

The Assessment of Mindfulness with Self-Report Measures: Existing Scales and Open Issues

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Abstract During recent years, mindfulness-based approaches have been gaining relevance for treatment in clinical populations. Correspondingly, the empirical study of mindfulness has steadily grown; thus, the availability of valid measures of the construct is critically important. This paper gives an overview of the current status in the field of self-report assessment of mindfulness. All eight currently available and validated mindfulness scales (for adults) are evaluated, with a particular focus on their virtues and limitations and on differences among them. It will be argued that none of these scales may be a fully adequate measure of mindfulness, as each of them offers unique advantages but also disadvantages. In particular, none of them seems to provide a comprehensive assessment of all aspects of mindfulness in samples from the general population. Moreover, some scales may be particularly indicated in investigations focusing on specific populations such as clinical samples (Cognitive and Affective Mindfulness Scale, Southampton Mindfulness Questionnaire) or meditators (Freiburg Mindfulness Inventory). Three main open issues are discussed: (1) the coverage of aspects of mindfulness in questionnaires; (2) the nature of the relationships between these aspects; and (3) the validity of self-report measures of mindfulness. These issues should be considered in future developments in the self-report assessment of mindfulness.

Keywords Mindfulness · Assessment · Self-Report · Questionnaire

Introduction

During the last decades, the empirical study of mindfulness and the use of mindfulness techniques in clinical practice have been steadily expanding. The efficacy of mindfulness-oriented interventions such as Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn 1990) and Mindfulness-Based Cognitive Therapy (MBCT; Segal et al. 2002; Teasdale et al. 1995) has been established (Grossman et al. 2004; Hofmann et al. 2010; Shigaki et al. 2006). Currently, researchers increasingly concentrate on the mechanisms through which mindfulness exerts positive influences on mental and physical well-being (Coffey and Hartman 2008; Crane et al. 2010; Shapiro et al. 2006; Williams et al. 2011).

A reliable and valid measurement of mindfulness is crucial for empirical investigation, especially as research is moving increasingly toward the study of how mindfulness influences health. The present article provides an overview and discussion of the state of assessment of mindfulness using self-reports. As reliability and validity analyses of current scales were already extensively covered elsewhere (Baer et al. 2009; Johnson 2007), we will focus on conceptual issues related to the content of the available self-report measures (content validity), on the relative strengths and disadvantages of each scale, as well as on the interpretation of unexpected findings and their implications for the validity of the assessment of mindfulness. First, general issues regarding the definition and operationalization of mindfulness will be described. We will then give a critical overview of the currently available validated self-report measures of mindfulness. Finally, we will highlight implications and future challenges for the conceptualization and operationalization of mindfulness.

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The Search for a Consensual Definition and Operationalization of Mindfulness

Bishop et al. (2004) offered an influential suggestion for a consensual definition and operationalization of mindfulness. The authors described two components of mindfulness: (1) self-regulation of attention such that it is directed to the present moment and (2) a particular orientation involving curiosity, openness, and acceptance. If one considers other definitions proposed in the scientific literature, further aspects might be added to the second component—mindful orientation. These aspects are: a non-judgmental, compassionate and openhearted attitude, non-identification with the experiences, insightful understanding, non-reactivity to the experiences, a decentered stance (i.e., experiencing one's thoughts and feelings from a decentered perspective, without overidentifying with them), and participation in the experience (Brown and Ryan 2004; Kabat-Zinn 1994, 2003; Lau et al. 2006; Marlatt and Kristeller 1999; Robins 2002; Teasdale et al. 2002; Walach et al. 2006). Hence, mindfulness can be conceptualized as a form of attention characterized by a range of attributes or aspects, which are distinct but overlapping (e.g., acceptance and non-judgment). The breadth and complexity of mindfulness, as well as its origins in Buddhist psychology, have significantly contributed to the current plurality of definitions and operationalizations. As a result, over the last decade, at least eight mindfulness self-report questionnaires have been developed and are now employed in psychological research: The *Freiburg Mindfulness Inventory* (FMI; Buchheld et al. 2001; Walach et al. 2006), the *Mindful Attention Awareness Scale* (MAAS; Brown and Ryan 2003), the *Cognitive and Affective Mindfulness Scale-Revised* (CAMS-R; Feldman et al. 2007; Hayes and Feldman 2004), the *Southampton Mindfulness Questionnaire* (SMQ; Chadwick et al. 2008), the *Kentucky Inventory of Mindfulness Scale* (KIMS; Baer et al. 2004), the *Five Facet Mindfulness Questionnaire* (FFMQ; Baer et al. 2006), the *Philadelphia Mindfulness Scale* (PHLMS; Cardaciotto et al. 2008), and the *Toronto Mindfulness Scale* (TMS; Lau et al. 2006).

The availability of a variety of measures of mindfulness can be beneficial for research. For instance, the TMS specifically assesses the capacity to invoke a mindfulness state during meditation practice, whereas at least seven scales (FMI, MAAS, CAMS-R, SMQ, KIMS, FFMQ, and PHLMS) were designed to measure trait mindfulness. The theoretical and operational distinction between state and trait mindfulness is appropriate, as both are closely related but different constructs (Thompson and Waltz 2007). In fact, studies suggest that there is little or no relationship between the mindfulness state during meditation (TMS) and everyday trait mindfulness (FFMQ, CAMS-R, and MAAS; Carmody, et al. 2008; Thompson and Waltz 2007). It is thus advisable to

have at one's disposal distinct questionnaires capturing either trait or state mindfulness.

