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ORIGINAL PAPER

Profiles of Mindfulness across Adulthood

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Abstract

Objectives Person-centered analytic approaches (e.g., latent profile analysis, cluster analysis) have been offered as a potential solution to measurement issues associated with the Five Facet Mindfulness Questionnaire (FFMQ). Yet, extant literature utilizing person-centered approaches reveals a lack of consistency in the identified mindfulness profiles, especially in non-college samples. The present study tested the generalizability of FFMQ profiles in an adult life span, community sample using latent profile analysis and cluster analysis. Furthermore, the study explored whether mindfulness profiles related to age and well-being.

Methods Age-diverse participants ($N = 715$) recruited through Amazon's Mechanical Turk completed the FFMQ and numerous measures of well-being.

Results Cluster analysis revealed four mindfulness profiles: (1) high mindfulness, (2) low mindfulness, (3) judgmentally observing, and (4) nonjudgmentally aware. Latent profile analysis indicated four profiles, but only two profiles resembled profiles resulting from the cluster analysis, and two of the profiles comprised less than 9% of the sample combined. Using profiles identified by cluster analysis, older age was associated with increased likelihood of classification into a high mindfulness profile and decreased likelihood of classification into a low mindfulness profile. Furthermore, the high mindfulness profile showed the best well-being and the low mindfulness profile showed the worst.

Conclusions Overall, these findings demonstrate that the type of analytic method and sample characteristics, such as age, may affect the makeup of resulting mindfulness profiles. Implications for the state of this literature are discussed.

Keywords Mindfulness · Person-centered analysis · Age · Well-being

Mindfulness is a sustained, receptive attention to and awareness of internal and external experiences as they occur (Brown and Ryan 2003). Most scholars agree that mindfulness is a multidimensional construct (Baer et al. 2006; Bishop et al. 2004; Kabat-Zinn 1994). The Five Facet Mindfulness Questionnaire (FFMQ) is one of the most frequently used self-report assessments of dispositional mindfulness (Gu et al. 2020; Quaglia et al. 2016). However, the empirical evidence supporting the utility and interrelation of the five facets is inconsistent, and researchers have voiced concerns about the use of the FFMQ (e.g., Baer et al. 2008; Bergomi et al. 2013; Davidson and Kaszniak 2015; Grossman 2011). As a solution, some researchers have proposed using person-centered techniques (e.g., cluster analysis, latent profile analysis) to produce profiles that represent unique combinations of the mindfulness dimensions (e.g., Bravo et al. 2016; Gu et al. 2020; Lilja et al. 2013; Pearson et al. 2015). Research utilizing person-centered approaches is inconsistent and limited in generalizability. Thus, it is important to replicate previously observed mindfulness profiles in an age-diverse, community sample.

To create the FFMQ, Baer et al. (2006) conducted a factor analysis of five measures of dispositional mindfulness: Mindful Attention Awareness Scale (Brown and Ryan 2003), Freiburg Mindfulness Inventory (Buchheld et al. 2001), Kentucky Inventory of Mindfulness Skills (Baer et al. 2004), Cognitive and Affective Mindfulness Scale (Feldman et al. 2007), and the Mindfulness Questionnaire (Chadwick et al. 2005). The factor analysis revealed five facets of mindfulness (Baer et al. 2006; Baer et al. 2008). *Observing* refers to noticing or attending to internal and external stimuli.

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Describing entails labeling internal experiences with words. *Acting with awareness* connotes attending to one's own current behavior and activities. *Non-judging* of inner experiences refers to taking a nonjudgmental or non-evaluative perspective towards one's thoughts and feelings. *Non-reactivity* to inner experiences is the ability to allow thoughts to come and go without getting carried away by them. Each facet is proposed to represent a unique dimension of mindfulness.

Although the FFMQ is commonly used and the association between greater dispositional mindfulness and better psychological well-being is well-established (e.g., Brown and Ryan 2003; Ford and Shook 2019), concerns have been raised about the measure, especially with regard to the observing subscale. In samples of participants who do not regularly meditate, the observing subscale has not reliably correlated with the other facets of the FFMQ, with some studies even showing negative correlations between observing and other facets (e.g., Baer et al. 2006; Brown et al. 2015; Fernandez et al. 2010; Pearson et al. 2015). Baer et al. (2006) found that the observing subscale did not significantly load onto a mindfulness latent variable in a sample of non-meditators. The observing subscale was also either unrelated or negatively related to psychological health in non-meditators (Baer et al. 2006; Baer et al. 2008; Brown et al. 2015; Desrosiers et al. 2013). Yet, in meditators, observing was positively associated with psychological health, and meditation experience was strongly related to higher observing scores (Baer et al. 2008). Another study showed that observing increased following participation in a mindfulness-based intervention (Carmody and Baer 2008). Conceptually, observing is a core component of mindfulness (e.g., Lilja et al. 2013; Rudkin et al. 2018). As such, it is important to understand why the observing subscale has been inconsistently associated with other subscales, especially in samples of non-mediators.

Some have argued that traditional, variable-centered data analytic techniques (e.g., regression, ANOVA, factor analysis) are problematic for multidimensional constructs, such as mindfulness (Bravo et al. 2016; Lilja et al. 2013; Pearson et al. 2015). Variable-centered approaches typically assess linear associations among variables, which may be misleading because a specific value on one dimension might have a very different meaning depending on the overall pattern of scores (Bergman and Magnusson 1997; Lilja et al. 2013). For example, a relatively high value on the observing facet might have a different meaning and different implications depending on the pattern of scores across other mindfulness facets. As such, instead of relying on variable-centered techniques, scholars have recommended the use of person-centered techniques in the assessment of mindfulness (e.g., Bravo et al. 2016; Gu et al. 2020; Lilja et al. 2013; Pearson et al. 2015). Person-centered techniques, such as cluster analysis and latent profile analysis (LPA), examine each participant's response pattern across items and extract sub-samples for whom the pattern of responding is similar (Aldenderfer and Blashfield 1984). Because person-centered approaches can identify response patterns along mindfulness facets, using person-centered analyses might ameliorate some of the limitations of variable-centered examinations of the FFMQ. Rather than examining how the observing facet linearly relates to well-being, person-centered analyses might reveal how levels of observing in combination with other mindfulness facets relates to well-being.

