provides an avenue to further consider these dynamics, specifically investigating trait mindfulness and its role in affecting these age-related dynamics. Another strength of this research involves the consideration of fluid intelligence being influenced by trait mindfulness. The observed significant, positive moderate correlation between fluid intelligence and trait mindfulness may be due to the attention component of both constructs. Additionally, the relationship between mindfulness and age was not directly hypothesized in this research, but there was a significant, strong positive correlation observed ($r = .37, p < .01$). If older adults are more likely to report higher levels of trait mindfulness and there is a relationship between trait mindfulness and fluid
intelligence, researchers should continue to explore the dynamics of the relationships among these variables.

Organizations may benefit from this research by considering other personality traits as predictors of job performance across ages and job roles. For example, if a job requires high levels of fluid intelligence (i.e., strong problem-solving skills or sustained attention), trait mindfulness may be useful to provide information about whether or not an individual can provide sustained attention to a task for a prolonged period of time. Additionally, although declines in fluid intelligence don’t necessarily translate to lower performance, older employees may experience harsher performance reviews upon making a mistake as the mistake may be attributed to their age. This research suggests that older employees report higher levels of trait mindfulness, and simply knowing that older employees are more likely to report greater ability to be present and exhibit sustained attention may lead to less negative attributions about mistakes they make.

**Future Research**

Until now, researchers have investigated the neural degradation of experienced and novice meditators. Researchers propose that state mindfulness may influence the decay of fluid intelligence among aging adults. However, it is worth investigating the role of trait mindfulness in neural degradation in aging adults. Future research should consider investigating participants across the lifespan to evaluate the neural degradation among aging adults with high levels of trait mindfulness and minimal experience with meditation. Although this type of longitudinal study is not always possible, it would provide valuable information about the mechanisms that influence cognitive decline among aging adults. In addition to dynamic cognitive processes among aging adults, future research should also consider the role of mindfulness in affective processes.
Affective well-being and job satisfaction were investigated in this research, but future research should build upon this research with a more appropriate sample and expand on other affective outcomes in the workplace, such as stress or organizational commitment. Both stress and organizational commitment have been empirically investigated in regard to the role of state mindfulness, but trait mindfulness may also play an inherent role in these outcomes. The dynamic nature of age and the constantly changing work role is important to understand, and by investigating trait mindfulness as a mechanism that influences work-related outcomes, organizations could benefit from structuring learning, training, or socialization programs accordingly.

CONCLUSION

This research revealed that both age and trait mindfulness were associated with job-related cognitive and affective processes. Age and trait mindfulness were both positively related to job-related affective well-being, job satisfaction, and fluid intelligence. By considering trait mindfulness as a moderator of the relationships between age and the job-related affective and cognitive processes, this research proposes an avenue for future research to further investigate the dynamics of trait mindfulness on these processes and develop a more thorough understanding of dynamics across and within age groups.
References


