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Components of Mindfulness in Patients with Chronic Pain

Lance M. McCracken · Miles Thompson

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Abstract Methods of mindfulness are gaining increasing popularity within the behavioral and cognitive therapies and appear helpful for a range of clinical problems. The purpose of this study was to examine cognitive and behavioral processes underlying mindfulness. One hundred fifty patients seeking treatment for chronic pain completed a battery of questionnaires, including the 15-item Mindful Attention Awareness Scale (MAAS; Brown and Ryan, J Pers Soc Psychol 84:822–848, 2003). Preliminary analyses supported reliability and validity of the MAAS for patients with chronic pain. A confirmatory factor analysis provided incomplete support for a singe factor structure from the items of the MAAS. In turn, an exploratory factor analysis yielded a four-factor solution: Acting with Awareness, Present Focus, Responsiveness, and Social Awareness. Correlation and regression analyses indicated that the Acting with Awareness and Present Focus subscales were significantly related to measures of patient emotional, physical, and social functioning. Further research that explores and validates models of mindfulness-based processes is recommended.

Keywords Mindfulness · Factor analysis · Chronic pain · Acceptance and commitment therapy

Methods of mindfulness are increasingly included in the behavioral and cognitive therapies. They now appear in Mindfulness-Based Stress Reduction programs (Kabat-Zinn 1990), Dialectical Behavior Therapy (Linehan 1993), Acceptance and Commitment Therapy (Hayes et al. 1999), Mindfulness-Based Cognitive Therapy (e.g., Teasdale et al. 2000), and other approaches (see Hayes et al. 2004). Although there are a number of standardly accepted definitions of mindfulness (e.g. Kabat-Zinn 1990; Baer 2006), the cognitive behavioral processes underlying mindfulness may remain unclear for many in the field.

Mindfulness has been defined as "a state in which one is highly aware and focused on the reality of the present moment, accepting and acknowledging it, without getting caught up in thoughts that are about the situation or in emotional reactions to the situation," (p. 71, Bishop 2002); as "the nonjudgmental observation of the ongoing stream of internal and external stimuli as they arise," (p. 125, Baer 2003); and, simply as, "nonevaluative contact with events that are here and now," (p. 163, Hayes and Wilson 2003). A recent consensus definition, from meetings of 11 researchers and clinicians in the field, proposed a two-component model of mindfulness involving "self regulation of attention so that it is maintained on immediate experience," and an orientation toward experience characterized by "curiosity, openness, and acceptance," (p. 232, Bishop et al. 2004). Each of these definitions, admittedly selected from a wide diversity of those available, includes a process of contact between behavior and experienced events, in the present, and the absence of reactions to these events that are based in judgments or evaluations.

In a series of studies focused on the content of five measures of mindfulness, Baer and colleagues (2006) found that mindfulness appears best conceptualized as a multifaceted construct. The facets of mindfulness based on these analyses included, non-reactivity to inner experiences, observing experiences, acting with awareness, describing experiences, and nonjudging of experience. Further analyses showed that three of these facets: nonreactivity, nonjudging, and acting with awareness; were shown to

L. M. McCracken (✉) · M. Thompson
Bath Centre for Pain Services,
Royal National Hospital for Rheumatic Diseases,
Bath BA1 1RL, UK
e-mail: Lance.McCracken@RNHRD-tr.swest.nhs.uk

have significant unique relations with psychological symptoms (Baer et al. 2006). These results, however, were found with a non-clinical student sample, and it is not clear to what degree they would generalize to other groups.

Most studies of mindfulness examine the effects of mindfulness training, typically in the form of meditation. There are now at least two meta-analyses of these studies (Baer 2003; Grossman et al. 2004), and the conclusion is that these methods may be helpful for a range of clinical problems. Far fewer studies have attempted to directly study the *processes* of mindfulness, particularly in clinical samples. In one study of this type, McCracken et al. (2007) investigated relations between mindfulness, as measured by the Mindful Attention Awareness Scale (MAAS, Brown and Ryan 2003), with measures of functioning in patients with chronic pain. This study found that the measure of mindfulness accounted for significant variance in depression, pain-related anxiety, and disability, independent of patient background variables or reported pain intensity. However, in this study mindfulness was measured globally, as a single composite psychological process, without considering the possibly separate roles of different component processes within it.