Several studies have now used person-centered analyses of the FFMQ to understand profiles of mindfulness. In college student samples, latent profile analysis has consistently identified four mindfulness profiles: a high mindfulness group (relatively high on all facets of mindfulness), a low mindfulness group (relatively low on all facets of mindfulness), a judgmentally observing group (low in non-judging and acting with awareness, high in observing), and a nonjudgmentally aware group (high in non-judging, high in acting with awareness) (Bravo et al. 2016; Bravo et al. 2018; Kimmes et al. 2017; Pearson et al. 2015). Although there is consistency in the number and types of profiles identified in these college student samples, the majority of participants fall into either the high mindfulness profile (16.13–28.60%) or the low mindfulness profile (41.2–63.87%). Relatively few participants comprise the nonjudgmentally aware (7.07–12.27%) and the judgmentally observing (7.79–22.4%) profiles.

Two studies with non-college samples have replicated the profiles previously identified in college students. One study, which examined mindfulness profiles in patients with cancer, found the high mindfulness, low mindfulness, judgmentally observing, and nonjudgmentally aware profiles (Lam et al. 2018), and Sahdra et al. (2017) identified the same four profiles in a large, nationally representative US sample. However, most studies of non-college student samples have generated less consistent profiles. In a sample with recurrent major depression, Gu et al. (2020) replicated the high mindfulness and nonjudgmentally aware profiles. They also found a very low mindfulness profile, which differed in extremity of scores, but resembled the low mindfulness profiles found in college student samples. Given the inverse relation between depression and mindfulness, the difference in the extremity of the low mindfulness profile is most likely a result of the sample consisting of individuals with major depression. Gu et al. (2020) did not find evidence of a judgmentally observing profile and instead found a moderate mindfulness profile. In a separate study, Lilja et al. (2013) identified 13 profiles in a sample recruited from college universities, meditation centers, and yoga studios. They found that individuals with meditation experience tended to be over-represented in profiles that were high in observing. Zhang et al. (2019) conducted latent profile analysis on a sample of adolescents and identified a four-profile solution, but the four profiles differed than those found in college students. In a sample of veterans, a three-profile solution provided optimal fit (Bravo et al. 2018). When taken

altogether, there is considerable variability in the identified mindfulness profiles, especially in non-college samples. Further examination of mindfulness profiles in large, diverse samples may help to resolve this inconsistency.

In particular, it is important to explore profiles of mindfulness in age-diverse samples. Because older adults are a growing segment of the US population (He et al. 2015), it is necessary to understand how facets of mindfulness cluster together in this demographic. Moreover, a small but growing literature using variable-centered analyses demonstrates that older adults report greater mindfulness than younger adults (Mahoney et al. 2015; Prakash et al. 2015; Shook et al. 2017). Two studies that used the FFMQ found that older adults were higher than younger adults in all five facets of mindfulness (Frank et al. 2015; Hohaus and Spark 2013). Initial studies of mindfulness profiles utilized primarily college student samples, limiting their generalizability to other age groups (i.e., Bravo et al. 2016; Kimmes et al. 2017; Lilja et al. 2013; Pearson et al. 2015). Although some studies examined mindfulness profiles in age-diverse samples (e.g., Bravo et al. 2018; Gu et al. 2020; Zhang et al. 2019), only one study explored how age relates to profile membership. In a nationally representative US sample, older participants were less likely than younger adults to belong to the judgmentally observing group (Sahdra et al. 2017). Of note, an abbreviated FFMQ measure was used in this study, which differs from all other studies in this area. Given these differences and the fact that this is only one study, it remains uncertain whether profiles of mindfulness are more or less characteristic of different age groups.

Profiles of mindfulness are also differentially related to well-being. Utilizing a traditional, variable-centered approach, a large body of literature demonstrates that greater mindfulness is associated with a wide range of psychological benefits, such as higher subjective well-being and optimism, as well as lower rumination, depression, anxiety, and pessimism (e.g., Barnhofer et al. 2011; Brown et al. 2007; Coffey et al. 2010; Desrosiers et al. 2013; Kiken and Shook 2012). Profiles of mindfulness may also have important implications for psychological well-being and mental health. Pearson et al. (2015) found that individuals with a high mindfulness or nonjudgmentally aware profile reported less depression, anxiety, affective lability, and distress intolerance than those with a low mindfulness or judgmentally observing profile. The high mindfulness and the nonjudgmentally aware profiles did not differ on any of these indicators. In line with these findings, Gu et al. (2020) found that individuals with the high mindfulness or nonjudgmentally aware profiles reported less depression and greater self-compassion than those who did not fit in these profiles. Bravo et al. (2016) explored profile differences on a wider range of negative emotional outcomes (e.g., rumination; worry) and indicators of well-being (e.g., psychological flexibility; self-regulation). Similarly, they found that the high mindfulness and the nonjudgmentally aware profiles were associated with better well-being than the judgmentally observing and low mindfulness profiles. Kimmes et al. (2017) replicated these findings by demonstrating that the high mindfulness and nonjudgmentally aware profiles were characterized by lower levels of depression and neuroticism compared with the judgmentally observing and low mindfulness profiles.

Across these studies, the high mindfulness and nonjudgmentally aware profiles were consistently associated with better psychological outcomes. These findings highlight the potential utility and information gained by considering profiles of mindfulness. However, the FFMQ profiles have only been examined in relation to a select number of psychological outcomes. For example, Bravo et al. (2016) measured eudemonic well-being, or the degree to which an individual has fulfilled or realized one's true nature (Ryan and Deci 2001), as assessed by the Scales of Psychological Well-Being (Ryff and Keyes 1995). The researchers did not explore how profiles of mindfulness related to hedonic well-being, which is typically conceptualized by high life satisfaction, high positive affect, and low negative affect (Ryan and Deci 2001). Presumably, the differences between mindfulness profiles extend to a broader range of psychological outcomes.

