CrossMark

Getting Personal with Mindfulness: a Latent Profile Analysis of Mindfulness and Psychological Outcomes

Adrian J. Bravo[1] · Laura G. Boothe[2] · Matthew R. Pearson[3]

Abstract Variable-centered analyses demonstrate that most facets of mindfulness are associated with improved psychological well-being. Person-centered analyses provide the ability to identify distinct subpopulations defined by individuals' full response profiles on mindfulness facets. Previous research has used latent profile analysis (LPA) to distinguish four subgroups of college students based on five facets of mindfulness: high mindfulness group, low mindfulness group, judgmentally observing group, and non-judgmentally aware group. On emotional outcomes, they found the judgmentally observing group had the most maladaptive emotional outcomes followed by the low mindfulness group. However, they did not examine experience with mindfulness meditation, other mindfulness-related constructs, or psychological well-being. In a sample of 688 college students (481 non-meditators, 200 meditators), we used LPA to identify distinct subgroups defined by their scores on the Five Facet Mindfulness Questionnaire (FFMQ). Using the Lo-Mendell-Rubin Likelihood Ratio Test, we found that a 4-class solution fits optimally for the entire sample as well as subsamples of meditation-naïve and meditation-experienced participants. We substantially replicated previous findings in all samples with regard to emotional outcomes. Further, the high mindfulness group demonstrated the highest levels of psychological well-being, decentering, self-regulation, and psychological flexibility. Overall, our results demonstrate the utility of person-centered analyses to examine mindfulness in unique ways.

✉ Matthew R. Pearson
mateo.pearson@gmail.com

[1] Department of Psychology, Old Dominion University, Norfolk, VA, USA

[2] Department of Psychology, University of Virginia, Charlottesville, VA, USA

[3] Center on Alcoholism, Substance Abuse, & Addictions, University of New Mexico, 2650 Yale Blvd SE MSC 11-6280, Albuquerque, NM 87109, USA

Introduction

Mindfulness has been conceptualized as the awareness that comes from paying attention to present moment experience in a purposeful and non-judgmental manner (Bishop et al. 2004; Kabat-Zinn 1994). Unfortunately, this conceptual definition contains several distinct components that can be a challenge to operationalize. With the Five Facet Mindfulness Questionnaire (FFMQ), Baer et al. (2006) have attempted to measure five specific components of mindfulness in a multifactorial questionnaire. Specifically, the FFMQ assesses acting with awareness (e.g., "It seems I am 'running on automatic' without much awareness of what I'm doing"), non-judging of inner experience, (e.g., "I criticize myself for having irrational or inappropriate emotions"), non-reactivity to inner experience (e.g., "I perceive my feeling and emotions without having to react to them"), describing (e.g., "I am good at finding the words to describe my feelings"), and observing (e.g., "When I am walking, I deliberately notice the sensations of my body moving").

Despite the fact that each of these facets appear to be face valid indicators of mindfulness, multiple studies in primarily non-meditating samples have found some negative correlations among mindfulness facets, such as observing and non-judging of inner experience ($r=-.07$, Baer et al. 2006; $r=-.38$,

Brown et al. 2015; $r=-.31$, Pearson et al. 2015b) and observing and acting with awareness ($r=-.19$, Fernandez et al. 2010; $r=-.10$, Roos et al. 2015). These negative intercorrelations of FFMQ facets prevent the meaningful creation of a total composite score. For example, in a factor analysis model using the five FFMQ subscales as indicators, we find that the observing facet loads negatively on an overall latent construct of mindfulness (Pearson et al. 2015b), which is consistent with Baer et al. (2006) who reported that loading the observing facet onto a latent mindfulness factor in a non-meditating sample fits poorly. Interestingly, observing has been shown to be positively related to poor psychological symptoms among college students without prior meditation experience, whereas it has been shown to be negatively related to these outcomes among individuals with meditation experience (Baer et al. 2008). Further, observing has been found to be the mindfulness facet that is most strongly positively correlated with meditation experience (Baer et al.) and increases following mindfulness-based interventions (Carmody and Baer 2008). These results confirm that observing is an important facet of mindfulness that can be cultivated through mindfulness practices.

These mixed findings above poses a serious challenge for variable-centered analyses (e.g., factor analysis, multiple regression) that could perhaps be better addressed through the use of person-centered approaches. At least two studies have used person-centered approaches to examining mindfulness. Lilja et al. (2013) used hierarchical cluster analysis to identify 13 clusters of individuals based on their mindfulness scores (cluster size ranged from 37 to 93 participants). They found that meditators were overrepresented in four clusters, all of which had higher than average observing scores, and meditators were underrepresented in three clusters, all of which had lower than average observing scores. However, they did not compare the clusters on any outcomes related to psychological functioning. Pearson et al. (2015b) used latent profile analysis (LPA) to identify four classes of individuals based on their mindfulness scores: "high mindfulness" group (high on all 5 facets, $N=245$), "low mindfulness" group (moderately low on all 5 facets, $N=563$), "judgmentally observing" group (high on observing, but low on non-judging and acting with awareness, $N=63$), and "non-judgmentally aware" group (low on observing, but high on non-judging and acting with awareness, $N=70$). Across four emotional outcomes (i.e., depressive symptoms, anxiety symptoms, affective instability, and distress intolerance), they found that the judgmentally observing group had the least adaptive emotional outcomes followed by the low mindfulness group. Both the high mindfulness group and the non-judgmentally aware group had the most adaptive emotional outcomes. However, they did not examine meditation experience, which is a significant limitation considering Baer et al.'s (2006) findings that factor structure of the FFMQ varies based on meditation experience.

The purpose of the present study was to expand previous research applying person-centered analyses to the study of mindfulness. We used LPA given its relative advantages over other person-centered approaches. For example, it considers membership to be probabilistic and considers the size of a class when assigning class membership. First, we wanted to see if we could replicate the 4-class solution observed by Pearson et al. (2015b) in an independent sample, as well as among subsamples of meditation-naïve (i.e., non-meditators) and meditation-experienced (i.e., meditators) participants. Second, we wanted to examine how these classes differed not only on negative emotional outcomes but also on a range of constructs purported to be mechanisms mobilized by mindfulness (e.g., psychological flexibility, decentering, self-regulation, purpose in life; Shapiro et al. 2006) and psychological well-being. We expected that a high mindfulness group would emerge and show the most adaptive profile indicated by the lowest negative emotional outcomes and highest on constructs purported to be mechanisms mobilized by mindfulness-based practices.

Method

Participants and Procedure

Participants were recruited from a Psychology Department participant pool at a large, US southeastern university ($N=688$). To distinguish between meditation-naïve (i.e., non-meditators) and meditation-experienced (i.e., meditators) participants, the students responded to a single item about previous meditation experience (i.e., "Do you have any previous or current experience with mindfulness meditation or any other forms of meditation?"). Based on responses, there were 481 students in the non-meditators subsample and 200 students in the meditators subsample. Demographic information across all three samples are summarized in Table 1. Participants received research credit for completing the study. The study was approved by the institutional review board at the participating institution.

Measures

For all measures, composite scores were created by averaging items and reverse-coding items when appropriate such that higher scores indicate higher levels of the construct. The bivariate correlations, descriptive statistics, and internal consistency measures in the present sample are shown in Table 2.