Recent research has at least slightly questioned the unidimensional factor structure of the MAAS as suggested by Brown and Ryan (2003). MacKillop and Anderson (2007) performed a confirmatory factor analysis on a large university sample (n=711) and found that the unidimensional structure was not necessarily generalizable to all groups. Although the authors suggest that this may have been due to low power, the study does establish a precedent for, and possible utility in, examining the factor structure of the MAAS within other samples, such as patients seeking treatment for chronic pain and disability. The usefulness of undertaking such research is also supported by definitions in the current literature (e.g. Bishop 2002; Bishop et al. 2004) and other measures of mindfulness (e.g. Baer et al. 2006), which all suggest that the construct is multifaceted.

The purposes of the present study were three-fold. First, preliminary reliability and validity analyses were conducted in the sample of patients with chronic pain, as this had not been explicitly done in the past. Second, the component structure of the MAAS was examined in the same sample. This analysis allowed for the exploration as to whether mindfulness, as measured by this instrument, is unidimensional or multidimensional and to see if the structure reflects current definitions of mindfulness, or previous empirical analyses of mindfulness measures. The prediction was that multiple components would emerge. Third, possible differences between components of mindfulness in their ability to predict patient functioning were examined. This third set of analyses was expected to achieve a finer-grained analysis of the cognitive-behavioral processes of mindfulness, particularly those that may convey its benefits in treatment.

Method

Participants

Participants were 150 consecutive patients seeking treatment on a United Kingdom based interdisciplinary pain management unit. This sample included 105 patients whose data were analyzed in the previous study of mindfulness (McCracken et al. 2007). The sample was predominantly women (64.0%), and ethnically White European (98.7%). The mean age was 46.7 years (SD=13.4), with an average of 12.5 years (SD=2.5) of completed education. Most of the sample were married (60%), followed by single (20.7%), divorced (12.7%), and widowed, separated or other (each between 2.0 and 2.7%). The median duration of pain was 140.6 months (range 7–576). Most reported pain in the lower back (52.0%), followed by lower limbs (15.3%), full body (12.7%), shoulder or upper limb (10.7%), or other (9.3%). Only 5.3% of the sample was working full time, with 72% not currently working or having retired early from work because of their pain.

Data were collected as part of a standard clinical assessment process, which involved patients completing a series of standardized self-report measures to help evaluate their treatment needs. These measures were mailed to patient homes in advance of the assessment appointments so that they could be completed in time for their initial consultation. As part of this process patients also provided information about their background characteristics, ratings of pain, pain-related distress (0–10 scales), estimates of daily uptime (i.e. time spent upright, standing or walking per day in the past week), and medications taken. The medication information was used to calculate a total score for the number of types of medication taken for pain (i.e., weak opioids, strong opioids, NSAIDS, tricyclic antidepressants, anticonvulsants, etc). All patients provided written consent for their data to be used for research purposes. There is a low rate of failure to gain consent, <5.0%, and, as all measures are checked for accuracy and completeness, there are few cases excluded or missing data, <10.0%. Approval to conduct this study was given by the Research Committee at the Royal National Hospital for Rheumatic Diseases.

Measures

The MAAS (Brown and Ryan 2003) was the primary measure of interest in this study. The 15-items ask participants to rate experiences of being mindless rather

than mindful (for example; "I find myself doing things without paying attention"). Items are rated on a 1 (almost always) to 6 (almost never) scale with higher scores being indicative of a greater degree of mindful behavior. The scores from all items are averaged to form the total score. The initial research conducted with this measure established good alpha reliability within student and general adult samples, α=0.82 and 0.87; along with good test–retest reliability, r=.81. MAAS scores were also appropriately correlated with measures of emotional distress, physical symptoms and self-awareness within the different sample groups (Brown and Ryan 2003). More recent research carried out with cancer outpatients and matched community members provides support for the construct and criterion validity of the scale (Carlson and Brown 2005).