To address the limitations of the extant literature using person-centered analyses with mindfulness, the present study had three aims. First, we sought to identify FFMQ profiles of mindfulness in an adult life span, community sample using the full FFMQ and utilizing latent profile analysis and cluster analysis. Cluster analysis was used in the present study in addition to latent profile analysis to explore whether the specific data analytic technique significantly impacts the number and makeup of the identified mindfulness profiles (Clatworthy et al. 2007; DiStefano and Kamphaus 2006; Morey et al. 1983). It is important to explore profiles of mindfulness using other forms of person-centered analyses to provide further evidence of external validity and to better ensure that the identified profiles are not an artifact of the type of analysis. Second, we examined whether age predicted membership in mindfulness profiles. As older adults are generally higher in all five facets of mindfulness than younger adults (Frank et al. 2015; Hohaus and Spark 2013), age may be associated with a higher likelihood of membership in the high mindfulness profile and a lower likelihood of membership in the low mindfulness profile. Although Sahdra et al. (2017) found that older age was related to lower likelihood of belonging to the nonjudgmentally aware profile, they did not use the full FFMQ. Third, we tested whether psychological well-being, as assessed by a variety of measures, differed across the mindfulness profiles. Building from prior research (Bravo et al. 2016; Pearson et al. 2015), we predicted that profiles approximating the high mindfulness and nonjudgmentally aware profiles would be associated with better psychological well-being than the low mindfulness or judgmentally observing profiles.

Method

Participants

Participants ($N = 888$) were US residents recruited through Amazon's Mechanical Turk (MTurk). Only MTurk workers located in the USA and with a hit approval rating of 95% or greater were allowed to participate in the study. Evidence suggests that data from MTurk samples are as reliable and valid as other forms of self-report surveys and that MTurk samples tend to be more demographically diverse than college samples (Buhrmester et al. 2011; Weigold et al. 2013). A stratified sampling strategy was utilized to recruit 322 younger adults (age 20–39), 304 middle-aged adults (age 40–59), and 262 older adults (age 60 and older). One-hundred and twenty participants who did not complete the mindfulness measure were excluded in the analyses. An additional 53 participants who inconsistently reported their age at least once on three questions about age embedded in the survey were also excluded. The final sample ($N = 715$) consisted of 265 younger adults, 246 middle-aged adults, and 204 older adults. The average age for the whole sample was 45.94 years ($SD = 15.05$; range, 20 to 88 years). Additional demographic information is included in Table 1. Demographic information, except for age, was missing for 113 participants. Analyses were conducted excluding these participants; however, the pattern of results was similar. Thus, the results are reported with all 715 participants.

Table 1 Participant characteristics for the entire sample ($n = 715$)

Measure	*M* (*n*)	*SD* (%)
Age	45.94	15.05
Gender		
Female	325	45.5
Male	274	38.3
Other	3	0.3
Not reported	113	15.8
Marital status		
Single	215	30.1
Married	294	41.1
Separated	8	1.1
Divorced	65	9.1
Widowed	18	2.5
Not reported	115	16.1
Ethnicity		
White/Caucasian	519	72.6
Hispanic/Latino(a)	28	3.9
African American /Black	36	5.0
Asian	23	3.2
Native American	8	1.1
Other	6	0.8
Not reported	95	13.3
Education		
Did not complete high school or GED	2	0.3
High school diploma or GED	72	10.1
Vocational training	13	1.8
Some college	134	18.7
Associate degree	85	11.9
Bachelor's degree	206	28.8
Some graduate work	13	1.8
Master's degree	60	8.4
Doctorate or professional degree	19	2.7
Not reported	111	15.5
Employment status		
Full time	322	45.0
Part time	87	12.2
Not employed and looking for work	37	5.2
Not employed and not seeking work	37	5.2
Retired	84	11.7
Other	34	4.8
Not reported	114	15.9
Income		
0–$19,999	91	12.7
$20,000–$39,000	145	20.3
$40,000–$59,000	110	15.4
$60,000–$79,000	115	16.1
$80,000–$99,000	54	7.6
$100,000–$119,999	36	5.0
$120,000–$139,999	26	3.6
$140,000 or more	27	3.8
Not reported	111	15.5

Procedure

Participants completed the study measures as part of a larger 1-h project examining personality, emotions, attitudes, and experiences (see Supplemental Material for a list of all additional measures). Participants electronically consented prior to beginning the survey. Questionnaires were presented in a random order, except for the Positive and Negative Affect Schedule which appeared first and the demographic questions which appeared last. Participants received a $1 honorarium.

Measures

Five Facet Mindfulness Questionnaire (FFMQ, Baer et al. 2006)

The FFMQ consists of 39 self-report items assessing mindfulness in daily life. It measures five facets of mindfulness: observing (e.g., "I pay attention to sensations, such as the wind in my hair or sun on my face."), describing (e.g., "I can easily put my beliefs, opinions, and expectations into words."), acting with awareness (e.g., "I am easily distracted."), non-judging of inner experiences (e.g., "I criticize myself for having irrational or inappropriate emotions."), and non-reactivity to inner experiences (e.g., "I perceive my feelings and emotions without having to react to them."). Participants rated items on a scale from 1 ("never or very rarely true") to 5 ("very often or always true"). Appropriate items were reverse coded. Subscales were created by calculating the mean of the relevant items. Higher mean scores indicated greater mindfulness on that facet. The five facets demonstrated good reliability (observe, $\alpha = 0.86$; describe, $\alpha = 0.89$; act with awareness, $\alpha = 0.92$; nonjudgement, $\alpha = 0.92$; nonreactivity, $\alpha = 0.84$).

Scales of Psychological Well-Being (SPWB; Ryff and Keyes 1995) The SPWB is an 18-item scale that assesses eudemonic well-being. On a scale from 1 ("strongly disagree") to 6 ("strongly agree"), participants indicated the extent to which they agreed with each statement (e.g., "When I look at the story of my life, I am pleased with how things have turned out."). The SPWB is comprised of 6 subscales: autonomy ($\alpha = 0.60$), environmental mastery ($\alpha = 0.73$), personal growth ($\alpha = 0.59$), positive relations ($\alpha = 0.68$), purpose in life ($\alpha = 0.43$), and self-acceptance ($\alpha = 0.81$). Items on each subscale were summed to compute total scores. Higher scores indicated greater psychological well-being.