Mindfulness Mindfulness was assessed using the 39-item Five Facet Mindfulness Questionnaire (FFMQ; Baer et al. 2006) measured on a 5-point response scale (1=never or very rarely true, 5=very often or always true). The five facets assessed by the FFMQ include acting with awareness

Table 1 Demographics

	Whole sample	Non-meditators subsample	Meditators subsample
Gender	n (%)	n (%)	n (%)
Male	224 (32.6)	160 (33.3)	61 (30.5)
Female	459 (66.7)	317 (65.9)	138 (69.0)
Missing	5 (0.7)	4 (0.8)	1 (0.5)
Age	n (%)	n (%)	n (%)
M	22.43 (6.99)	22.29 (7.21)	22.83 (6.43)
18	165 (24.0)	132 (27.4)	31 (15.5)
19	120 (17.4)	88 (18.3)	29 (14.5)
20	100 (14.5)	67 (13.9)	32 (16.0)
21	85 (12.4)	54 (11.2)	31 (15.5)
22	44 (6.4)	30 (6.2)	14 (7.0)
23+	160 (23.3)	104 (21.6)	27 (13.5)
Missing	14 (2.0)	6 (1.2)	8 (4.0)
Race/ethnicity	n (%)	n (%)	n (%)
American Indian/Alaska Native	7 (1.0)	4 (0.8)	3 (1.5)
Asian	38 (5.5)	27 (5.6)	11 (5.5)
Black/African American	202 (29.4)	153 (31.8)	46 (23.0)
Native Hawaiian/Pacific Islander	3 (0.4)	3 (0.6)	0 (0.67)
White, non-Hispanic	287 (41.7)	196 (40.8)	91 (45.5)
Hispanic/Latino	19 (2.8)	15 (3.1)	4 (2.0)
Mixed	128 (18.6)	83 (17.3)	45 (22.5)
Meditation experience	n (%)	n (%)	n (%)
Yes	200 (29.1)	—	—
No	481 (69.9)	—	—
Missing	7 (1.0)	—	—

Race and ethnicity were assessed with separate checkbox items (i.e., could select multiple options)

(e.g., "I rush through activities without being really attentive to them", reverse-coded; α=.90), non-judging of inner experience, (e.g., "I tend to evaluate whether my perceptions are right or wrong," reverse-coded; α=.90), non-reactivity to inner experience (e.g., "I watch my feelings without getting lost in them"; α=.84), describing (e.g., "My natural tendency is to put my experiences into words"; α=.81), and observing (e.g., "I intentionally stay aware of my feelings"; α=.97).

Depressive Symptoms Depressive symptoms were assessed using the 20-item Center for Epidemiological Studies Depression-Revised (CESD-R; Eaton et al. 2004) measured on a 5-point response scale (1=not at all or less than 1 day, 2=1–2 days, 3=3–4 days, 4=5–7 days, 5=nearly every day for 2 weeks). As advised by Van Dam and Earleywine (2011), the "5–7 days" and "nearly every day…" were collapsed into the same value. Example items include, "Nothing made me happy" and "I could not get going" (α=.94).

Worry Worry was assessed using the 16-item Penn State Worry Questionnaire (PSWQ; Meyer et al. 1990) measured on a 5-point response scale (1=not at all typical of me, 5=very

typical of me). Example items include, "Many situations make me worry" and "I have been a worrier all my life" (α=.93).

Distress Intolerance Distress intolerance was assessed using the 15-item Distress Tolerance Scale (DTS, Simons and Gaher 2005) measured on a 5-point response scale (1=strongly agree, 5=strongly disagree). Example items include, "My feelings of distress are so intense that they completely take over" and "I'll do anything to avoid feeling distressed or upset" (α=.94).

Psychological Flexibility Psychological flexibility was assessed using the 16-item Acceptance and Action Questionnaire (AAQ; Hayes et al. 2004) measured on a 7-point response scale (1=never true, 7=always true). Example items include, "I am able to take action on a problem even if I am uncertain what is the right thing to do" and "It's OK to feel depressed or anxious" (α=.62).

Decentering Decentering was assessed using the 11-item Experiences Questionnaire (Fresco et al. 2007) measured on a 5-point response scale (1=never, 5=all the time). Example items include, "I am better able to accept myself as I am" and "I can treat myself kindly" (α=.94).

Table 2 Bivariate correlations and descriptive statistics among all study variables in the whole sample

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	M	SD
1. Observing	.87																			3.06	0.84
2. Describing	.43	.81																		3.30	0.74
3. Acting with awareness	−.29	.27	.90																	3.46	0.82
4. Non-judging	−.36	.15	.72	.90																3.48	0.87
5. Non-reactivity	.63	.44	−.23	−.26	.84															2.90	0.77
6. FFMQ_total score	.47	.79	.56	.50	.50	.87														3.25	0.45
7. Psyc. flexibility	.08	.41	.41	.49	.26	.59	.62													3.16	0.63
8. Decentering	.26	.36	.16	.14	.39	.45	.45	.94												3.49	0.88
9. Self-regulation	.21	.47	.44	.31	.25	.60	.48	.45	.93											3.70	0.56
10. Autonomy	.24	.52	.31	.28	.34	.59	.49	.43	.59	.67										4.14	0.80
11. Environment mastery	.14	.52	.49	.47	.26	.68	.63	.41	.59	.63	.75									3.92	0.60
12. Personal growth	.31	.56	.32	.28	.28	.62	.42	.33	.57	.65	.64	.74								4.38	0.84
13. Positive relations	.28	.48	.25	.25	.28	.55	.42	.38	.51	.58	.68	.69	.73							4.29	0.84
14. Purpose in life	.27	.57	.36	.30	.25	.62	.43	.36	.62	.62	.68	.80	.69	.74						4.35	0.83
15. Self-acceptance	.20	.49	.36	.39	.30	.62	.57	.48	.57	.69	.77	.65	.74	.72	.80					4.16	0.92
16. Depressive symptoms	.10	−.20	−.45	−.44	.00	−.37	−.42	−.31	−.42	−.31	−.43	−.28	−.33	−.36	−.45	.94				0.72	0.66
17. Worry	.09	−.19	−.40	−.42	−.15	−.39	−.51	−.33	−.21	−.31	−.41	−.14	−.18	−.12	−.35	.43	.93			3.07	0.91
18. Rumination	.32	−.07	−.53	−.53	.14	−.27	−.35	−.11	−.17	−.17	−.35	−.07	−.08	−.08	−.22	.32	.47	.96		4.27	1.18
19. Distress Intolerance	.19	−.17	−.56	−.63	.04	−.43	−.52	−.21	−.30	−.32	−.47	−.28	−.26	−.27	−.38	.46	.49	.49	.94	2.54	0.92

FFMQ Five Facet Mindfulness Questionnaire

Significant correlations (*p*<.05) are bolded for emphasis. Cronbach's alphas are underlined and shown

Psychological Well-being Psychological well-being was assessed using the 42-item Psychological Well-being Questionnaire (PWB; Ryff 1989) measured on a 6-point response scale (1=strongly disagree, 6=strongly agree). The measure assesses six subscales of psychological well-being: autonomy (e.g., "I judge myself by what I think is important, not by the values of what others think is important"; α=.67), environmental mastery (e.g., "In general, I feel I am in charge of the situation in which I live"; α=.75), personal growth (e.g., "I have the sense that I have developed a lot as a person over time"; α=.74), positive relations (e.g., I enjoy personal and mutual conversations with family members or friends"; α=.73), purpose in life (e.g., "I have a sense of direction and purpose in life"; α=.74), and self-acceptance (e.g., "In general, I feel confident and positive about myself"; α=.80).