Current mindfulness scales differ with respect to fundamental aspects of the mindfulness construct. While most scales include a focus on attention or awareness, comparisons also reveal substantial deviations. For instance, the MAAS (Brown and Ryan 2003) measures mindfulness rather narrowly focusing on the attention component. The KIMS and the FMI measure mindfulness as a multifaceted construct. However, the facets are distinct in the KIMS (Baer et al. 2004) but overlap in the FMI and cannot be clearly distinguished through factor analysis (Leigh et al. 2005; Walach et al. 2006). Accordingly, correlations of mindfulness measurements between MAAS, CAMS, FMI, KIMS, and PHLMS were found to range from .21 to .67 (Baer et al. 2006; Cardaciotto et al. 2008). This heterogeneity in the self-report assessments of mindfulness evidently constitutes a problem for comparing and replicating research findings. According to a recent study, current mindfulness scales include nine distinguishable aspects of mindfulness, whereas each scale comprises a different subset of these aspects and none includes all (Table 1) (Bergomi et al. 2012). The nine aspects were theoretically derived based on a review of eight questionnaires, the subscales they include, and the theoretical constructs their conceptualization is based upon. All aspects of mindfulness included in the scales were listed and semantically grouped, taking into consideration the scale descriptions and the content of items. The resulting aspects are (1) *observing, attending to experiences*; (2) *acting with awareness*; (3) *non-judgment, acceptance of experiences*; (4) *self-acceptance*; (5) *willingness and readiness to expose oneself to experiences, non-avoidance*; (6) *non-reactivity to experience*; (7) *non-identification with own experiences*; (8) *insightful understanding*; and (9) *labeling, describing*.

The subsequent section will provide an overview of the existing validated mindfulness scales (for adults), of their strengths and limitations as well as of relevant research findings. Particular attention will be paid to the conceptualization of mindfulness underlying the scales and their suitability for assessing mindfulness in the general population. All scales presented in the following show satisfactory to good internal consistency; several studies have supported their convergent, discriminant, and known-groups validity (Baer et al. 2009; Johnson 2007). Evidence for their predictive validity is nevertheless still scarce and, to our knowledge, limited to the MAAS: in one study, post-treatment MAAS scores predicted the risk of relapse/recurrence to major depressive disorder during 12 months after an MBCT intervention (Michalak et al. 2008). Moreover, scores of mindfulness questionnaires show inconsistent patterns of relationship with practice in meditators. Studies provided evidence for positive associations of meditation practice with MAAS, KIMS, FMI, FFMQ, and TMS (Baer et al.

Table 1 Aspects of mindfulness in eight current mindfulness questionnaires

| Aspect of mindfulness (item example) | Questionnaire (subscale or construct) |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Observing, attending to experiences (PHLMS 09: “When I walk outside, I am aware of smells or how the air feels against my face.”) | CAMS (awareness) FMI (mindful presence, Walach et al. 2006; FMI (mind/body awareness, Leigh et al. 2005) KIMS (observing) FFMQ (observe) PHLMS (awareness) |
| Acting with awareness (MAAS 10: “I do jobs or tasks automatically, without being aware of what I’m doing.”) | MAAS (presence) KIMS (acting with awareness) FFMQ (actaware) FMI (concentration, Bergomi 2007) CAMS (attention and present-focus) |
| Non-judgment, acceptance of experiences (KIMS 04: “I criticize myself for having irrational or inappropriate emotions.”) | KIMS (accepting without judgment) FFMQ (nonjudge) SMQ (accepting difficult thoughts/images and oneself versus judging cognitions and self) CAMS (acceptance) |
| Self-acceptance (FMI 19: “I accept myself as I am.”) | FMI (non-judgmental acceptance, Walach et al. 2006; acceptance and openness to self and experience in Leigh et al. 2005; self-acceptance, in Bergomi 2007) SMQ (accepting difficult thoughts/images and oneself versus judging cognitions and self) |
| Willingness and readiness to expose oneself to experiences, non-avoidance (PHLMS 06: “I try to stay busy to keep thoughts or feelings from coming to mind.”) | PHLMS (acceptance) FMI (openness to experience, Walach et al. 2006; non-avoidant awareness, Bergomi 2007) SMQ (allowing attention to remain with difficult cognitions versus experiential avoidance) TMS (curiosity) CAMS (acceptance) |
| Non-reactivity to experience (SMQ 1: “Usually when I have distressing thoughts or images, I am able just to notice them without reacting.”) | FFMQ (nonreact) FMI (nonreactivity to inner experience, Bergomi 2007) SMQ (letting difficult cognitions pass without reacting versus rumination/worry) CAMS (acceptance) |
| Non-identification with own experiences (SMQ 10: “Usually when I have distressing thoughts or images, I just notice them and let them go.”) | TMS (decentering) FMI (mindful presence, Walach et al. 2006; non-attachment to thoughts, Leigh et al. 2005) SMQ (decentered awareness). |
| Insightful understanding (FMI 16: “I see how I create my own suffering.”) | FMI (insight, Walach et al. 2006), |
| Labeling, describing (KIMS 2: “I’m good at finding the words to describe my feelings.”) | KIMS (describing) FFMQ (describe) |