Positive and Negative Affect Schedule (PANAS; Watson et al. 1988) The PANAS is a 20-item scale that assesses one's general level of positive and negative affect. Participants rated the extent to which they currently felt each emotion on a scale from 1 ("very slightly or not at all") to 5 ("extremely"). The positive affect subscale consisted of 10 adjectives (e.g., interested, active), and the negative affect subscale consisted of 10 adjectives (e.g., upset, afraid). Items were averaged to compute total positive ($\alpha = 0.92$) and negative affect ($\alpha = 0.94$) scores with higher scores indicating more positive and negative affect, respectively.

Subjective Happiness Scale (SHS; Lyubomirsky and Lepper 1999) The SHS is a 4-item scale that assesses subjective happiness. An example item is "Compared with most of my peers, I consider myself…" 1 ("less happy") to 7 ("more happy"). One item was reverse scored and then items were averaged to compute total scores. Higher scores indicated greater subjective happiness ($\alpha = 0.91$).

Satisfaction with Life Scale (SWLS; Diener et al. 1985) The SWLS is a 5-item scale that assesses life satisfaction. On a scale from 1 ("strongly disagree") to 7 ("strongly agree"), participants indicated the extent to which they agreed with each statement (e.g., "I am satisfied with my life."). Items were summed to compute total scores. Higher scores indicated greater life satisfaction ($\alpha = 0.93$.).

Scale of Emotional Well-Being (SEWB; Mroczek and Kolarz 1998) The SEWB is a 6-item measure of positive affect used as an indicator of emotional well-being. On a scale from 1 ("none of the time") to 5 ("all of the time"), participants indicated the frequency with which they experienced each emotion (e.g., "cheerful") over the past 30 days. Items were summed to compute total scores. Higher scores indicated greater emotional well-being ($\alpha = 0.93$).

Future Events Scale (FES; Andersen 1990) The FES is a 26-item scale that assesses optimism and pessimism. On a scale from − 5 ("extremely unlikely") to + 5 ("extremely likely), participants rated the likelihood of positive (e.g., "To have what I consider to be the perfect job") and negative (e.g., "To experience unhappiness with my relationships for several years") events happening in the future. Ratings were summed for the positive events to create the optimism subscale ($\alpha = 0.89$). Ratings were summed for the negative events to create the pessimism subscale ($\alpha = 0.88$). Higher subscale scores indicated greater optimism and pessimism, respectively.

Demographics Participants reported their age, gender, race/ethnicity, marital status, income, employment status, and education.

Data Analyses

First, to isolate profiles of mindfulness, scores on the five subscales of the FFMQ were subjected to a cluster analysis. Henry et al. (2005) recommended a two-step clustering technique in which hierarchical clustering is used to derive the total number of clusters present in the data, and then K-means analysis is performed with the specified number of clusters. In the first step, we submitted the five FFMQ subscales to a Ward's hierarchical agglomerative cluster analysis to determine the number of clusters present in the data. Visual inspection of the resulting dendrogram was used to determine the number of clusters present. In the second step, an iterative, K-means analysis using the number of clusters based on the hierarchical clustering method was conducted to assign individuals to clusters. Finally, a MANOVA with cluster membership as the independent variable and the five FFMQ subscales as dependent variables was performed to ensure the clusters consisted of distinct profiles. Then, to compare potential analytic differences, latent profile analysis was utilized. As recommended (e.g., Henson et al. 2007) and in keeping with previous research (e.g., Bravo et al. 2018), goodness-of-fit indices and tests of statistical significance were used in conjunction to determine the optimal number of profiles present in the latent profile analysis.

To assess potential age differences in profile membership, four binary logistic regression analyses were performed. For each regression, membership in a specific mindfulness profile was entered as a dichotomous outcome (0 = not in profile, 1 = in profile), and age was entered as a continuous predictor variable. Because socio-economic status might be associated with age, as well as mindfulness, household income was examined as a covariate. However, entering household income as a covariate did not change the pattern of findings. For ease of interpretation, results without covariates are presented.

To determine whether the mindfulness profiles differed on the measures of well-being, a series of ANCOVAs were conducted. For each ANCOVA, profile membership was entered as the independent variable, age was entered as a covariate, and the measure of well-being was entered as the dependent

variable. Age was entered as a covariate because age is associated with well-being (Charles and Carstensen 2010), and age was significantly related to mindfulness profiles. Bonferroni corrected post hoc pairwise comparisons were performed to examine the differences in well-being between profiles.

Next, as an exploratory post hoc analysis, we examined the incremental utility of using profiles of mindfulness by examining differences in well-being between profiles while controlling for the individual subscales of the FFMQ. To do so, a procedure similar to that used by Sahdra et al. (2017) was utilized. A series of ANCOVAs were conducted in which profile membership was entered as the independent variable, age and the five FFMQ subscales were entered as covariates, and the measure of well-being was entered as the dependent variable. Bonferroni corrected post hoc pairwise comparisons were performed to examine the differences in well-being between profiles.

Results

Means and standard deviations for all measures are presented in Table 2. The first aim of the study was to determine whether the four FFMQ profiles of mindfulness commonly found in college student samples generalized to an adult life-span, community sample. The two-step cluster analysis resulted in a 4-cluster solution. A MANOVA determined that the four clusters significantly differed across a linear combination of the FFMQ subscales, $F(4, 713) = 160.14$, Wilk's $\lambda = 0.11$, $p < 0.001$. This result indicated that the identified clusters differed across mindfulness facets. Table 3 displays the standardized mean scores on each FFMQ subscale for each cluster. Figure 1 also presents the standardized mean scores on the FFMQ subscales for each cluster. Cluster 1 comprised 22.52% of the sample ($n = 161$). We labeled this cluster the "high mindfulness profile," as all FFMQ subscales were relatively high (zs ranged from 0.48 to 1.10). Cluster 2 comprised 32.59% of the sample ($n = 233$). We labeled this cluster the "low mindfulness profile," as all FFMQ subscales were relatively low (zs ranged from − 0.18 to − 0.94). Cluster 3 comprised 26.15% of the sample ($n = 187$). We labeled this cluster the "judgmentally observing profile," as the observing score was high ($z = 0.60$) and the nonjudgment score was low ($z = -0.22$). Cluster 4 comprised 18.74% of the sample ($n = 134$). We labeled this cluster the "nonjudgmentally aware profile," as both the nonjudgment ($z = 0.59$) and acting with awareness ($z = 0.32$) scores were high, but the observing score was low ($z = -1.07$).