Depression was measured using the British Columbia-Major Depression Inventory (BC-MDI; Iverson and Remick 2004). The BC-MDI is a 20-item self-report measure of depression based on the Diagnostic and Statistical Manual of Mental Disorders (4th edition; DSM-IV; American Psychiatric Association 1994) criteria for major depression. Items 1–16 are symptoms of depression. Patients are asked to report whether they had each of these symptoms in the past 2 weeks and then to rate each endorsed symptom on a 1–5 scale of severity, from 1 (very mild problem) to 5 (very severe problem). Items 17–20 ask patients to rate the impact of the endorsed symptoms on their lives, in areas of work or school, family, and social life. These impact scores were not used in the present study. Scores from the BC-MDI have demonstrated convergent and discriminant validity (Iverson 2001), a sensitivity of .92, and a specificity of .99 for detecting cases of depression as identified by a structured clinical interview (Iverson and Remick 2004).

The Pain Anxiety Symptoms Scale (PASS-20; McCracken and Dhingra 2002) is a 20-item measure of anxious responses related to chronic pain. The PASS assesses levels of fear, avoidance, cognitive, and physiological anxiety. Patients rate each item on a scale from 0 (never) to 5 (always) indicating how often they do or experience each of the responses described. Studies involving the PASS-20 have demonstrated good internal consistency, reliability, an appropriate factor structure, strong correlations with the original subscales and with other measures of patient functioning (McCracken and Dhingra 2002; Roelofs et al. 2004).

The Sickness Impact Profile (SIP; Bergner et al. 1981) is a 136-item measure that assesses the effects of a health problem on daily functioning. The measure includes 12 categories of functioning that can be combined together to form three composite scores for physical, psychosocial and "other" aspects of disability. In scoring the SIP each item is given a different weight that reflects the degree of disability implied by the item content. Each scale sum is converted to a proportion and, thus, all scores from the SIP range from 0 to 1. The temporal consistency reliability of the SIP total score is very good at r=.92, and the composite scores have demonstrated good convergent and discriminant validity (Bergner et al. 1981). The physical and psychosocial domain scores were used as primary measures of patient functioning in the current analyses and the 10-item alertness behavior scale, a measure of difficulties with concentration, memory, and clear thinking, was used for preliminary validity analyses of the MAAS.

Results

Preliminary Reliability and Validity Analyses

Because the reliability and validity of the MAAS in a chronic pain sample has not been previously demonstrated, a short series of reliability and correlation analyses was conducted that examined the internal consistency and construct validity of the measure in the current sample. A fully satisfactory Cronbach's alpha of .85 was found. Initial results indicated that the total MAAS score was not significantly correlated with patient age, gender, education, or duration of pain, all p>.10. It was, however, significantly correlated with pain, r=−.25, p<.01, pain-related distress, r=−.34, p<.001, physical disability, r=−.36, p<.001, psychosocial disability, r=−.52, p<.001, depression, r=.51, p<.001, pain-related anxiety, r=−.47, p<.001, number of pain-related medications, r=−.26, p<.01, number of GP visits in the last 6 months, r=−.26, p<.01, and disability in alertness from the SIP, r=−.49, p<.001 (also see Table 2). These correlations support the validity of scores from the MAAS in yielding inferences regarding mindfulness in patients with chronic pain.

Confirmatory Factor Analysis Testing a Single Factor Model

Next a confirmatory factor analysis (CFA) on the single-factor model of the MAAS reported by Brown and Ryan (2003) and Carlson and Brown (2005) was performed. Initially, the MAAS data were screened to ensure that the assumptions underlying CFA were not violated (i.e. multivariate normality, linearity, absence of multicollinearity, absence of singularity, and analyzability of covariances). Having met these assumptions, the adequacy of the fit between the single factor model and the sample data was determined. The CFA used maximum-likelihood estimation; error terms were assumed to be uncorrelated. The analysis was carried out within AMOS 6.0 (Arbuckle 2005).