The nine aspects proposed here were theoretically derived on the basis of a review of current mindfulness scales. The FMI showed an unstable factor solution over different studies. This overview comprises all subscales of the FMI derived in three different studies in which the scale was subjected to principal component analysis: Walach et al. 2006; Leigh et al. 2005; Bergomi 2007

2004, 2006, 2008; Brown and Ryan 2003; Walach et al. 2006) as well as for the absence of such relationships with MAAS, FFMQ, CAMS, MQ, and TMS (Baer et al. 2006, 2008; Carmody et al. 2008; Lau et al. 2006; MacKillop and Anderson 2007). It is not the primary focus of the present overview to systematically reinvestigate this psychometric

evidence. Issues relating to the validity of the scales will be addressed insofar as they may contribute to guide the construction of further mindfulness scales.

This overview will start with two questionnaires, the FMI and the TMQ, which require respondents have some meditation experience. The remaining questionnaires, which

should allow measurement of mindfulness in individuals without meditation experience, will be reviewed in an order convenient for the logic of the argumentation in the overview.

Overview of Available Mindfulness Scales

The Freiburg Mindfulness Inventory

The construction of the FMI (Buchheld et al. 2001; Walach et al. 2006) was particularly inspired by the Buddhist roots of the construct. Items construction and selection were based on an extensive review of mindfulness and insight meditation literature, interviews with experts (i.e., mindfulness meditation teachers and long-time meditators), and finally, on validation analysis in a sample of Buddhist meditators. The final scale contains 30 items. The four-factor structure found in the validation study (*mindful presence, non-judgmental acceptance, openness to experiences, and insight*) was found to be unstable (Walach et al. 2006). Correspondingly, in two studies principal component analyses yielded a three-factor (Leigh et al. 2005) and a four-factor (Bergomi 2007) structure differing from the structure of the FMI validation study, thus reflecting the richness of aspects of mindfulness captured by this scale. In the FMI, mindfulness comprises facets that cannot be clearly disentangled. Further statistical analyses led to a short, putatively one-dimensional 14-item version of the FMI that should be more appropriate for use in the general population (Walach et al. 2006). In two studies, the 14-item version was found to be two-dimensional, comprising a *presence* factor (FMI 7: “I feel connected to my experience in the here-and-now.”) and an *acceptance* factor (FMI 9: “I am friendly to myself when things go wrong.”), with the number of items of each subscale differing between studies (Kohls et al. 2009; Ströhle 2006). A recent qualitative analysis of the German (i.e., original) 14-item FMI showed that individuals without meditation experience systematically misunderstood items 1 (“I am open to the experience of the present moment”), 2 (“I sense my body, whether eating, cooking, cleaning or talking.”), 3 (“When I notice an absence of mind, I gently return to the experience of the here and now.”), and 7 (see above) (Belzer et al. 2011). The authors recommended reformulating these items.

In summary, the FMI in its current (short and long) versions seems inappropriate in populations unfamiliar with mindfulness or Buddhist concepts, since at least some items may be systematically misunderstood by individuals without meditation experience. Nevertheless, the FMI may be particularly suited for addressing aspects of mindfulness that are relevant to experienced meditators, and its use is encouraged in populations familiar with meditation. As the scale comprises more “advanced” items, it may better differentiate

among meditators. The unstable factor structure of the FMI does not allow the measurement of distinct facets of the mindfulness construct. This is an important limitation for the analysis of the differential contributions of each aspect of mindfulness and of their association with other constructs (Smith et al. 2003; Smith and McCarthy 1995). However, the lack of a clear-cut structure found in the FMI is possibly less an indication of weakness of the scale rather than an inherent aspect of mindfulness itself. This issue will be discussed further.

The Toronto Mindfulness Scale

The TMS was developed by Lau et al. (2006) as a measure of the mindful state. The scale addresses a person's experiences during an immediately preceding meditation session. The TMS comprises two factors, *curiosity* (TMS 17: “I was curious about my reactions to things”) and *decentering* (TMS 33: “I was more concerned with being open to my experiences than controlling or changing them”). A trait version of the TMS was developed and preliminarily validated in meditators and nonmeditators (Davis et al. 2009). Both *trait decentering* and *trait curiosity* were positively associated with other trait mindfulness scales, with correlations higher for trait decentering. The trait decentering scores were higher in participants with longer meditation experience. Similarly, in the validation study of the state version of the TMS, *state decentering* was generally higher in meditators with more meditation experience, whereas *state curiosity* was increased only in a subgroup of meditators trained in mindfulness meditation as described in MBSR, yet not in the Shambhala subgroup. These results suggest that the curiosity subscale of the TMS may be specific to particular conceptualizations of mindfulness. The Shambhala Buddhist tradition emphasizes the redirection of attention to the meditation object rather than the observation and investigation of distracting experiences (as is emphasized in the non-secular practice of MBSR), which may explain the reported lack of effect of this practice on curiosity (Lau et al. 2006). Moreover, the Shambhala tradition focuses on existing in the world as a “warrior” who is seeking enlightenment out of compassion for all sentient beings (Rinpoche 2005). In contrast, all curiosity items of the TMS are directed towards oneself (TMS 32: “I was curious about what I might learn about myself by taking notice of how I react to certain thoughts, feelings or sensations.”).