To be consistent with previous research and to determine whether the data analytic strategy affects the resulting profiles, latent profile analysis was also performed in M*plus* 8.1 (Muthén and Muthén 1998–2012). We assessed the latent profile model containing four profiles fit to data using the Akaike information criterion (AIC; Akaike 1974), Bayesian information criterion (BIC; Schwarz 1978), sample size–adjusted BIC (sBIC; Yang 2006), and Lo–Mendell–Rubin adjusted likelihood ratio test (LMR-LRT; Lo et al. 2001). Smaller goodness-of-fit values on the AIC, BIC, and sBIC suggest better model fit. The LMR-LRT compares whether a k class solution fits significantly better than a $k - 1$ class solution. We explored the fit indices for latent profile models containing two to six profiles fit to the data (see Table 4). The AIC and BIC were smaller for a 5-profile solution than a 4-profile solution. However, the LMR-LRT suggested that a 5-profile solution did not fit significantly better than the 4-profile solution ($p = 0.06$). Given these results and prior work, we settled on the 4-profile solution.

According to the latent profile analysis, the four-profile model had a high entropy value of 0.84, which indicates that 84% of participants were classified in the appropriate profile (i.e., Clark and Muthén 2009). Profile 1 comprised 4.20% of the sample ($n = 13$) and was labeled the "very low mindfulness profile" due to low mean scores on all FFMQ subscales (zs ranged from − 1.73 to − 0.02). Profile 2 comprised 59.02% of the sample ($n = 422$) and was labeled the "moderate mindfulness profile" due to scores on all FFMQ subscales falling close to the mean (zs = − 0.41 to − 0.05). Profile 3 comprised 4.34% of the sample ($n = 31$) and was labeled the "nonjudgmentally aware profile" based on relatively high mean scores on both the nonjudgment ($z = 0.98$) and acting with awareness facets ($z = 0.71$), but low mean score on the observing ($z = -1.91$) and nonreactance facets ($z = -1.80$). Profile 4 comprised 32.45% of the sample ($n = 232$) and was labeled the "high mindfulness profile" due to relatively high mean scores on all FFMQ subscales (zs ranged from 0.37 to 0.89). Figure 2 depicts the mean scores on each FFMQ subscale for each profile.

The second aim of the study was to investigate whether age differentially related to the mindfulness profiles. Because the profiles identified by the latent profile analysis included two profiles (i.e., very low mindfulness profile and nonjudgmentally aware) that each comprised less than 5% of the total sample and therefore were potentially unreliable profiles and because comparing groups of vastly different sample sizes introduces concerns about power and type I error rate (Rusticus and Lovato 2014), we used the profiles derived from the cluster analysis. See Table 5 for a summary of the results of these analyses. Age was associated with an increased probability of membership in the high mindfulness profile, $X^2(1) = 14.94$, $p < 0.001$, Nagelkerke $R^2 = 0.03$. Growing older by 1 year was associated with a 2% increased odds of being in the high mindfulness profile. Age was also associated with a decreased probability of membership in the low mindfulness profile, $X^2(1) = 14.65$, $p < 0.001$, Nagelkerke $R^2 = 0.03$. Growing older by 1 year was associated with a 2% decreased odds of being in the low mindfulness profile. Age was not

Table 2 Descriptive statistics for all self-report measures ($n = 715$)

Measure	*M*	*SD*	Possible range of scores
FFMQ-observe	3.29	0.74	1–5
FFMQ-describe	3.53	0.79	1–5
FFMQ-act with awareness	3.66	0.82	1–5
FFMQ-nonjudgment	3.56	0.87	1–5
FFMQ-nonreactance	3.17	0.71	1–5
SPWB-autonomy	13.51	2.67	6–18
SPWB-environmental mastery	13.05	3.11	6–18
SPWB-personal growth	13.49	2.79	6–18
SPWB-positive relations	12.64	3.36	6–18
SPWB-purpose in life	12.81	2.88	6–18
SPWB-self-acceptance	12.67	3.51	6–18
PANAS-positive affect	29.93	8.61	10–50
PANAS-negative affect	19.80	5.72	10–50
SHS	4.86	1.47	1–7
SWLS	22.95	8.01	5–35
SEWB	19.80	5.26	6–30
FES-optimism	− 0.11	24.36	− 65–65
FES-pessimism	− 11.30	23.72	− 65–65

FFMQ, Five Facet Mindfulness Questionnaire; *SPWB*, Scales of Psychological Well-Being; *PANAS*, Positive and Negative Affect Schedule; *SHS*, Subjective Happiness Scale; *SWLS*, Satisfaction With Life Scale; *SEWB*, Scales of Emotional Well-Being; *FES*, Future Events Scale

associated with membership in the judgmentally observing profile, $X^2(1) = 1.02$, $p = 0.31$, Nagelkerke $R^2 = 0.002$, or the nonjudgmentally aware profile, $X^2(1) = 0.91$, $p = 0.34$, Nagelkerke $R^2 = 0.002$.

The third aim of the study was to determine whether well-being differed across mindfulness profiles. Again, we used the profiles derived from the cluster analysis. First, ANCOVAs were conducted with age entered as a covariate. All of the ANCOVAs were significant, indicating that there were differences between the profiles on all measures of well-being (see Table 6). In general, the high mindfulness profile was characterized by the best psychological well-being and the low mindfulness profile was characterized by the worst psychological well-being. The nonjudgmentally aware and the judgmentally observing profiles were generally similar in psychological well-being. However, the judgmentally observing profile was significantly higher in positive affect and personal growth than the nonjudgmentally aware profile.