Self-regulation Self-regulation was assessed using the 31-item Short Self-Regulation Questionnaire (Carey et al. 2004) measured on a 5-point response scale (1=strongly disagree, 5=strongly agree). Example items include, "Once I have a goal, I can usually plan how to reach it" and "I tend to keep doing the same thing, even when it doesn't work" (α=.93).

Rumination Rumination was assessed using the 20-item Ruminative Thought Style Questionnaire (RTSQ; Brinker, and Dozois 2009) measured on a 7-point response scale (1=not all descriptive of me, 7=describes me very well). Example items include, "I find than my mind often goes over things again and again" and "When I am looking forward to an exciting event, thoughts of it interfere with what I am working on" (α=.96).

Demographics Demographic information for the participants was collected through a simple demographic questionnaire created by the research team. The participants gave information about their age, race, ethnicity, gender, meditation experience, class standing, and marital status. The questionnaire was administered at the end of the survey to reduce any potential bias.

Results

Class Solutions

As recommended by previous research (Marsh et al. 2009; Henson et al. 2007), we relied on goodness-of-fit indexes, such as the Akaike Information Criterion (AIC; Akaike 1973, 1974; Sakamoto et al. 1986) and Bayesian

Information Criterion (BIC; Schwarz 1978), as well as tests of statistical significance to settle upon the number of latent classes. Specifically, to determine the number of latent classes based on the pattern of means of the five subscales of the FFMQ across our three analytic samples (i.e., whole sample, non-meditators only sample, and meditators only sample) using Mplus 7.11 (Muthén and Muthén 1998–2012), we used the Lo-Mendell-Rubin Adjusted Likelihood Ratio Test (Lo et al. 2001; Vuong 1989), which compares whether a k class solution fits better than a $k-1$ class solution. Table 3 reports commonly used fit statistics for 1 through 6 class solutions for all three analytic samples.

Whole sample Within our whole analytic sample ($n=688$), the Likelihood Ratio Test suggested that a 2-class solution fits better than a 1-class solution ($p<.001$), a 3-class solution fits better than a 2-class solution ($p<.001$), and a 4-class solution fits better than a 3-class solution ($p<.001$); however, a 5-class solution did not fit significantly better than a 4-class solution ($p=.192$). Although the AIC and BIC continue to improve (i.e., decrease) from 1 through 6 class solutions (see Table 3), given the results of the Likelihood Ratio Test, we settled on the 4-class solution. Further, when comparing the 4-class solution to a latent trait model (i.e., one latent factor of mindfulness), the AIC and BIC are lower for the 4-class solution than the latent trait model, suggesting that a 4-class model fits significantly better than a single latent trait model (see Table 3).

The relative entropy value of .878 indicates that it is estimated that about eight in nine subjects were correctly classified in the appropriate latent class, which is a level of relative entropy that is considered high (i.e., .80, Clark and Muthén 2009). Figure 1 depicts the pattern of means across the latent classes. Scores have been standardized so that positive values are above the mean and negative values are below the mean. Class 1 comprised 9.30 % of the sample ($N=63.95$), and we label this class the judgmentally observing group as they were the highest on observing ($z=0.95$) but very low on non-judging of inner experience ($z=-1.72$) and acting with awareness ($z=-1.64$). The largest group, class 2, comprised 58.07 % of the sample ($N=399.51$), and we label this class the low mindfulness group as they were relatively low on every facet of mindfulness ($-.31<zs<-.01$). Class 3 comprised 12.71 % of the sample ($N=87.41$), and we label this class the non-judgmentally aware group as they were high on non-judging of inner experience ($z=1.15$) and acting with awareness ($z=1.16$) but very low on the observing facet of mindfulness ($z=-1.61$). Finally, class 4 comprised 19.93 % of the sample ($N=137.13$), and we label this class the high mindfulness group as they were moderately high on all facets of mindfulness ($.72<zs<1.27$).

Non-meditators Only Sample Within our non-meditators analytic sample ($n=481$), the Likelihood Ratio Test suggested that a 2-class solution fits better than a 1-class solution ($p<.001$), a 3-class solution fits better than a 2-class solution ($p<.001$), and a 4-class solution fits better than a 3-class

Table 3 Fit statistics for 1 through 6 class solutions for latent profile analysis (LPA) across three analytic samples

Fit statistics	Number of classes—whole sample						
	1	2	3	4	5	6	Latent trait
AIC	8292.56	7784.41	7305.17	7012.63	6933.14	6873.19	7641.63
BIC	8337.90	7856.96	7404.92	7139.57	7087.29	7054.55	7709.64
Adjusted BIC	8306.15	7806.15	7335.06	7050.67	6979.33	6927.54	7662.01
Entropy	—	0.90	0.86	0.88	0.87	0.87	—
Smallest n	688	90	98	63	13	13	—
Fit statistics	Number of classes—non-meditators only sample						
	1	2	3	4	5	6	Latent trait
AIC	5756.32	5319.96	4980.77	4822.56	4755.45	4714.95	5252.19
BIC	5798.08	5386.77	5072.64	4939.48	4897.43	4881.99	5314.83
Adjusted BIC	5766.34	5335.99	5002.81	4850.61	4789.52	4755.03	5237.22
Entropy	—	0.90	0.88	0.85	0.83	0.83	—
Smallest n	481	76	81	59	40	26	—
Fit statistics	Number of classes—mediators only sample						
	1	2	3	4	5	6	Latent trait
AIC	2355.06	2237.56	2127.19	2051.31	2006.49	1970.64	2251.54
BIC	2388.05	2290.34	2199.75	2143.66	2118.63	2102.58	2301.01
Adjusted BIC	2356.37	2239.65	2130.05	2054.95	2010.92	1975.85	2253.49
Entropy	—	0.80	0.87	0.90	0.92	0.89	—
Smallest n	200	60	10	11	8	8	—

AIC Akaike Information Criterion, *BIC* Bayesian Information Criterion
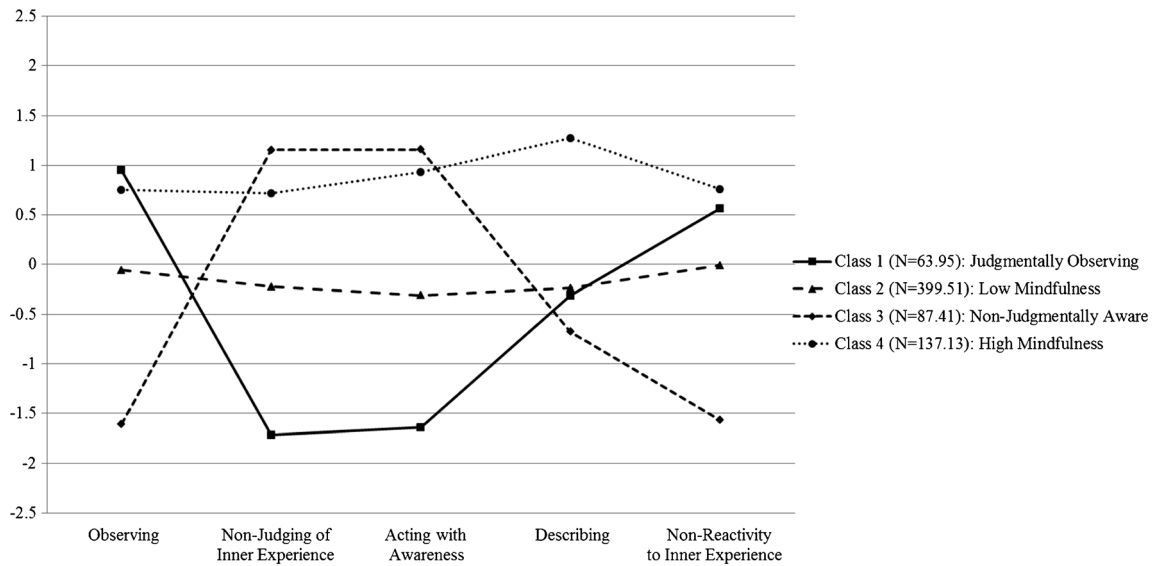
Fig. 1 Depiction of the four latent classes defined by pattern of standardized means on five facets of mindfulness in whole sample