In sum, the TMS measures two aspects of mindfulness: decentering and curiosity. Thus the TMS has the advantage of explicitly assessing the decentered stance to experiences which, as a central aspect of mindful attention (Teasdale et al. 2002), is clearly underrepresented among current mindfulness scales. Moreover, the TMS is the only current

mindfulness scale assessing state mindfulness. The TMS seems to focus on the second component of mindfulness (mindful orientation) proposed by Bishop et al. (2004), whereas self-regulation of attention is not explicitly measured by this scale. Results from meditator subgroups suggest that the curiosity subscale of the TMS may be more related to specific conceptualizations of mindfulness, for example mindfulness as taught in MBSR, rather than to a more general mindfulness construct.

The Philadelphia Mindfulness Scale

The *Philadelphia Mindfulness Scale* (PHLMS; Cardaciotto et al. 2008) is a 20-item questionnaire comprising two subscales: awareness and acceptance. The awareness subscale assesses noticing and being aware of thoughts, feelings, perceptions, and body sensations (PHLMS 3: “When talking with other people, I am aware of their facial and body expressions.”) while the acceptance subscale is focused on the assessment of experiential avoidance (PHLMS 12: “There are things I try not to think about.”). The scale is theoretically well-founded, predominantly based on definitions of mindfulness proposed by Kabat-Zinn (1994) and Bishop et al. (2004). Unfortunately, the two components of the PHLMS are conceptualized rather narrowly. The awareness subscale comprises open awareness of perceptions, sensations, and feelings and omits the *acting with awareness* aspect that is covered, for example, in the KIMS or FFMQ (Baer et al. 2006). Moreover, the acceptance subscale contains only items that are negatively formulated and capture experiential avoidance while positive acceptance, a compassionate stance towards oneself, non-reactivity and non-judgment are excluded.

The Mindful Attention Awareness Scale

The MAAS (Brown and Ryan 2003) is a 15-item scale measuring mindfulness as a single factor relating to attention. The one-dimensional structure of the MAAS was replicated in several studies (Carlson and Brown 2005; MacKillop and Anderson 2007). Originally, the MAAS comprised a *presence* and an *acceptance* factor. The acceptance factor was excluded in the final version because it did not provide an “explanatory advantage over that shown by the presence factor alone” (Brown and Ryan 2004, p. 244). The authors concluded that the acceptance of the present moment is already embedded within the capacity for sustained attention and thus “as a distinct construct, acceptance is functionally redundant in mindfulness” (Brown and Ryan 2004, p. 245). This conclusion, however, is challenged by results obtained with the PHLMS, which comprises both awareness and acceptance subscales. The associations reported in the validation study of the PHLMS suggest an explanatory

advantage of the acceptance factor over the awareness factor, as the former was markedly associated with indicators of well-being that were uncorrelated to awareness. Similarly, using the 14-item FMI, Kohls et al. (2009) claimed that the negative relationship between mindfulness and anxiety and depression may be “completely due to the ‘Acceptance’ factor of mindfulness” (p. 224).

One important difference between the MAAS and both PHLMS and FMI is that the awareness items in the PHLMS and the 14-item FMI are all in the positive form, whereas in the MAAS items are all negatively formulated (MAAS 7: “It seems I am ‘running on automatic’ without much awareness of what I’m doing.”). Some authors have described the MAAS as a measure of “being seriously, spaced out” (Rosch 2007, p. 262–263), an agitated lack of attentiveness (Grossman 2008), everyday attention lapses (Carriere et al. 2008), or automatic pilot and its effects (Williams 2010). The negative formulation of the MAAS may implicitly measure a judgmental and critical stance towards oneself. This assumption is supported by several findings. First, the MAAS has a higher correlation with the acceptance subscale than with the subscale capturing an open observing stance of the PHLMS ($r=.32$ vs. $.21$, $p<.001$; Cardaciotto et al. 2008) and of the KIMS ($r=.41$ vs. $.18$, $p<.01$; Höfling et al. 2011). Second, in the validation study of the Child and Adolescent Mindfulness Measure (CAMM; Greco et al. 2011), items reflecting (1) noticing or attending to internal phenomena; (2) lack of awareness of ongoing activities (i.e., similar to the presence items of the MAAS); and (3) a judgmental, non-accepting stance towards thoughts and feelings were subjected to exploratory factor analysis. In the resulting two-factor solution of the CAMM, the MAAS-similar items and those capturing a judgmental stance loaded on the same factor, supporting semantic relatedness. In other words, the presence factor of the MAAS may include an acceptance aspect and thus an additional acceptance factor loses explanatory power. This appears to be a result of the specific formulation of the presence items in the MAAS.

In summary, the MAAS allows a concise assessment of mindfulness in populations without previous meditation experience. This scale appears to address both the attention and the acceptance aspects of mindfulness, yet does not differentiate one aspect from the other. Moreover, measuring mindfulness “negatively” may not reflect the complete spectrum of mindfulness experiences.