As an exploratory, post hoc analysis, ANCOVAs were conducted with age as well as the five FFMQ subscales entered as covariates to investigate the incremental contribution of the profiles on well-being. Nine of the thirteen ANCOVAs were not significant (all $ps > 0.10$). Significant differences between profiles were localized to negative affect ($p = 0.003$), environmental mastery ($p = 0.02$), personal growth ($p = 0.001$), and purpose in life ($p = 0.001$). With regard to negative affect, there was a trend whereby the low mindfulness profile possessed higher levels of negative affect than the judgmentally

Table 3 Standardized mean scores and standard deviations on FFMQ subscales for each cluster in cluster analysis

	Cluster 1: high mindfulness profile	Cluster 2: low mindfulness profile	Cluster 3: judgmentally observing profile	Cluster 4: nonjudgmentally aware profile
Observe	0.48 (0.99)	− 0.18 (0.77)	0.60 (0.64)	− 1.07 (0.83)
Describe	1.10 (0.61)	− 0.74 (0.71)	0.37 (0.65)	− 0.49 (0.84)
Acting with Awareness	1.07 (0.55)	− 0.94 (0.62)	0.04 (0.65)	0.32 (0.80)
Non-judging	1.10 (0.53)	− 0.90 (0.65)	− 0.22 (0.62)	0.59 (0.67)
Non-reactivity	0.87 (0.97)	− 0.26 (0.76)	0.08 (0.79)	− 0.68 (0.98)

Numbers in parentheses represent standard deviations

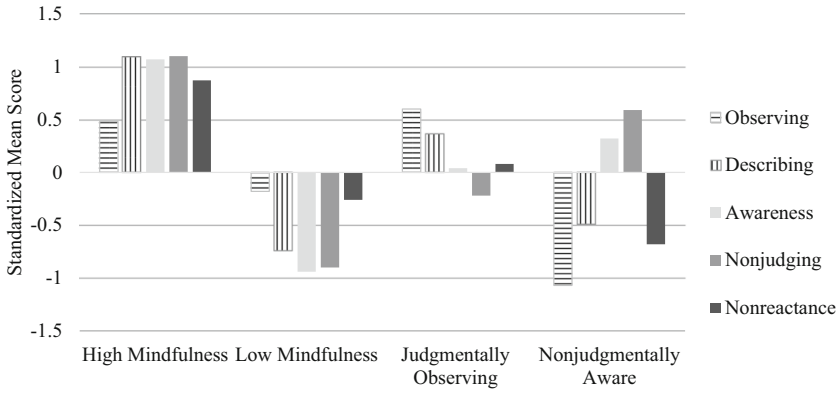

Fig. 1 Depiction of four profiles of mindfulness identified in cluster analysis characterized by pattern of standardized means on the FFMQ

observing profile ($p = 0.06$). With regard to environmental mastery, there were no significant differences between profiles when Bonferroni-corrected pairwise comparisons were conducted (all $ps > 0.17$). With regard to personal growth, the high mindfulness profile and the judgmentally observing profile possessed higher levels than the low mindfulness profile ($ps < 0.03$). With regard to purpose in life, the low mindfulness profile possessed lower levels than all other profiles ($ps < 0.01$).

Discussion

The present study used a large adult life-span, community sample to examine FFMQ profiles of mindfulness utilizing two person-centered techniques and explored whether profiles were related to age and psychological well-being. Cluster analysis revealed four mindfulness profiles: (1) high mindfulness, (2) low mindfulness, (3) judgmentally observing, and (4) nonjudgmentally aware. Our latent profile analysis also revealed four mindfulness profiles: (1) very low mindfulness, (2) moderate mindfulness, (3) nonjudgmentally aware, and (4) high mindfulness. However, two of the profiles identified by the latent profile analysis differed from those found using the cluster analysis. Further, two of the profiles identified by the latent profile analysis accounted for less than 10% of the sample when combined, raising concerns about their reliability. Using the four profiles identified by the cluster analysis, older age predicted higher likelihood of possessing a high mindfulness profile and a lower likelihood of possessing a low mindfulness profile. Mindfulness profiles identified by cluster analysis also differed in psychological well-being, with the high mindfulness profile possessing the highest levels of well-being and the low mindfulness profile possessing the lowest levels of psychological well-being. In an exploratory analysis examining the incremental validity of the profiles while controlling for the individual mindfulness facets, most of the profile differences in well-being were reduced to nonsignificance.

Our research expands prior studies of mindfulness profiles by utilizing two different person-centered approaches in a US adult life-span sample. Because each approach identified different profile solutions, these findings highlight how different types of person-centered analyses can impact the results and conclusions (Clatworthy et al. 2007; Morey et al. 1983). Using cluster analysis, we found profiles of mindfulness that were largely similar to those identified in prior research that used LPA with undergraduate students (Bravo et al. 2016; Kimmes et al. 2017; Pearson et al. 2015), a sample of adult cancer patients (Lam et al. 2018), as well as one national representative US sample (Sahdra et al. 2017). However, the mindfulness profiles resulting from LPA in our dataset did not replicate this pattern. The profiles from our LPA did resemble profiles found from an LPA with an adult sample of individuals in the UK with recurrent major depression (Gu et al.

Table 4 Fit indices for 2-class through 6-class solutions in latent profile analysis

Model	Log-likelihood	AIC	BIC	SSABIC	Entropy	LMR-LRT Test	*p*
2 classes	−4807.31	9646.625	9719.782	9668.978	0.745	536.296	0
3 classes	−4716.901	9477.801	9578.392	9508.536	0.836	176.352	0
4 classes	−4675.187	9406.373	9534.397	9445.49	0.84	81.365	0.2566
5 classes	−4638.201	9344.402	9499.459	9391.9	0.821	72.142	0.0551
6 classes	−4604.413	9288.827	9471.718	9344.708	0.845	215.831	0.8

AIC, Akaike Information Criterion, *BIC*, Bayesian Information Criterion; *SSABIC*, sample size-adjusted BIC; *LMR-LRT Test*, Lo–Mendell–Rubin adjusted likelihood ratio test

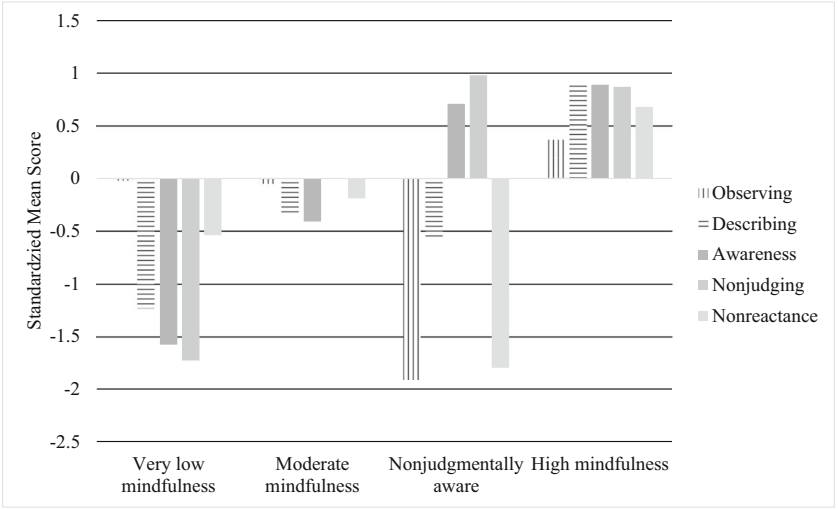

Fig. 2 Depiction of four profiles of mindfulness identified in latent profile analysis characterized by pattern of standardized means on the FFMQ