solution ($p<.001$); however, a 5-class solution did not fit significantly better than a 4-class solution ($p=.071$). Although the AIC and BIC continue to improve (i.e., decrease) from 1 through 6 class solutions (see Table 3), given the results of the Likelihood Ratio Test, we settled on the 4-class solution. Further, when comparing the 4-class solution to a latent trait model (i.e., one latent factor of mindfulness), the AIC and BIC are lower for the 4-class solution than the latent trait model; suggesting that a 4-class model fits significantly better than a single latent trait model (see Table 3).

The relative entropy value of .854 indicates that it is estimated that about six in seven subjects were correctly classified in the appropriate latent class, which is a level of relative entropy that is considered high. Figure 2 depicts the pattern of means across the latent classes. Scores have been

standardized so that positive values are above the mean and negative values are below the mean. Class 1 (judgmentally observing group) comprised 12.87 % of the sample ($N=61.93$) and were the highest on observing ($z=0.65$), but very low on non-judging of inner experience ($z=-1.28$) and acting with awareness ($z=-1.36$). Class 2 (low mindfulness group) comprised 54.85 % of the sample ($N=263.82$) and were relatively low on all facets of mindfulness ($-.33<zs<-.07$). Class 3 (non-judgmentally aware group) comprised 14.94 % of the sample ($N=71.84$) and were high on non-judging of inner experience ($z=1.21$) and acting with awareness ($z=1.24$), but very low on the observing facet of mindfulness ($z=-1.65$). Finally, class 4 (high mindfulness group) comprised 17.34 % of the sample ($N=83.41$) and were moderately high on every facet of mindfulness ($.60<zs<1.22$).
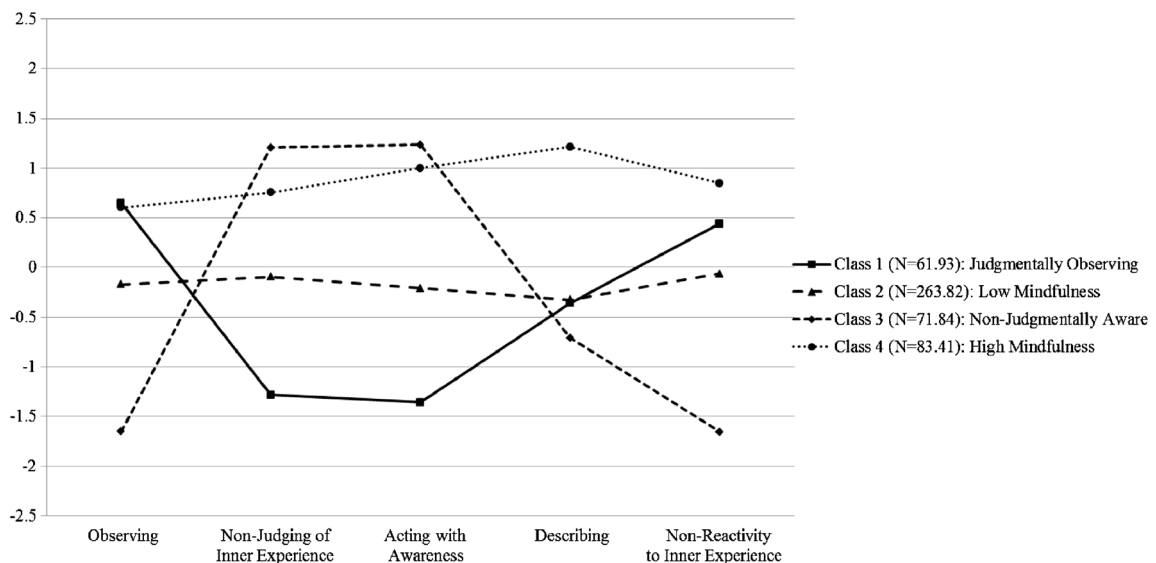

Fig. 2 Depiction of the four latent classes defined by a pattern of standardized means on five facets of mindfulness in non-meditators only sample
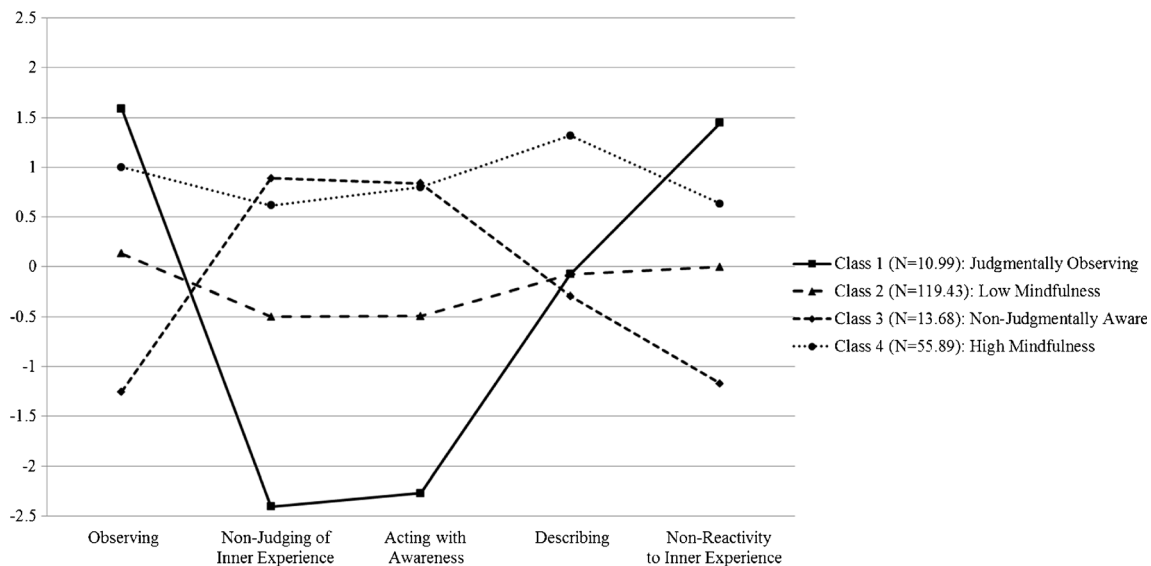
Fig. 3 Depiction of the four latent classes defined by pattern of standardized means on five facets of mindfulness in meditators only sample

Meditators Only Sample Within our meditators only analytic sample (*n*=200), the Likelihood Ratio Test suggested that a 2-class solution fits better than a 1-class solution (*p*=.009), a 3-class solution did not fit better than a 2-class solution (*p*=.110), but a 4-class solution fits better than a 3-class solution (*p*=.011) and a 5-class solution fits better than a 4-class solution (*p*=.009). Further, similar to the whole sample, the AIC and BIC continue to improve (i.e., decrease) from 1 through 6 class solutions (see Table 3). Though the Likelihood Ratio Test may indicate a 5-class solution, researchers recommend selecting the number of classes based on theory, previous research, and interpretation of the results (Marsh et al. 2009). Thus, based on previous research (Pearson et al. 2015b) and the interpretation of the results, we settled on the 4-class solution. Further, when comparing the 4-class solution to a latent trait model (i.e., one latent factor of mindfulness), the AIC and BIC are lower for the 4-class solution than the latent trait model, suggesting that a 4-class model fits significantly better than a single latent trait model (see Table 3).