Although the test of absolute fit using the chi-square likelihood ratio statistic (χ^2), produced an unsatisfactory significant result; χ^2 (90, N=150)=164.82, p<0.001, three other relative goodness of fit measures were examined, (the comparative fit index [CFI], the Bentler–Bonett normed fit index [NFI], and the root mean square error of approximation [RMSEA]). The CFI and NFI measure how much better the model fits the data compared to a baseline model (by convention, values above .90 are considered adequate). The RMSEA quantifies the divergence between the data and a proposed model per degree of freedom (values below .05 indicate a close fit). The goodness of fit measures produced mixed results. The score on the CFI of .87 indicated a less than ideal fit. Similarly, the NFI of .77 suggested problems with the single factor model. On the other hand, an RMSEA score of .48 indicated a better fit. Together, these mixed results, particularly the poor test of absolute fit and two of three unsatisfactory tests of relative fit, suggest the possible usefulness of investigating whether other latent factor solutions exist within the MAAS aside from the single-factor model.

Exploratory Factor Analysis

Following the mixed CFA results regarding the single factor model, an exploratory factor analysis was conducted on the 15 items of the MAAS to determine possible alternate factor structures. The Kaiser–Meyer–Olkin index of sampling adequacy was .86, indicating that the correlation matrix was suitable for factor analysis. The initial principal components were rotated orthogonally (Varimax with Kaiser Normalization). The number of components extracted was determined by examining eigenvalues, scree plot, communalities, variance accounted for, and interpretability. Four factors had eigenvalues greater than one. A line fit through all of the very small factors in the scree plot showed four plotted factors above this line. This four-factor solution yielded communalities greater than .40 for all items, accounted for 58.8% of the variance in the variable set, was considered interpretable, and, hence, was retained as an appropriate solution. The rotated factor loading table showing the final solution is included in Table 1.

The first factor, labeled *Acting with Awareness*, included seven items, each describing actions that take place automatically or without awareness. The second component, labeled *Present Focus* included 3 items, generally reflecting difficulties in remaining aware of the present moment as opposed to being caught up with either past or future events. The third factor, labeled *Responsiveness*, also included three items, each describing instances where one focus of activity dominates awareness to the detriment of broader contact with other events that are also taking place at the same time. The fourth and final component, labeled *Social Awareness*, includes just two items, each describing inattention in social situations.

Cronbach's alpha coefficients were calculated to determine the internal consistency of the four subscales derived from the factor analyses. These analyses indicated good internal consistencies for Acting with Awareness, α=.82, and Present Focus, α=.72. However the scores for

Table 1 Results from principal components analyses with orthogonal rotation of items from the MAAS (N=150)

Item content	Factors			
	1	2	3	4
15. I snack without being aware that I am eating	**.72**	.11	.04	.01
10. I do jobs of tasks automatically, without being aware of what I am doing	**.63**	−.06	.30	.36
1. I could be experiencing some emotion and not be conscious of it until some time later	**.62**	.37	−.04	−.10
12. I drive places on "automatic pilot," without much awareness of what I am doing	**.62**	.12	.05	.14
14. I find myself doing things without paying attention	**.61**	.45	.13	.32
8. I rush through activities without being really attentive to them	**.60**	.17	.29	.16
7. It seems I am "running on automatic," without much awareness of what I'm doing	**.50**	.25	.27	.43
13. I find myself preoccupied with the future or the past	−.01	**.81**	.19	.07
3. I find it difficult to stay focused on what's happening in the present	.37	**.72**	.05	.21
2. I break or spill things because of carelessness, not paying attention, or thinking of something else	.38	**.62**	.17	−.01
4. I tend to walk quickly to get where I'm going without paying attention to what I experience along the way	.24	.04	**.75**	−.14
5. I tend not to notice feelings of physical tension or discomfort until they really grab my attention	−.11	.14	**.67**	.18
9. I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there	.29	.21	**.51**	.12
6. I forget a person's name almost as soon as I've been told it for the first time	.11	.10	−.07	**.84**
11. I find myself listening to someone with one ear, doing something else at the same time	.17	.08	.45	**.59**
% Variance	20.8	14.1	12.1	11.0

Note: All MAAS items are rated on a scale from 1 (almost always) to 6 (almost never). Factors were labeled: (1) Acting with Awareness, (2) Present Focus, (3) Responsiveness, and (4) Social Awareness. Bolded factor loadings denote item factor assignments

Responsiveness, α=.51, and Social Awareness, α=.48, were unacceptable. Summary scores were calculated from the MAAS items by calculating mean raw item responses from each of the four factors.