2020). To our knowledge, our study is the first to examine profiles of mindfulness in an adult life span sample by exploring and comparing two person-centered techniques. Our findings raise important concerns due to the lack of convergence in findings when using different analytic tools.

Overall, our work, in context with previous studies utilizing person-centered analyses, highlights three potential issues with this literature that calls into question the reliability of the profiles of mindfulness. First, our study reveals inconsistencies in the resulting profiles depending on the data analytic strategy. If LPA and cluster analysis converged to produce similar profiles, there would have been increased confidence that the resulting profiles were stable and meaningful. However, the results of the two techniques did not converge and therefore do not provide evidence for the external validity of the identified mindfulness profiles. It is noteworthy that the only other study (e.g., Lilja et al. 2013) to utilize cluster analysis identified 13 profiles of mindfulness, rather than the four identified via latent profile analysis in studies with college adults. Secondly, the LPA results add to variability and inconsistency of profiles of mindfulness in age-diverse samples. As described above, the high mindfulness, low mindfulness, nonjudgmentally aware, and nonjudgmentally observing profiles have been consistently observed in college student samples when using LPA. However, in age-diverse samples, such as the current study, the identified profiles are more inconsistent. The cluster analysis results provided similar profiles observed in previous studies of young adults, but these profiles were not replicated in the LPA. Third, in our study, the very low mindfulness and nonjudgmentally aware profiles from the LPA described less than 10% of the total sample. Because some profiles account for so few participants, there is concern about the replicability of these profiles. It should be reiterated here though that several of the previous studies (e.g., Bravo et al. 2016; Kimmes et al. 2017; Pearson et al. 2015; Bravo et al. 2018) also identified profiles that comprised very small percentages of the total sample, which may contribute to the lack of consistency of identified profiles across studies.

The second aim of the study was to explore whether profile membership varied by age. It should be noted that these results should be interpreted with caution given the lack of convergence in observed profiles resulting from the LPA and cluster analysis. Using the profiles resulting from the cluster analysis, we found that older age was significantly associated with an increased likelihood of membership in the high mindfulness profile and a decreased likelihood of membership in the low mindfulness profile. Older individuals reported relatively high mindfulness across all of the five facets. These findings are in contrast to Sahdra et al. (2017), the only other study to date to examine age differences in mindfulness profiles that found

Table 5 Regression weights and odds ratios of age predicting mindfulness profile in logistic regressions

Predicted profile	*b* (SE)	95% CI for odds ratio		
		Lower	Odds ratio	Upper
High mindfulness profile	0.02 (0.006)**	1.01	1.02	1.04
Low mindfulness profile	− 0.02 (0.005)**	0.97	0.98	0.99
Judgmentally observing profile	− 0.006 (0.006)	0.98	0.99	1.01
Nonjudgmentally aware profile	0.006 (0.006)	0.99	1.01	1.02

**$p < 0.001$

Table 6 Mean and standard deviation for each standardized psychological well-being measure by profile

	High mindfulness	Low mindfulness	Judgmentally observing	Nonjudgmentally aware	$F(3, 710)$
PANAS-PA	0.41_{a} (1.01)	-0.20_{b} (0.93)	0.20_{a} (0.93)	-0.34_{b} (1.02)	19.79*
PANAS-NA	-0.46_{a} (0.30)	0.46_{b} (1.30)	-0.21_{c} (0.59)	$-0.23_{a,c}$ (0.74)	42.09*
SPWB autonomy	0.72_{a} (0.79)	-0.55_{b} (0.96)	0.08_{c} (0.83)	-0.01_{c} (0.94)	57.28*
SPWB environmental mastery	0.79_{a} (0.86)	-0.67_{b} (0.83)	0.14_{c} (0.81)	0.03_{c} (0.90)	88.73*
SPWB personal growth	0.64_{a} (0.88)	-0.56_{b} (0.88)	0.31_{c} (0.82)	-0.23_{d} (0.95)	71.17*
SPWB positive relations	0.73_{a} (0.93)	-0.54_{b} (0.79)	0.12_{c} (0.91)	-0.09_{c} (0.95)	63.54*
SPWB purpose in life	0.61_{a} (0.95)	-0.56_{b} (0.83)	0.21_{c} (0.85)	-0.05_{c} (1.00)	58.12*
SPWB self-acceptance	0.75_{a} (0.80)	-0.56_{b} (0.85)	0.21_{c} (0.85)	-0.05_{c} (1.00)	65.53*
SHS	0.73_{a} (0.79)	-0.52_{b} (0.90)	0.14_{c} (0.92)	-0.12_{c} (0.97)	57.87*
SWLS	0.53_{a} (0.88)	-0.38_{b} (0.97)	0.09_{c} (0.97)	$-0.15_{b,c}$ (1.02)	21.41*
SEWB	0.62_{a} (0.88)	-0.43_{b} (0.95)	0.14_{c} (0.89)	-0.13_{c} (1.01)	37.36*
FES optimism	0.40_{a} (1.03)	-0.32_{b} (0.89)	0.11_{c} (1.00)	$-0.08_{b,c}$ (0.96)	19.93*
FES pessimism	-0.58_{a} (0.96)	0.41_{b} (0.85)	-0.05_{c} (0.94)	0.04_{c} (1.02)	32.62*

*$p < 0.01$. Numbers in parentheses represent standard deviations. Means sharing a subscript in a row indicate means that are not significantly different from each other (e.g., $p > 0.05$), after controlling for age. *PANAS-PA*, Positive and Negative Affective Schedule–Positive Affect, *PANAS-NA*, Positive and Negative Affective Schedule–Negative Affect, *SPWB*, Scales of Psychological Well-Being, *SHS*, Subjective Happiness Scale, *SWLS*, Satisfaction With Life Scale, *SEWB*, Scales of Emotional Well-Being, *FES*, Future Events Scale

that older age was associated with decreased likelihood of membership in the judgmentally observing profile. However, it is difficult to compare these contrasting findings, given that there are differences in FFMQ measure utilized.