The relative entropy value of .897 indicates that it is estimated that about nine in ten subjects were correctly classified in the appropriate latent class, which is a level of relative entropy that is considered high. Figure 3 depicts the pattern of means across the latent classes. Scores have been standardized so that positive values are above the mean and negative values are below the mean. Class 1 (judgmentally observing group) comprised 5.50 % of the sample (*N*=10.99) and were the highest on observing (*z*=0.95), but very low on non-judging of inner experience (*z*=−1.72) and acting with awareness (*z*=−1.64). Class 2 (low mindfulness group) comprised 59.72 % of the sample (*N*=119.43) and were relatively low on four out of five facets of mindfulness (−.50<*z*s<−.00). Class 3 (non-judgmentally aware group) comprised 6.84 % of the

sample (*N*=13.68) and were high on non-judging of inner experience (*z*=0.89) and acting with awareness (*z*=0.84), but very low on the observing facet of mindfulness (*z*=−1.25). Finally, class 4 (high mindfulness group) comprised 27.94 % of the sample (*N*=55.89) and were moderately high on all facets of mindfulness (.62<*z*s<1.32).

Equality of Means

Upon settling on a 4-class solution for each analytic sample, we then tested the equality of means across latent classes on mindfulness-related constructs (i.e., psychological flexibility, decentering, self-regulation), psychological well-being outcomes (i.e., autonomy, environmental mastery, personal growth, positive relationships, purpose in life, self-acceptance), and emotional outcomes (i.e., depressive symptoms, worry, rumination, distress intolerance) using pseudo-class-based multiple imputations (Asparouhov and Muthén 2007). Rather than assigning individuals to the latent class where their membership has the highest probability and conducting traditional techniques like analysis of variance (ANOVA), this method accounts for the probabilistic nature of class membership, and both global and pairwise comparisons can be conducted using Wald tests (see Tables 4, 5, and 6).

Mindfulness-Related Constructs Across the whole sample and non-meditators only sample, the results were quite consistent across mindfulness-related constructs (see Tables 4 and 5). Across each mindfulness-related construct (i.e., psychological flexibility, decentering, and self-regulation), we found that the high mindfulness group had the most adaptive profile on these constructs (i.e., higher psychological flexibility, decentering, and self-regulation) and was significantly different from all other groups in both analytic samples. Further, we

Table 4 Mean comparisons between latent classes on mindfulness facets, psychological constructs, psychological well-being, and emotional outcomes in whole sample

	Standardized scores (z-scores)			
	Class 1 Judgmentally observing	Class 2 Low mindfulness	Class 3 Non-judgmentally aware	Class 4 High mindfulness
Mindfulness facets	M (SE)	M (SE)	M (SE)	M (SE)
Observing	0.95_a (.092)	-0.06_b (.035)	-1.61_c (.081)	0.75_a (.073)
Describing	-0.31_a (.130)	-0.24_a (.039)	-0.68_b (.082)	1.27_c (.073)
Acting with awareness	-1.64_a (.079)	-0.31_b (.031)	1.16_c (.066)	0.93_d (.056)
Non-judging	-1.72_a (.095)	-0.22_b (.035)	1.15_c (.054)	0.72_d (.069)
Non-reactivity	0.56_a (.142)	-0.01_b (.032)	-1.57_c (.082)	0.76_a (.079)
Mindfulness-related constructs	M (SE)	M (SE)	M (SE)	M (SE)
Psychological flexibility	-0.89_a (.143)	-0.17_b (.044)	-0.04_b (.065)	0.94_c (.089)
Decentering	-0.11_a (.146)	-0.14_a (.045)	-0.37_a (.154)	0.69_b (.059)
Self-regulation	-0.65_a (.124)	-0.19_b (.046)	-0.22_b (.103)	0.98_c (.066)
Psychological well-being	M (SE)	M (SE)	M (SE)	M (SE)
Autonomy	-0.31_a (.113)	-0.25_a (.046)	-0.27_a (.104)	1.03_b (.071)
Environmental mastery	-0.66_a (.132)	-0.16_b (.045)	-0.16_b (.108)	0.86_c (.087)
Personal growth	-0.49_a (.135)	-0.19_b (.046)	-0.46_a (.097)	1.06_c (.059)
Positive relations	-0.32_a (.133)	-0.18_a (.046)	-0.39_a (.105)	0.91_b (.078)
Purpose in life	-0.56_a (.121)	-0.20_b (.047)	-0.37_{ab} (.093)	1.06_c (.061)
Self-acceptance	-0.70_a (.138)	-0.17_b (.046)	-0.22_b (.102)	0.97_c (.069)
Emotional outcomes	M (SE)	M (SE)	M (SE)	M (SE)
Depressive symptoms	1.09_a (.175)	0.08_b (.049)	-0.34_c (.087)	-0.51_c (.050)
Worry	0.86_a (.116)	0.12_b (.049)	-0.36_c (.085)	-0.53_c (.092)
Rumination	1.08_a (.125)	0.15_b (.041)	-0.84_c (.123)	-0.39_d (.084)
Distress intolerance	1.21_a (.126)	0.17_b (.044)	-0.67_c (.112)	-0.62_c (.065)

Means sharing a subscript in a row indicate means that are not significantly different from each other. Mean comparisons of the raw scores are available from the authors upon request

found that the judgmentally observing, non-judgmentally aware, and low mindfulness groups had a less adaptive profile on mindfulness-related constructs (i.e., lower psychological flexibility, decentering, and self-regulation) and did not significantly differ from each other on most of these constructs (see Tables 4 and 5). However, in the meditators only sample (see Table 6), the non-judgmentally aware group had a more adaptive profile on the mindfulness-related constructs (i.e., higher psychological flexibility, higher decentering, and higher self-regulation), although still less adaptive than the high mindfulness group, which once again had the most adaptive profile. Further, unlike the other samples and within the meditators only sample, the judgmentally observing group had positive scores on decentering which is divergent from the negative scores found in the whole and non-meditators only samples.

Psychological Well-being Across the whole sample and non-meditators only sample, the results were fairly consistent across psychological well-being outcomes (see Tables 4 and 5). Across each psychological well-being outcome, we found

that the high mindfulness group had the most adaptive profile (i.e., higher autonomy, environmental mastery, personal growth, positive relations, purpose in life, and self-acceptance) and was significantly different than all other groups in both analytic samples. Further, we found that judgmentally observing, non-judgmentally aware, and low mindfulness groups had less adaptive profiles (i.e., lower autonomy, environmental mastery, personal growth, positive relations, purpose in life, and self-acceptance) and did not significantly differ from each other on most of these outcomes (see Tables 4 and 5). However, in the meditators only sample (Table 6), the non-judgmentally aware group had a more adaptive profile on most of the psychological well-being outcomes (i.e., higher autonomy, environmental mastery, personal growth, and self-acceptance) than the judgmentally observing and low mindfulness groups. The high mindfulness group still had the most adaptive profile on the psychological well-being outcomes.