The Cognitive and Affective Mindfulness Scale-Revised

The CAMS-R (Feldman et al. 2007; Hayes and Feldman 2004) is a 12-item scale of mindfulness in general daily experience. The scale was designed to address *attention*, *present-focus*, *awareness*, and *acceptance/non-judgment of thoughts and feelings*, which all converge in a single total

mindfulness score. The scale differs in an interesting way from most other mindfulness scales: most items capture a capacity and willingness to be mindful (CAMS-R 9: “I try to notice my thoughts without judging them”; CAMS-R 1: “It is easy for me to concentrate on what I am doing”) rather than the extent to which an individual is being mindful throughout the day. Moreover, in developing the CAMS, the authors' intention was to measure “a kind of mindfulness that ... could be useful in the treatment of depression” (Hayes and Feldman 2004, p. 260). Correspondingly, the present-focus items of the CAMS involve a tendency to preoccupation or worrying (CAMS-R 2: “I am preoccupied by the future”). In two studies, the CAMS-R (resp. the CAMS) was more related to measures of psychological distress (e.g., psychological symptoms, neuroticism, and difficulties in emotion regulation) than the MAAS, FMI, KIMS, and SMQ (Baer et al. 2006; Thompson and Waltz 2007). In sum, the CAMS-R offers a short instrument that still captures different aspects of mindfulness. Mindfulness as measured by the CAMS-R is unique in two ways: (1) it is understood as the willingness and ability to be mindful rather than as a realization of mindfulness experience during the day, and (2) it is particularly related to psychological distress. As a consequence, the CAMS-R may be of particular use in clinical studies.

The Southampton Mindfulness Questionnaire

The Southampton Mindfulness Questionnaire (SMQ; Chadwick et al. 2008; first introduced as *Mindfulness Questionnaire*, MQ, Chadwick et al. 2005, unpublished manuscript, cited in Baer et al. 2006) is a 16-item scale with four related bipolar aspects of a mindful approach to distressing thoughts and images. All items begin with, “Usually, when I have distressing thoughts or images” and continue with a mindfulness-related response (SMQ 1: “I am able to just notice them without reacting.”; SMQ 12: “In my mind I try to push them away”). The four bipolar aspects assessed by the SMQ are (1) decentered awareness vs. being lost in reacting to cognitions; (2) allowing attention to stay in contact with difficult cognitions vs. experiential avoidance; (3) acceptance of difficult thoughts and images and of oneself vs. being judgmental; and (4) letting go of and being non-reactive to difficult cognitions vs. rumination or worry. Exploratory factor analyses, however, suggested a one-dimensional factor structure of the scale (Chadwick et al. 2005, 2008). The SMQ specifically assesses how (mindfully) one relates to “distressing thoughts and images, which are important phenomena in all mental health problems and the cornerstone of cognitive theory and therapy” (Chadwick et al. 2008, p. 452). Hence, the SMQ may prove to be very useful for the investigation of relationships between mental health problems and mindful awareness. The scale appears particularly suited for

studies focusing on the effects of a mindful attitude towards distressing inner experiences but may be too specific for more general use, as it does not involve items relating to positive or neutral phenomena. Moreover, individuals who are less prone to distressing thoughts and images may have difficulties relating the SMQ items to their daily experience.

The Kentucky Inventory of Mindfulness Scale

The KIMS (Baer et al. 2004) comprises 39 items that largely target the conceptualization of mindfulness skills as described in Dialectical Behavioral Therapy (DBT; Linehan 1993). The KIMS was designed to measure four aspects of mindfulness in daily life (*observing, describing, acting with awareness, and accepting without judgment*). One aspect of mindfulness unique to the KIMS and largely based on elements of DBT is describing, the ability to verbally describe (or label) experiences (KIMS 10: “I’m good at thinking of words to express my perceptions, such as how things taste, smell, or sound.”). In the mindfulness tradition, labeling of experiences is often considered a component of mindfulness meditation, signifying a general recognition that thoughts are (just) thoughts, feelings are feelings, etc. rather than an accurate description of feelings or of the contents of thought. In fact, mindfulness has been described as being pre- or para-conceptual, not involving categorization, reflection, introspection, or comparisons of experiences (Brown et al. 2007; Gunaratana 2002). It is thus unclear to what extent the ability to verbally describe experiences as measured by the KIMS constitutes a core component of mindfulness and should accordingly be a central facet in a mindfulness scale. In 2006, Baer et al. developed a further self-report measure of mindfulness, the FFMQ, which includes the four facets of the KIMS and many of its items. As these two scales are similar and interrelated, they will be discussed jointly in the following section.