Correlation Analyses

Preliminarily, none of the four MAAS components significantly correlated with age, gender, or duration of pain. Acting with Awareness was correlated with years of education, r=.20, p<.05, but none of the other components were. Inter-correlations between the components were all significant, ranging from r=.30, p<.001, between Present Focus and Social Awareness, to r=.58, p<.001, between Acting with Awareness and Present Focus.

To examine the relationship between the four MAAS components and patient functioning, a series of correlations were calculated with the measures of physical and psychosocial disability, depression, pain-related anxiety, pain-related medication use, number of GP visits and uptime. The correlation coefficients are illustrated in Table 2.

The general pattern of correlations indicates that components of mindfulness tend to be positively correlated with patient functioning (i.e. higher levels of mindfulness are correlated with higher levels of functioning). Significant correlations were found between Acting with Awareness, Present Focus and all nine measures of patient functioning. The Responsiveness and Social Awareness components did not perform so well. In fact, no significant correlation was found between Responsiveness and any measure of functioning. Social Awareness was significantly correlated with psychosocial disability, depression, and pain-related anxiety. Interestingly, the Present Focus component appeared to correlate with measures of patient functioning as well or better than did the total MAAS score.

Hierarchical Multiple Regression

Hierarchical multiple regression analyses were conducted to examine the unique abilities of the mindfulness components to predict aspects of patient functioning independent of relevant correlations of present pain intensity and patient background variables. In these analyses, the criterion variables were pain-related distress, physical disability, psychological disability, depression, pain-related anxiety, number of pain-related medications, number of GP visits in the last 6 months, and daily uptime. The 0 to 10 rating of present pain, patient age, education, gender, and pain duration were entered and tested for retention in each equation based on statistical criteria (p<.05 to enter; p>.10 to remove). The Acting with Awareness and Present Focus scores were entered together after these other potential predictors were taken into account. The Responsiveness and Social Awareness components were not included in these analyses due to their low internal consistency and their generally unremarkable results in the correlation analyses. Table 3 displays the results of these regression equations.

In seven of eight equations, present pain accounted for significant increments of variance in the measures of functioning. These ranged from 5.0% in the equation for number of pain medications to 32.0% in the equation for pain-related distress. In general, patient background variables played little role in the analyses; only gender was retained in the equation for pain-related anxiety. In all eight of the equations, the Acting with Awareness and Present Focus scores together also accounted for a statistically significant increment of variance. The amounts of variance predicted by the two scores ranged from 7.0% to 31.0% (average 16.6%). The largest increments were found in the equations for psychosocial disability, depression, and pain-related anxiety. The direction of the relationship between Acting with Awareness and Present Focus and the measures

Table 2 Correlations between the four factors of the MAAS; pain, disability, emotional distress, and healthcare use (N=150)

MAAS components scores and total	Pain	Pain Distress	Psychosocial disability	Physical disability	Depression	Pain anxiety	Pain medication use	GP visits	Uptime	MAAS total
Act. w/ awareness	−.27**	−.29***	−.49***	−.33***	−.47***	−.47***	−.24**	−.28***	.18*	.91***
Present focus	−.28**	−.41***	−.60***	−.44***	−.60***	−.54***	−.32***	−.33***	.33***	.75***
Responsiveness	−.05	−.13	−.14	−.11	−.15	−.07	−.03	−.02	.03	.65***
Social awareness	−.04	−.13	−.23**	−.14	−.20*	−.21**	−.11	.00	.08	.61***
MASS total	−.25**	−.34***	−.52***	−.36***	−.51***	−.47***	−.26**	−.26**	.21*	–

Note: Pain and pain-related distress were measured with single 0 to 10 rating scales, disability was assessed with the SIP, depression with the British Columbia Major Depression Inventory, and pain-related anxiety with the Pain Anxiety Symptoms Scale. Pain-related medication use, General Practitioner (GP) visits for pain in the past 6 months, and "uptime" (hours of standing or walking per day in the past week) were also based on self-report