Emotional Outcomes Across the three analytic samples, the results were remarkably consistent across emotional outcome

Table 5 Mean comparisons between latent classes on mindfulness facets, psychological constructs, psychological well-being, and emotional outcomes in non-meditators only sample

	Standardized scores (z-scores)			
	Class 1 Judgmentally observing	Class 2 Low mindfulness	Class 3 Non-judgmentally aware	Class 4 High mindfulness
Mindfulness facets	M (SE)	M (SE)	M (SE)	M (SE)
Observing	0.65_c (.086)	-0.17_a (.042)	-1.65_b (.090)	0.60_c (.097)
Describing	-0.36_a (.124)	-0.32_a (.047)	-0.71_b (.085)	1.22_c (.097)
Acting with awareness	-1.36_c (.073)	-0.21_a (.037)	1.24_b (.071)	1.00_d (.068)
Non-judging	-1.28_c (.091)	-0.10_a (.042)	1.21_b (.059)	0.76_d (.087)
Non-reactivity	0.44_c (.105)	-0.07_a (.041)	-1.66_b (.090)	0.85_d (.101)
Mindfulness-related constructs	M (SE)	M (SE)	M (SE)	M (SE)
Psychological flexibility	-0.81_b (.136)	-0.12 (.054)	-0.06_a (.070)	0.86_c (.116)
Decentering	-0.12_a (.127)	-0.19_a (.056)	-0.39_a (.170)	0.72_b (.079)
Self-regulation	-0.65_b (.126)	-0.16_a (.056)	-0.25_a (.113)	0.92_c (.081)
Psychological well-being	M (SE)	M (SE)	M (SE)	M (SE)
Autonomy	-0.42_a (.102)	-0.30_a (.058)	-0.29_a (.111)	1.06_b (.093)
Environmental mastery	-0.52_a (.131)	-0.09_b (.056)	-0.15_b (.121)	1.02_c (.107)
Personal growth	-0.48_{ab} (.123)	-0.26_a (.055)	-0.51_b (.100)	0.96_c (.080)
Positive relations	-0.37_a (.132)	-0.21_a (.056)	-0.39_a (.117)	0.88_b (.105)
Purpose in life	-0.50_a (.121)	-0.24_a (.058)	-0.39_a (.101)	1.09_b (.084)
Self-acceptance	-0.59_b (.137)	-0.17_a (.054)	-0.25_{ab} (.111)	0.95_c (.096)
Emotional outcomes	M (SE)	M (SE)	M (SE)	M (SE)
Depressive symptoms	0.79_c (.166)	-0.01_a (.060)	-0.39_b (.094)	-0.50_b (.071)
Worry	0.70_c (.125)	0.09_a (.061)	-0.39_b (.092)	-0.55_b (.122)
Rumination	0.85_c (.128)	0.11_a (.050)	-0.82_b (.131)	-0.47_d (.107)
Distress intolerance	0.85_c (.124)	0.10_a (.053)	-0.75_b (.129)	-0.47_b (.086)

Means sharing a subscript in a row indicate means that are not significantly different from each other. Mean comparisons of the raw scores are available from the authors upon request

variables (Tables 4, 5, and 6). Across each emotional outcome, we found that the high mindfulness and the non-judgmentally aware groups in each analytic sample had the most adaptive emotional outcomes (i.e., lower depressive symptoms, worry, rumination, and distress intolerance) and did not significantly differ from each other on any outcome. In contrast, the judgmentally observing group in each analytic sample had the poorest emotional outcomes (i.e., highest depressive symptoms, worry, rumination, and distress intolerance), which were significantly worse than all other groups. Finally, the low mindfulness group was always significantly better than the judgmentally observing group in each analytic sample on these outcomes, but significantly worse than the non-judgmentally aware and high mindfulness groups.

Discussion

The present study aimed to replicate and extend previous research using a person-centered approach to examining self-reported mindfulness using the FFMQ. Specifically, to overcome limitations of variable-centered analyses, we conducted latent profile analysis (LPA) to identify homogenous subpopulations based on mindfulness scores within a heterogeneous sample. In a previous study using LPA, Pearson et al. (2015b) found 4 classes of individuals based on their mindfulness scores. In the present study, we replicated this 4-class solution in an independent sample including subsamples of meditators and non-meditators. The profiles of each class were markedly similar across these studies and across each subsample which included a high mindfulness group (i.e., moderately high on all facets of mindfulness), a low mindfulness group (i.e., relatively low on all facets of mindfulness), a judgmentally observing group (i.e., high on observing facet, low on non-judging of inner experience and acting with awareness), and a non-judgmentally aware group (i.e., low on observing, high on non-judging of inner experience and acting with awareness).

In an attempt to quantify the similarity between these two studies, we compared the raw means observed by Pearson

Table 6 Mean comparisons between latent classes on mindfulness facets, psychological constructs, psychological well-being, and emotional outcomes in meditators only sample

	Standardized scores (z-scores)			
	Class 1 Judgmentally observing	Class 2 Low mindfulness	Class 3 Non-judgmentally aware	Class 4 High mindfulness
Mindfulness facets	M (SE)	M (SE)	M (SE)	M (SE)
Observing	1.59_a (.124)	0.13_b (.064)	-1.25_d (.185)	1.00_c (.096)
Describing	-0.07_a (.246)	-0.08_a (.073)	-0.29_a (.222)	1.32_b (.113)
Acting with awareness	-2.27_a (.136)	-0.49_b (.060)	0.84_c (.167)	0.80_c (.096)
Non-judging	-2.41_a (.147)	-0.50_b (.066)	0.89_c (.154)	0.62_c (.111)
Non-reactivity	1.45_a (.377)	-0.00_b (.057)	-1.17_d (.176)	0.63_c (.117)
Mindfulness-related constructs	M (SE)	M (SE)	M (SE)	M (SE)
Psychological flexibility	-0.89_a (.353)	-0.29_a (.081)	0.07_c (.156)	1.07_b (.131)
Decentering	0.40_{ab} (.437)	-0.12_a (.080)	0.01_{ab} (.393)	0.64_b (.090)
Self-regulation	-0.60_a (.246)	-0.26_{ab} (.088)	0.22_b (.242)	1.07_c (.116)
Psychological well-being	M (SE)	M (SE)	M (SE)	M (SE)
Autonomy	-0.05_a (.247)	-0.15_a (.082)	0.15_a (.275)	0.96_b (.110)
Environmental mastery	-0.89_a (.251)	-0.30_b (.076)	-0.00_{bc} (.265)	0.58_c (.133)
Personal growth	-0.99_a (.268)	-0.02_b (.089)	0.04_b (.306)	1.21_c (.079)
Positive relations	-0.35_a (.231)	-0.09_a (.086)	-0.13_a (.278)	0.95_b (.115)
Purpose in life	-1.06_a (.239)	-0.09_b (.087)	-0.13_b (.285)	1.02_c (.087)
Self-acceptance	-0.68_a (.267)	-0.23_{ab} (.090)	0.17_b (.280)	0.99_c (.097)
Emotional outcomes	M (SE)	M (SE)	M (SE)	M (SE)
Depressive symptoms	1.44_a (.498)	0.30_b (.093)	-0.25_c (.244)	-0.52_c (.074)
Worry	0.64_a (.240)	0.23_a (.088)	-0.27_b (.223)	-0.47_b (.136)
Rumination	1.49_a (.212)	0.24_b (.073)	-1.07_c (.411)	-0.27_c (.132)
Distress intolerance	2.03_a (.184)	0.34_b (.083)	-0.45_c (.239)	-0.57_c (.095)

Means sharing a subscript in a row indicate means that are not significantly different from each other. Mean comparisons of the raw scores are available from the authors upon request

et al. (2015b) for each of the five facets of mindfulness in each of the four latent classes with the means we observed in our full sample using discrepancy scores (i.e., absolute value of difference scores). For example, we subtracted the mean for the observing facet in the low mindfulness group in the current sample from the mean for the observing facet in the low mindfulness group reported in Pearson et al. The average discrepancy between the means in these two studies was .256 (range .033–.596). To provide a context for this value, we compared this mean difference with the average across-class discrepancy in the means in the present study (e.g., mean for the observing facet in the low mindfulness group minus the mean for the observing facet in the high mindfulness group), which was 1.12. Together, these comparisons reveal a striking similarity in the pattern of means across these two studies.