The Five Facet Mindfulness Questionnaire

The FFMQ (Baer et al. 2006) is a 39-item multifaceted scale covering five aspects of mindfulness: *nonreactivity to inner experience (nonreact)*, *observing/noticing/attending to sensations/perceptions/thoughts/feelings (observe)*, *acting with awareness/automatic pilot/concentration/nondistraction (actaware)*, *describing/labeling with words (describe)*, and *nonjudging of experience (nonjudge)*. We will describe the FFMQ in more detail, as it constitutes an important attempt to integrate the conceptualizations and operationalizations of five validated mindfulness questionnaires. This scale and its facets resulted from an exploratory factor analysis of the combined pool of 112 items collected from the KIMS, the FMI, the MAAS, the CAMS, and the SMQ. The factor analysis produced five factors that could be replicated with confirmatory factor analysis (Baer et al. 2006). In a hierarchical

model, all facets except observe (KIMS 21: “I pay attention to sensations, such as the wind in my hair or sun on my face.”) were shown to be aspects of an overall mindfulness construct (in a subgroup of meditators, observe significantly loaded on the overall mindfulness construct as well). This finding was unexpected, since observing, i.e., directing attention at perceptions and experiences, is generally recognized as the core aspect of mindfulness. Moreover, the observe facet was unexpectedly positively correlated with measures of dissociation, absentmindedness, psychological symptoms, and thought suppression, and not associated with nonjudging of experience (Baer et al. 2006). Furthermore, the nearly identical observe scale of the KIMS (which comprises some additional items) was negatively associated with the accepting without judgment KIMS scale in a college student sample (Baer et al. 2004). Similar associations with thought suppression (Greco et al. 2011; Thompson and Waltz 2010), somatic complaints (Greco et al. 2011), and accepting without judgment (Vujanovic et al. 2009) were also established in further studies using the original English versions of the FFMQ and KIMS and in the validation study of the CAMM (an adaptation of the KIMS for children and adolescents, from which the observing scale was finally excluded). The authors proposed that attention to experiences might be related to a tendency towards judging them in individuals without meditation experience, which is not (or less so) the case for people with meditation experience. In accordance with this, the correlation between the FFMQ observe and the FFMQ nonjudging of experience was positive in a subgroup with meditation experience (Baer et al. 2006). However, other mindfulness scales do not show similar association patterns (Bergomi 2007; Cardaciotto et al. 2008). These unexpected patterns may be more related to the observe items of the FFMQ than to attending to experience that is characteristic of mindfulness. Baer et al. (2006) proposed that the unexpected results may be due to FFMQ observe items addressing external stimuli and bodily sensations, whereas items pertaining to other facets are rather related to internal factors such as emotions, cognitions, and functioning on “automatic pilot” (Baer et al. 2006). However, this explanation leaves the unexpected positive associations between observe items and measures of mental disorders unresolved. One possible alternative explanation is that many items of the observe facet involve aspects such as strain and effort to pay attention (KIMS 9: “When I’m walking, I deliberately notice the sensations of my body moving.”; KIMS 13: “When I take a shower or a bath, I stay alert to the sensations of water on my body.”). What these items aim at may be well understood by individuals with some degree of meditation experience, but in the general population, endorsement of such items may reflect an exaggerated tendency to self-attention. Moreover, individuals lacking experience with meditation may easily misinterpret and misunderstand FFMQ items such as “I notice how foods and drinks affect my

thoughts, bodily sensations, and emotions.” (KIMS 17) (cf. Grossman 2008).

In sum, the FFMQ is a comprehensive scale that integrates the conceptualizations of mindfulness underlying five validated mindfulness scales and measures clearly distinct facets of mindfulness. It is thus a suitable instrument for the assessment of differential contributions of mindfulness aspects. Unfortunately, it also has several limitations. The approach leading to the scale was mainly empirically (rather than theoretically) founded. Merging all items of different mindfulness scales produced a rather arbitrary item pool, in which some theoretically meaningful aspects of mindfulness are absent (e.g., willingness and readiness to expose oneself to experiences), whereas others are over- or underrepresented. Additionally, it must be expected that those questionnaires which contributed more items to the item pool and which had a clearer factor structure may have had a larger impact on the results of the exploratory factor analysis. In particular, four out of the five facets resulting from the analysis yielded the same factor structure as the KIMS, which was the longest scale included in the analysis and the only one showing a clear multifaceted factor structure. It may be a consequence of this procedure that some of the aspects present in the five contributing questionnaires did not appear in the final factor structure of the FFMQ. For example, non-identification with own experiences, which is included in the FMI and the SMQ, failed to emerge from the factor analysis. The observe facet was positively associated with psychopathological categories and with mental disorders and, in a hierarchical model, it failed to load on an overall (second-order) mindfulness factor (Baer et al. 2006). It is thus unclear whether the observe items adequately pertain to the quality of noticing, an essential characteristic of mindfulness.

Implications for the Assessment of Mindfulness

The available questionnaires provide an interesting range of instruments, some of which may be particularly helpful in the investigation of specific research questions. For example, the CAMS and the SMQ may be preferable for assessments in clinical practice and research, as they focus on clinically relevant aspects such as reactions on distressing inner experiences. All other scales may also be applied in clinical contexts but may be more generally useful for research, including fields such as meditation research, cognitive science, and social psychology. For example, the use of the FMI may be encouraged in populations that are familiar with meditation. For assessments in the general population, the FFMQ provides the most comprehensive coverage of aspects of mindfulness, whereas the PHLMS offers the advantages of a short but multidimensional scale.

Yet, the current situation in the self-report assessment of mindfulness suffers from several limitations. First, each of the validated mindfulness scales is associated with particular advantages but also disadvantages for a comprehensive assessment of mindfulness in the general population. Second, substantial differences in the covered aspects of mindfulness hinder the comparison of results from studies using different scales, thus impeding communication about the construct (Brown et al. 2007; Malinowski 2008). Finally, results from current scales point at a possible further problem: the inclusion of items that can be easily misinterpreted, in particular, by respondents who are not familiar with the mindfulness concept (cf. Grossman 2008).