Our findings showing that older age is associated with greater mindfulness align with previous studies using variable-centered approaches (Frank et al. 2015; Hohaus and Spark 2013; Mahoney et al. 2015; Prakash et al. 2015; Shook et al. 2017). Theories of aging suggest that motivation to maximize positive experiences in the "here and now" increases when individuals perceive limited time left in life, as occurs with aging (Carstensen 2006; Carstensen et al. 1999). Age-related increases in mindfulness may be indicative of developmental changes due to focusing on the present moment (Shook et al. 2017). However, because all of the extant work investigating aging and mindfulness is based on cross-sectional samples, it is unclear whether age-related differences reflect maturational change or cohort differences (Schaie 1983). It is important to note that causal claims about age and profile membership cannot be made due to the cross-sectional nature of the present study. It therefore cannot be determined that aging causes increased likelihood of profile membership. As such, there might be other important third variables that explain the relation between age and profile membership.

When assessing the relation between mindfulness profiles and well-being, only the profiles resulting from the cluster analysis were utilized, given the lack of reliability in the LPA profiles. Again, these results should be interpreted with caution given the inconsistent findings between the LPA and cluster analysis. As hypothesized and similar to previous research, when age was entered as the sole covariate, the high mindfulness profile possessed the highest levels of well-being and the low mindfulness profile was generally characterized by the lowest levels of psychological well-being across several measures. These findings, in part, align with previous research that found an association between high mindfulness and better psychological well-being (Bravo et al. 2016; Kimmes et al. 2017; Pearson et al. 2015). However, unlike these studies, we did not find the nonjudgmentally aware profile to be associated with better psychological well-being. In our study, the nonjudgmentally aware profile had worse well-being than the high mindfulness profile. These findings suggest that in adult life-span, community samples, such as ours, all facets of mindfulness must be relatively high to produce the greatest well-being. Future work with life span samples is necessary to help clarify whether the high mindfulness profile and the nonjudgmentally aware profile are similar or different in well-being.

Of note, the nonjudgmentally aware and judgmental observing profiles were similar on eleven of the thirteen measures of well-being in our sample. The two exceptions were positive affect and personal growth, where the judgmentally observing profile was associated with better scores. Given that these profiles only differed in two of the thirteen measures of well-being and the lack of theoretical explanation as to why the profiles differed specifically in positive affect and personal growth, the differences between profiles are likely due to random chance. Future studies should continue to investigate differences between these two profiles in well-being in age-diverse samples.

In line with Sahdra et al. (2017), differences in well-being between the profiles were assessed while controlling for age as well as the five FFMQ subscales. The purpose of these analyses was to test the incremental validity of using profiles of mindfulness, rather than individual facets. When controlling for FFMQ subscales, significant differences between profiles were only observed in four of the thirteen indicators of well-being. Thus, these results suggest that profile differences in well-being found in previous research might be overstated (Bravo et al. 2016; Kimmes et al. 2017; Pearson et al. 2015), because these studies did not control for individual FFMQ subscales. However, these analyses were strict ways of examining incremental validity of profiles of mindfulness. The very scales that comprised the mindfulness profiles were controlled for, which makes interpretation of these results somewhat difficult. So, results from these analyses should be interpreted with caution.

Limitations and Future Research Directions

As with any study, ours has a few limitations. First, because completing surveys via MTurk requires engagement with a device that connects to the internet, MTurk workers, especially older adult MTurk workers, may possess more technological skills relative to the more general older adult population. Yet, similarities of our findings to those from other studies of aging and mindfulness temper this concern. Secondly, although recruitment from MTurk resulted in a more age-diverse sample as intended, the sample was relatively homogenous in terms of race and education level. Most of the sample reported Caucasian ethnicity and completion of some college. To further enhance generalizability of the findings, person-centered analyses should be utilized to assess profiles of mindfulness in more racially and educationally diverse populations. Third, the use of MTurk introduces numerous possible problems regarding data integrity including but not limited to workers creating bots to complete surveys, having multiple individuals provide responses from the same account, and one user completing the survey on multiple accounts. Fourth, our use of a cross-sectional design precludes causal and temporal conclusions between variables. For instance, membership in the high mindfulness profile might lead to well-being or be a result of higher well-being. However, a large body of evidence indicates that mindfulness practice leads to better psychological well-being (e.g., Hofmann et al. 2010; Khoury et al. 2013). Fifth, two of the Scales of Psychological Wellbeing subscales demonstrated low levels of internal consistency, which calls into question the reliability and validity of these subscales. These relatively low alpha coefficients are also similar to the alpha coefficients observed in previous studies (e.g., Ryff and Keyes 1995). Sixth, we did not ask participants about their meditation experience. Experience meditating has been shown to affect trait mindfulness and the observing subscale has been shown to operate differently in meditators (Baer et al. 2006, 2008). It is important for future research to assess meditation experience to gain more insight into how these profiles look in both meditating and non-meditating adult lifespan samples. Seventh, because all constructs were assessed via self-report measures, the study may suffer from common method bias (Podsakoff et al. 2003). It is possible that some of the relations observed are inflated due to constructs being measured in similar ways.

Author Contributions CGF: developed research questions, conducted data analysis, and wrote the manuscript. JMW: designed and executed the study, conducted some data analysis, and collaborated with writing and editing the manuscript. NA: designed and executed the study, and assisted in the early stages of the writing process. JS: collaborated with the design and execution of the study, and collaborated with writing and editing the manuscript. NJS: collaborated with the design and execution of the study, consulted on data analytic procedures, and collaborated with writing and editing the manuscript.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethics Statement All procedures performed in studies involving human participants were in accordance with the ethical standards of West Virginia University and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Informed Consent Statement Informed consent was obtained from all participants before participation.

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