We replicated the pattern of differences across latent classes observed by Pearson et al. (2015b) on negative emotional outcomes including depressive symptoms, worry, and distress intolerance. Specifically, the high mindfulness and non-judgmentally aware were most adaptive, followed by the low mindfulness group, and the judgmental observing group showed the least adaptive outcomes. We also extended the findings from previous research by examining a wider range of constructs theoretically related to mindfulness and psychological well-being. Based on Shapiro et al.'s (2006) model of mindfulness, mindfulness is purported to have effects on psychological health outcomes via decentering, cognitive/behavioral flexibility, self-regulation/self-management, values clarification, and exposure. Previous studies have provided support for this model of mindfulness using variable-centered analyses (Brown et al. 2015; Carmody and Baer 2008; Pearson et al. 2015a). We found that the high mindfulness group demonstrated the highest scores on each of these putative mechanisms of mindfulness as well as the highest scores on psychological well-being variables.

Just as differences in factor structure and concurrent validity of the FFMQ have been found based on whether participants had meditation experience (Baer et al. 2008), we found that the non-judgmentally aware group appeared to be more adaptive among meditators than non-meditators. These

unexpected results should be interpreted cautiously until they are replicated, but they do suggest that meditation experience can change both how mindfulness facets relate to each other and to outcomes. Despite these small differences, the 4-class solution in the meditators sample was remarkably similar to the 4-class solution in the non-meditators sample.

Strengths and Limitations

The present study replicated a 4-class solution reported by Pearson et al. (2015b) as a parsimonious way to describe the pattern of means on five mindfulness facets in a college student sample. We extended the findings of Pearson et al. by demonstrating that the 4-class solution fits the data well in subsamples with and without meditation experience and by demonstrating that the high mindfulness group demonstrated the most adaptive profile on a wider range of emotional and psychological constructs. Further, our results point to the utility of person-centered analyses to examine mindfulness. Given that one of the limitations of variable-centered analyses is that they assume that all participants have been sampled from a single population (i.e., population homogeneity assumption, Collins and Lanza 2010), person-centered analyses can identify individuals who share particular attributes (i.e., subgroups) that may relate differently across various psychological outcomes. For example, in terms of a total mindfulness score, the two most similar classes were the non-judgmentally aware (total score $z = -.31$) group and the judgmental observing group (total score $z = -.43$). However, they differ quite dramatically from each other on many outcomes. For example within the whole sample, these two groups show very large differences on depressive symptoms (1.43 standard deviation difference), rumination (1.92 standard deviation difference), worry (1.22 standard deviation difference), and distress intolerance (1.88 standard deviation difference). Although their FFMQ total score might suggest a strong similarity between the judgmental observing and the non-judgmentally aware groups, examining these outcome variables suggests that the non-judgmentally aware group is much more adaptive on emotional outcomes compared to the judgmentally observing group.

Nonetheless, interpretation of these results should be constrained according to the present study's limitations. Our cross-sectional study design does not allow the demonstration of temporal precedence, preventing causal inferences. Although we found key differences in emotional functioning and psychological well-being across the mindfulness subgroups, there are several "third variable" explanations that could be better studied with the use of experimental and longitudinal designs. Future research using longitudinal extensions of LPA (i.e., longitudinal LPA and latent transition analysis) in the context of mindfulness-based interventions could make significant contributions to the literature. Such studies

could determine whether mindfulness-based practices increase the likelihood that one transitions from a less adaptive class to a more adaptive class (e.g., from judgmentally observing to high mindfulness) or change how "adaptive" a specific profile is (e.g., non-judgmentally aware). Given that the 4-class solution has been replicated and both clinical and longitudinal studies tend to have smaller sample sizes, confirmatory LPA may be most useful in these studies. Although we segmented our sample into two groups based on whether they had any experience with mindfulness meditation (i.e., meditators vs. non-meditators), results may differ in a cohort of long-term mindfulness meditators or individuals undergoing structured mindfulness-based interventions. Research into these populations is needed to determine the degree to which our 4-class solution would generalize to these populations. Although we examined emotional functioning, psychological well-being, and putative mechanisms of the effects of mindfulness on psychological health, other prime targets of mindfulness-based interventions (e.g., chronic pain, Kabat-Zinn 1982) were not examined in the present study. Thus, it is important to examine how these latent classes differ on a broader range of physical and mental health variables.

Clinical Implications

Although social scientists predominantly use variable-centered analyses that assume that most individual characteristics exist on a continuum, lay persons tend to classify individuals into types or categories based on these characteristics. Thus, the way that LPA classifies individuals into distinct subgroups using rigorous statistical methods is a more sophisticated way of classifying individuals in much the same way as people do naturally. As evidenced by their use of categorical diagnoses (American Psychiatric Association 2013), clinicians also tend to think about their patients as being in certain subgroups or categories. Although the past decade has shown a rapid proliferation of mindfulness-based interventions targeting many areas of psychopathology (Godfrey et al. 2015; Gu et al. 2015; Shonin et al. 2015), tailoring specific mindfulness-based practices to individuals based on their mindfulness profiles may be a way to enhance the efficacy and the efficiency of mindfulness-based interventions. For example, an individual whose mindfulness profile fits with the judgmentally observing group may benefit most from mindfulness-based practices that cultivate the non-judging of inner experience facet of mindfulness, whereas an individual whose mindfulness profile fits with the non-judgmentally aware group may benefit most from mindfulness-based practices that cultivate the observing facet of mindfulness. Perhaps self-compassion meditation may be more effective for the former and open monitoring may be more effective for the latter; however, this supposition warrants testing.

Conclusion

The present study identified four similar subgroups of individuals based on their mindfulness profiles as identified in a previous study (Pearson et al. 2015b) in an independent sample including subsamples of both meditators and non-meditators. All of the results suggest that individuals in the high mindfulness group (i.e., moderately high on all facets of mindfulness) have the most adaptive emotional and psychological outcomes. However, this subgroup forms a minority of our sample (<20 % of the total sample). The largest subgroup was the low mindfulness group, suggesting the promise of mindfulness-based interventions as a way to promote general psychological well-being and thwart negative emotional functioning in the college student population.

References

Akaike, H. (1973). Information theory and an extension of the maximum likelihood principle. In B. N. Petrov & F. Casaki (Eds.), *Second International Symposium on Information Theory* (pp. 267–281). Budapest: Academiai Kiado.

Akaike, H. (1974). A new look at the statistical model identification. *IEEE Transactions on Automatic Control, 19*, 716–723. doi:10.1109/TAC.1974.1100705.

American Psychiatric Association (2013). Diagnostic and statistical manual of mental disorders (5th ed.). Washington, DC: Author.