The availability of a suitable scale, however, is essential for research in the rapidly evolving field of mindfulness research. New self-report instruments may therefore be needed that are theoretically based and take into account previous operationalizations as well as results from the empirical research based on the available measures. The development of new scales may profit from cross-validation with constructs that are closely related to mindfulness such as non-attachment (Sahdra et al. 2010), self-compassion (Neff 2003) and awareness (Shields et al. 1989), as well as with mindfulness measures that do not rely on self-report but, for example, on experimental tasks or interview data (Grossman 2008; Frewen et al. 2011). The development of such measures is attracting increasing interest (see Bishop et al. 2004; Brown and Ryan 2003; Burg and Michalak 2010; Collins et al. 2009; Davidson 2010; Dobkin 2008; Frewen et al. 2008; Williams 2010).

Open Issues for Self-Report Measures

Researchers working on the further development of self-report measures of mindfulness will have to deal with at least three major open issues: (1) the aspects of mindfulness to be assessed; (2) the nature of the relationships between these aspects; and (3) the validity of mindfulness assessment using self-report. In the following, these issues and possible research strategies for resolving them will be described.

The issue of the coverage of the aspects of mindfulness is related to the comprehensiveness or, conversely, the parsimony (Carmody 2009) of assessments. As mentioned above, each of the current mindfulness scales provides a different description of the construct (Christopher et al. 2009). Conceiving of mindfulness too narrowly would entail the danger of denaturalizing the construct, e.g., by focusing primarily on the attention component while leaving out the attributes that distinguish mindfulness from a more general attention construct. For operationalizations of mindfulness, this would correspond to a lack of content validity. On the other hand, Rosch (2007) suggested that some of the

factors included in current mindfulness questionnaires assess traits indicating reasonableness such as not being “spaced out”, overly emotional, or self-critical. This may imply that a more general inclusion of such aspects may lead to “measuring a construct of more versus less pathology...or Relative Sanity or Reasonableness” (Rosch 2007, p. 262–263). There is no definite answer to the issue of conceptual coverage of mindfulness because no normative mindfulness definition exists. Despite disparities, the conceptualizations of mindfulness behind current questionnaires also show important similarities and overlaps pointing to an implicit consensus among experts regarding an applicable definition of mindfulness for scientific research. It seems reasonable for research to pursue a flexible (but still consensual) conceptualization of the construct. In our view, the use of a more comprehensive conceptualization and operationalization of mindfulness is preferable. Our exploratory study based on the nine aspects of mindfulness reported in Table 1 pointed, on one side, to the relevance of non-avoidance as an aspect of the mindfulness construct and, on the other side, to a possibly marginal role of the capacity to put thoughts and feelings into words (Bergomi et al. 2012). In future studies, researchers may investigate and compare the development of putative facets of mindfulness with mindfulness meditation practice in different traditions, including secular practices such as taught in MBSR. This may contribute to determining the aspects of the mindfulness construct that are commonly enhanced among different mindfulness meditation practices. Moreover, empirical research may generally profit from a phenomenological approach, which allows a more detailed account of individual experiences related to mindfulness and meditation.

The second issue concerns the extent to which mindfulness can be subdivided into meaningful, distinct facets. Results based on the FMI, CAMS-R, and SMQ suggest that mindfulness is intrinsically holistic with tightly interconnected aspects (Leary and Tate 2007; Walach et al. 2006). Alternatively, validation studies of the KIMS, FFMQ, TMS, and PHLMS support that mindfulness may be conceptualized and assessed by distinct (and stable) facets (Baer et al. 2004, 2006; Cardaciotto et al. 2008; Lau et al. 2006). An important point needs to be resolved in this respect: do such results depend on the nature of mindfulness, or rather on theoretical assumptions and methodological artifacts specific to each questionnaire? The KIMS items, for instance, were formulated based on a clear four-factor conceptualization of mindfulness (Baer et al. 2004), which may have had a decisive influence on the factor-analytical confirmation of the expected structure. Interestingly, in a cross-cultural study, the clear-cut KIMS factor structure reported by Baer et al. (2004) could not be replicated in both an American and a Thai sample (Christopher et al. 2009). Further studies comparing the structure of

mindfulness scales between samples varying in degree of meditation experience, cultural background, gender, and age are needed. Such studies could shed light on the (in)stability of putative factor structures of scales and thus provide evidence for or against the conceptualization and measurement of mindfulness as comprising clearly distinct facets.