*p<.05; **p<.01; ***p<.001

Table 3 Hierarchical multiple regression analyses examining the contribution of Acting with Awareness and Present Focus components of mindfulness in relation to measures of patient functioning

Block	Predictors	Beta (β) final	ΔR^2 block	Total R^2
Pain-related distress (0–10)				
1	Present pain	.49***	.32***	
2	Acting with awareness	−.01	.07***	
	Present focus	−.27***		.39***
Physical disability				
1	Present pain	.20**	.10***	
2	Acting with awareness	−.08	.14***	
	Present focus	−.34***		.24***
Psychosocial disability				
1	Present pain	.14*	.10***	
2	Acting with awareness	−.19*	.31***	
	Present focus	−.46***		.41***
Depression				
1	Present pain	.16*	.11***	
2	Acting with awareness	−.16*	.29***	
	Present focus	−.46***		.40***
Pain-related anxiety				
1	Present pain	.17*	.10***	
2	Gender	−.16*	.04**	
3	Acting with awareness	−.22**	.24***	
	Present focus	−.36***		.37***
Number of pain-related medications				
1	Present pain	.13	.05**	
2	Acting with awareness	−.07	.08**	
	Present focus	−.24*		.12***
Number of GP visits in the last 6 months				
1	Present pain	.15	.06**	
2	Acting with awareness	−.11	.09***	
	Present focus	−.23*		.15***
Uptime				
1	Acting with awareness	−.02	.11***	
	Present focus	.34***		.11***

Note: In these analyses patient age, gender (1=men, 2=women), years of education, duration of pain, and 0 to 10 rating of present pain intensity were tested for entry and retained if significant in the first block. The Acting with Awareness and Present Focus components of the MAAS were entered simultaneously after that. Disability was assessed with the SIP, depression with the British Columbia Major Depression Inventory, and pain-related anxiety with the Pain Anxiety Symptoms Scale. Present pain intensity, pain-related distress, number of pain-related medications, number of GP visits in the last 6 months, and uptime, were based on self-report

*$p<.05$; **$p<.01$; ***$p<.001$

of functioning was consistent. In each case, a greater level of these aspects of mindfulness was associated with more positive functioning (i.e. less reported depression or more uptime). Overall, the three-item Present Focus subscale achieved significant regression coefficients in all eight equations, while the larger Acting with Awareness subscale did so in only 3 occasions. The total variance accounted for in the equations was relatively moderate, averaging 28.4%.

Discussion

According to the present analyses, "mindfulness," as assessed by the MAAS, in persons seeking treatment for chronic pain, may include a number of separate cognitive-behavioral components. These were labeled as Acting with Awareness, Present Focus, Responsiveness, and Social Awareness. The first two of these components demonstrated adequate internal consistency and significant correlations with measures of patient functioning. These results may help to identify that important processes within mindfulness possibly include contact with direct experiences of ongoing activity, rather than experiences located in some other place, and with the present moment, rather than the past or future.

Additional results from the present analyses support the internal consistency, and criterion and construct validity, of the MAAS in patients with chronic pain. They leave open

the question of temporal consistency in this particular group. They also do not confirm the best fit factor structure for the measure. While it appears the single factor model may not represent an ideal fit to the data, this does not confirm that the four factor model is necessarily a better fit. To make this test would require an additional, large, independent, sample, which is not currently available. Moreover, the MAAS is an extremely carefully developed measure and dismantling it or revising it based on these current results alone is not advised.

The present results show that both the Acting with Awareness and Present Focus components of mindfulness were significantly correlated with pain, pain-related distress, disability, depression, pain-related anxiety, medication use, and physician visits related to pain. While Social Awareness achieved small significant correlations with psychosocial disability, depression, and pain-related anxiety, the Responsiveness component achieved no significant correlations. The Present Focus component achieved somewhat higher correlations than the Acting with Awareness component with the measures of patient functioning and was a significant predictor in each of the eight regression equations while Acting with Awareness was a secondary predictor and significant in only three equations. These results suggest that, in terms of patient functioning in chronic pain, there may be some particularly important psychological process at play in remaining in contact in time with the present situation. Both the Social Awareness and Responsiveness component failed to achieve adequate internal consistency or remarkably useful relations with patient functioning. Social awareness, or being mindful in social situations, is an intriguing notion but may need further consideration and further development before it can be assessed adequately, as will the Responsiveness component.