Asparouhov, T., & Muthén, B. (2007). Computationally efficient estimation of multilevel high-dimensional latent variable models. *Proceedings of the 2007 Joint Statistical Meetings, Section on Statistics in Epidemiology* (2531–2535). Alexandria, VA: American Statistical Association.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*, 27–45. doi:10.1177/1073191105283504.

Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., & Williams, J. M. G. (2008). Construct validity of the five facet mindfulness questionnaire in meditating and nonmeditating samples. *Assessment, 15*, 329–342. doi:10.1177/1073191107313003.

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., Segal, Z. V., Abbey, S., Speca, M., Velting, D., & Devins, G. (2004). Mindfulness: a proposed operational definition. *Clinical Psychology: Science and Practice, 11*, 230–241. doi:10.1093/clipsy/bph007.

Brinker, J. K., & Dozois, D. J. A. (2009). Ruminative thought style and depressed mood. *Journal of Clinical Psychology, 65*, 1–19. doi:10.1002/jclp.20542.

Brown, D. B., Bravo, A. J., Roos, C. R., & Pearson, M. R. (2015). Five facets of mindfulness and psychological symptoms: evaluating a psychological model of the mechanism of mindfulness. *Mindfulness, 6*, 1021–1032. doi:10.1007/s12671-014-0349-4.

Carey, K. B., Neal, D. J., & Collins, S. E. (2004). A psychometric analysis of the self-regulation questionnaire. *Addictive Behaviors, 29*, 253–260. doi:10.1016/j.addbeh.2007.05.004.

Carmody, J., & Baer, R. A. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine, 31*, 23–33. doi:10.1007/s10865-007-9130-7.

Clark, S. L., & Muthén, B. (2009). Relating latent class analysis results to variables not included in the analysis. Submitted for publication. Available from http://www.statmodel.com/download/relatinglca.pd

Collins, L. M., & Lanza, S. T. (2010). *Latent class and latent transition analysis with applications in the social, behavioural, and health sciences*. Hoboken: John Wiley & Sons, Inc.

Eaton, W. W., Muntaner, C., Smith, C., Tien, A., & Ybarra, M. (2004). Center for Epidemiologic Studies Depression Scale: review and revision (CESD and CESD-R). In M. E. Maruish (Ed.), *The use of psychological testing for treatment planning and outcomes assessment* (3rd ed., pp. 363–377). Mahwah: Lawrence Erlbaum.

Fernandez, A. C., Wood, M. D., Stein, L. A. R., & Rossi, J. S. (2010). Measuring mindfulness and examining its relationship with alcohol use and negative consequences. *Psychology of Addictive Behaviors, 24*, 608–616. doi:10.1037/a0021742.

Fresco, D. M., Moore, M. T., van Dulmen, M. H., Segal, Z. V., Ma, S. H., Teasdale, J. D., & Williams, J. M. (2007). Initial psychometric properties of the experiences questionnaire: validation of a self-report measure of decentering. *Behavior Therapy, 38*, 234–246. doi:10.1016/j.beth.2006.08.003.

Godfrey, K. M., Gallo, L. C., & Afari, N. (2015). Mindfulness-based interventions for binge eating: a systematic review and meta-analysis. *Journal of Behavioral Medicine, 38*, 348–362.

Gu, J., Strauss, C., Bond, R., & Cavanah, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clinical Psychology Review, 37*, 1–12.

Hayes, S. C., Strosahl, K. D., Wilson, K. G., Bissett, R. T., Pistorello, J., Toarmino, D., et al. (2004). Measuring experiential avoidance: a preliminary test of a working model. *The Psychological Record, 54*, 553–578.

Henson, J. M., Reise, S. P., & Kim, K. H. (2007). Detecting mixtures from structural model differences using latent variable mixture modeling: a comparison of relative model fit statistics. *Structural Equation Modeling, 14*, 202–226. doi:10.1080/10705510709336744.

Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: theoretical considerations and preliminary results. *General Hospital Psychiatry, 4*, 33–47.

Kabat-Zinn, J. (1994). *Wherever you go, there you are: mindfulness meditation in everyday life*. New York: Hyperion Books.

Lilja, J. L., Lundh, L.-G., Josefsson, T., & Falkenst m, F. (2013). Observing as an essential facet of mindfulness: a comparison of FFMQ patterns in meditating and non-meditating individuals. *Mindfulness, 4*, 203–2012. doi:10.1007/s12671-012-0111-8.

Lo, Y., Mendell, N., & Rubin, D. (2001). Testing the number of components in a normal mixture. *Biometrika, 88*, 767–778. doi:10.1093/biomet/88.3.767.

Marsh, H. W., Lüdtke, O., Trautwein, U., & Morin, A. J. (2009). Classical latent profile analysis of academic self-concept dimensions: synergy of person-and variable-centered approaches to theoretical models of self-concept. *Structural Equation Modeling, 16*, 191–225. doi:10.1080/10705510902751010.

Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the Penn state worry questionnaire. *Behavior Research and Therapy, 28*, 487–495. doi:10.1016/0005-7967(90)90135-6.

Muthén, L. K., & Muthén, B. O. (1998–2012). *Mplus user's guide* (7th ed.). Los Angeles: Muthén & Muthén.

Pearson, M. R., Brown, D. B., Bravo, A. J., & Witkiewitz, K. (2015a). Staying in the moment and finding purpose: the associations of trait mindfulness, decentering, and purpose in life with depressive symptoms, anxiety symptoms, and alcohol-related problems. *Mindfulness, 6*, 645–653. doi:10.1007/s12671-014-0300-8.

Pearson, M. R., Lawless, A. K., Brown, D. B., & Bravo, A. J. (2015b). Mindfulness and emotional outcomes: identifying subgroups of college students using latent profile analysis. *Personality and Individual Differences, 76*, 33–38. doi:10.1016/j.paid.2014.11.009.

Roos, C. R., Pearson, M. R., & Brown, D. B. (2015). Drinking motives mediate the negative associations between mindfulness facets and alcohol outcomes among college students. *Psychology of Addictive Behaviors, 29*, 176–183. doi:10.1037/a0038529.

Ryff, C. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology, 57*, 1069–1081. doi:10.1037/0022-3514.57.6.1069.

Sakamoto, Y., Ishiguro, M., & Kitagawa, G. (1986). *Akaike information criterion statistics*. Dordrecht, The Netherlands: D. Reidel.

Schwarz, G. (1978). Estimating the dimension of a model. *The Annals of Statistics, 6*, 461–464. doi:10.1214/aos/1176344136.

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology, 62*, 373–386. doi:10.1002/jclp.20237.

Shonin, E., Van Gordon, W., Compare, A., Zangeneh, M., & Griffiths, M. D. (2015). Buddhist-derived loving-kindness and compassion meditation for the treatment of psychopathology: a systematic review. *Mindfulness, 6*, 1161–1180.

Simons, J. S., & Gaher, R. M. (2005). The distress tolerance scale: development and validation of a self-report measure. *Motivation and Emotion, 29*, 83–102. doi:10.1007/s11031-005-7955-3.

Van Dam, N. T., & Earleywine, M. (2011). Validation of the center for epidemiologic studies depression scale—revised (CESD-R): Pragmatic depression assessment in the general population. *Psychiatry Research, 186*, 128-132. doi:10.1016/j.psychres.2010.08.018.

Vuong, Q. (1989). Likelihood ratio tests for model selection and non-nested hypotheses. *Econometrica, 57*, 307–333. doi:10.2307/1912557.