The third major challenge concerns whether self-report measures are a valid assessment of mindfulness (Brown et al. 2007; Christopher et al. 2009; Grossman 2008, 2011; Van Dam et al. 2009), i.e., if they provide an accurate and consistent measurement. As mentioned previously, several studies have supported the validity of current mindfulness scales, including expected associations with other constructs (convergent and discriminant validity) as well as with meditation experience (known-groups validity) (Baer et al. 2009). The MAAS was also found to predict outcomes that are consistent with mindfulness theory (predictive validity) (Michalak et al. 2008). However, several authors point to a range of problems specific to the assessment of mindfulness (Christopher et al. 2009; Grossman 2008, 2011; Grossman and van Dam 2011; Van Dam et al. 2009). Grossman (2011) mentions ten putatively intractable problems. Some of these (e.g., substantial divergence in the operationalizations of mindfulness, content validity, the complexity and richness of mindfulness, and the possibility to measure the construct relying exclusively on negatively formulated items as in the MAAS) were already discussed above. A number of the issues raised by Grossman challenge the validity of current mindfulness scales and should carefully be dealt with: Are people's ratings of their own mindfulness biased by desires or valuations due to the personal meaningfulness of items? Does the understanding of mindfulness items vary across different populations? The first question deals with an issue affecting self-report assessment in general such as bias due to social desirability and personal values. Evidence dealing with this issue in mindfulness assessment is still scarce and inconsistent. For example, social desirability was found to be positively correlated with the MAAS (Brown and Ryan 2003) but negatively correlated with the PHLMS (Cardaciotto et al. 2008). Moreover, the results were not consistent over different social desirability scales as well as over different populations (Brown and Ryan 2003; Cardaciotto et al. 2008). This question, although pointing to an important issue, generally applies to self-report assessment, and it may not be specifically relevant for mindfulness. Some unexpected results, however, suggest that a valid self-report assessment of mindfulness may be hampered by significant differences in how scale items are understood semantically (Grossman 2008, 2011). Several findings pointed to such differences: in a student sample, binge drinking and smoking students scored higher on the FMI than matched control students (Leigh et al. 2005); positive associations of the FFMQ observe scale with measures of psychological

disorders in people without meditation experience, but not in experienced meditators, likewise suggested an idiosyncratic understanding of certain items (Baer et al. 2006). A qualitative study by Belzer et al. (2011) involving the FMI could confirm the unstable interpretation of some items. The ambiguity of words that are typically used in mindfulness items such as "awareness", "to notice", "to judge" or "experience" may be the reason for the differences in the understanding of items (Belzer et al. 2011; Grossman 2008). Moreover, Grossman (2011) suggested that a certain degree of mindfulness may be a prerequisite for identifying own states of mindfulness (resp. mindlessness), and thus for meaningfully responding to mindfulness items. Nevertheless, mindfulness has also been described as an inherent human capacity that occurs naturally and is not culturally bound (Brown and Ryan 2004; Goldstein 2002; Kabat-Zinn 2003). As such, it is experienced by all individuals and hence should be measurable in individuals unacquainted with Buddhist psychology. In our view, a general rejection of the validity of self-report scales in the measurement of mindfulness (as advocated by Grossman 2008) seems a rather extreme response to this challenge. In fact, current criticisms of self-report measures are based up on data derived from the currently available measures and are thus influenced by the limitations of these scales.

The weaknesses of current mindfulness scales can serve to improve the operationalization of the concept in the future. Therefore, it may be misleading to generalize from the current state of research and conclude that mindfulness in principle cannot be assessed using self-report scales. The challenge for the construction of self-report measures of mindfulness may thus lie with constructing semantically clear and unambiguous items, e.g., by formulating less abstract items. This fundamental issue should be addressed in future studies. Further qualitative examinations, evaluating item understanding in participants with different meditation experience, age, culture, or gender may considerably contribute to the compilation of items that are uniformly interpreted across different groups. Such studies may also point to aspects of mindfulness that cannot be meaningfully self-evaluated by individuals who lack a certain degree of mindfulness. Uniform understanding of items across groups should also be addressed in quantitative studies by means of differential item functioning analyses (Walker 2011).

Finally, it should be noted that the act of responding to a mindfulness questionnaire itself may exert a positive influence on the development of mindfulness. In fact, the process of self-monitoring and self-reporting alone can produce desirable behavior change (Korotitsch and Nelson-Gray 1999), and this effect may be deliberately employed in mindfulness-based interventions. To our knowledge, no study has yet dealt with this putative effect but several

observations speak for its plausibility. Favorable effects may for example result from the fact that the act of responding to questionnaire items may remind participants of their intention to develop mindfulness. Moreover, the items may provide a trigger for reflecting on which kind of experiences or emotional states facilitate or hinder keeping a mindful attitude through the day. Feedback from participants involved in studies we are currently conducting appear to confirm that such favorable effects occur when mindfulness is assessed through self-report.

Conclusion

During past decades, several self-report measures of mindfulness have been validated and are currently used in research. Each of the scales offers unique advantages and disadvantages. Together they provide an interesting palette of instruments allowing the assessment of trait and state mindfulness in populations with differing degrees of familiarity with mindfulness meditation, covering a broad spectrum of aspects of mindfulness. Yet, several findings have pointed to weaknesses of current scales, particularly with regard to the ambiguous interpretations of some items of these scales. Moreover, there is still a lack of consensus with regard to which aspects of mindfulness should be included in a scale and to the kind of relationships existing between them. Further studies, as well as new assessment instruments addressing these issues, are thus encouraged. The present overview suggested how problematic issues may be addressed. Moreover, future studies may profit from the growing literature based on previous operationalization attempts. In general, given the increased importance of the mindfulness concept and its widespread application in various clinical and health-related fields, the assessment of mindfulness should be put on a more solid theoretical and methodological basis.

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