The two mindfulness components highlighted from the present analyses are generally consistent with previous conceptualizations (e.g., Baer 2003; Baer et al. 2006; Bishop 2002; Bishop et al. 2004; Hayes and Wilson 2003), particularly if these are examined carefully. The consensus definition of Bishop and colleagues (2004) included two primary components: awareness and acceptance. While the awareness component appears clearly identified in the present results, the acceptance component is perhaps less clear. It is worth noting, however, that, based on analyses of an earlier mindfulness scale, Brown and Ryan (2001; as cited in Brown and Ryan 2004) found that an acceptance factor added no explanatory value over the factor reflecting a focus on the present moment. Interestingly, they concluded that continuing awareness without diverting attention necessarily implies acceptance.

The non-evaluative and nonjudgmental qualities attributed to mindfulness in previous conceptualizations may appear absent from these results, and may require further examination. One interpretation is that while evaluations and judgments are present in mindfulness, they are not experienced in a way that interferes with wider, ongoing, direct experiences. In other words, successful mindfulness is *functionally* evaluation- and judgment-free in that these events exert little or no impact on behavior. In any case, their absence from the current results appears to owe more to their absence in the item content of the MAAS than to their actual demonstrated level of importance in the overall processes of mindfulness.

Mindfulness does not come originally from an empirical tradition or from within cognitive-behavioral psychology. This history is important to acknowledge. It did not derive from theory and testing before being applied to human behavior problems, as has been a tradition within CBT (Hayes and Shenk 2004). The word "mindfulness" and common techniques for practicing it may be perceived as having a mysterious quality, which could hinder scientific investigation. Even some of the more familiar and apparently more technical terms that are used to describe the processes underlying mindfulness, such as "attention," "awareness," and "acceptance," can create ambiguity. This current situation seems to require a theoretical framework that can accommodate and organize these processes in a scientifically useful way, such as the framework underlying ACT (Hayes et al., 1999). This framework appears particularly useful for its emphasis on how verbal/cognitive influences can dominate direct experience and lead to inflexible and avoidant behavior patterns. Indeed, mindfulness seems to include ACT therapeutic processes of acceptance, cognitive defusion, and contact with the present moment, and it may be these processes that are more useful to understand mindfulness than the term "mindfulness" itself (Hayes and Shenk 2004). In addition to the framework suggested by ACT, there are other current, well-reasoned, and insightful process models of mindfulness (e.g., Lau et al. 2004; Shapiro et al. 2006).

The present study has a number of limitations. Primary among these are its correlational nature, its reliance on just one of several possible measures of mindfulness, its lack of confirmatory analysis of the four-factor solution from the MAAS, and its focus on a very specific clinical population. Although the participant sample (N=150) may be considered small for factor analyses, it is likely adequate for these exploratory analyses. It exceeds the subjects-to-variables ratio of 5 suggested by Bryant and Yarnold (1995) and meets the commonly cited "rule of 10." Further investigations will be required to validate a factor model from the MAAS in patients with chronic pain and to test whether the findings generalize to other measures and patient groups. A firmer understanding of the components underlying mindfulness, may allow us to conduct studies that

include manipulations of these individual components to further identify those with the highest clinical impact.

In summary, in a sample of patients seeking treatment for chronic pain, the overall process called "mindfulness" appears to be made up of multiple, cognitive-behavioral, component processes. Two of these are potentially important for clinical purposes, as they appear related to multiple measures of emotional, physical, social, and health-care-related functioning. These components were labeled Acting with Awareness and Present Focus. These reflect the degree of contact between ongoing behavior and the direct situation where and when the behavior is occurring, as opposed to contact based in cognitive processes, for example. As such they reflect processes of direct interest in current cognitive behavioral treatment developments. This tie-in is important as it links the growing interest in mindfulness to strong empirical approaches within the cognitive-behavioral tradition.

References

American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorder* (4th ed.). Washington, DC: American Psychiatric Association.

Arbuckle, J. L. (2005). *Amos 6.0 user's guide*. Chicago: SPSS.

Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science & Practice*, *10*, 125–143.

Baer, R. A. (2006). *Mindfulness-based treatment approaches: A clinician's guide to evidence and applications*. London: Academic.

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

Bergner, M., Bobbitt, R. A., Carter, W. B., & Gilson, B. S. (1981). The sickness impact profile: development and final revision of a health status measure. *Medical Care*, *19*, 787–805.

Bishop, S. R. (2002). What do we really know about mindfulness-based stress reduction. *Psychosomatic Medicine*, *64*, 71–84.

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., et al. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Research and Practice*, *11*, 230–241.

Brown, K. W., & Ryan, R. M. (2001). *Testing a two-factor model of mindfulness*. University of Rochester.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*, 822–848.

Brown, K. W., & Ryan, R. M. (2004). Perils and promise in defining and measuring mindfulness: Observations from experience. *Clinical Psychology: Science and Practice*, *11*, 242–248.

Bryant, F. B., & Yarnold, P. R. (1995). Principal-components analysis and exploratory and confirmatory factor analysis. In L. G. Grimm, & P. R. Yarnold (Eds.), *Reading and understanding multivariate statistics* (pp. 99–136, 1st ed.). Washington, DC: American Psychological Association.

Carlson, L. E., & Brown, K. W. (2005). Validation of the mindful attention awareness scale in a cancer population. *Journal of Psychosomatic Research*, *58*, 29–33.

Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits: A meta-analysis. *Journal of Psychosomatic Research*, *57*, 35–43.

Hayes, S. C., & Shenk, C. (2004). Operationalizing mindfulness without unnecessary attachments. *Clinical Psychology: Science and Practice*, *11*, 249–254.

Hayes, S. C., & Wilson, K. G. (2003). Mindfulness: Methods and process. *Clinical Psychology: Science and Practice*, *10*, 161–165.

Hayes, S. C., Follette, V. M., & Linehan, M. M. (2004). *Mindfulness and acceptance: Expanding the cognitive-behavioral tradition*. New York: Guilford.

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change*. New York: Guilford.

Iverson, G. L. (2001). Psychometric properties of the British Columbia major depression inventory. *Canadian Psychology*, *42*, 49.

Iverson, G. L., & Remick, R. (2004). Diagnostic accuracy of the British Columbia major depression inventory. *Psychological Reports*, *95*, 1241–1247.

Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness*. New York: Delacorte.

Lau, M. A., Segal, Z. V., & Williams, J. M. G. (2004). Teasdale's differential activation hypothesis: implications for mechanisms of depressive relapse and suicidal behavior. *Behavior Research and Therapy*, *42*, 1001–1017.

Linehan, M. M. (1993). *Cognitive-behavioral treatment of borderline personality disorder*. New York: Guilford.

MacKillop, J., & Anderson, E. J. (2007). Further psychometric validation of the mindful attention awareness scale (MAAS). *Journal of Psychopathology and Behavioral Assessment*, *29*, 289–293.

McCracken, L. M., & Dhingra, L. (2002). A short version of the pain anxiety symptoms scale (PASS-20): preliminary development and validity. *Pain Research and Management*, *7*, 45–50.

McCracken, L. M., Gauntlett-Gilbert, J., & Vowles, K. E. (2007). The role of mindfulness in a contextual cognitive-behavioral analysis of chronic pain-related suffering and disability. *Pain*, *131*, 63–69.

Roelofs, J., McCracken, L. M., Peters, M. L., Crombez, G., van Breukelen, G., & Vlaeyen, J. W. S. (2004). Psychometric evaluation of the pain anxiety symptoms scale (PASS) in chronic pain patients. *Journal of Behavioral Medicine*, *27*, 167–83.

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freeman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology*, *62*, 373–386.

Teasdale, J. D., Segal, Z. V., Williams, J. M. G., Ridgeway, V. A., Soulsby, J. M., & Lau, M. A. (2000). Prevention of relapse/recurrence in major depression by mindfulness-based cognitive therapy. *Journal of Consulting and Clinical Psychology*, *68*, 615–623.