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## Facets of mindfulness – Results of an online study investigating the Freiburg mindfulness inventory

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### ABSTRACT

There is an ongoing discussion about the definition of mindfulness including the question whether mindfulness is a one-dimensional or multidimensional construct. Research on the Freiburg mindfulness inventory (FMI) has also reflected this debate. We have investigated the psychometric properties of the FMI-14-item in an online convenience sample of  $n = 244$  individuals (150 female; mean age 28.7 (SD = 8.76)) with ( $n = 75$ ) and without ( $n = 169$ ) regular meditative training. A simplified version of the beck depression inventory (BDI-V) and the trait subscale of the state-trait-anxiety-inventory (STAI-T) were used for determining criterion validity. A one-dimensional ( $\alpha = .83$ ) and an alternative two-dimensional solution ( $\alpha_{F1} = .77$ ;  $\alpha_{F2} = .69$ ) of the FMI-14 were tested with a confirmatory factor analysis and yielded suboptimal fit indices. An exploratory analysis resulted in a reduced 8-item version of the two-dimensional solution with better fit indices, but low internal consistency ( $\alpha_{F1} = .71$ ;  $\alpha_{F2} = .64$ ). The factors could be identified as “Presence” (F1) and “Acceptance” (F2). Further investigation revealed that the substantial negative relationship between mindfulness and anxiety and depression is completely due to the “Acceptance” factor of mindfulness. This suggests that there may be heuristic value in the two-factorial solution, although for practical purposes it seems sufficient to assess mindfulness as one-dimensional construct.

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### 1. Introduction

Mindfulness and its relationship with health related parameters have become a focus of interest within the health sciences. Mindfulness-based-stress reduction (MBSR) programs have generally shown efficacy for improving various medical conditions and emotional symptoms (Baer, 2003; Grossman, Schmidt, Niemann, & Walach, 2004; Ott, Norris, & Bauer-Wu, 2006), although methodological variability in some studies and particularly paucity of randomized controlled trials precludes strong conclusions (Toneatto & Nguyen, 2007). Nevertheless, there is a growing body of evidence that mindfulness is particularly beneficial for coping with depression, anxiety and stress (Grossman et al., 2004; Segal, Williams, & Teasdale, 2002).

Although the concept of mindfulness was originally derived from Buddhist psychology, mindfulness can be understood in secular terms as the mental ability to focus on the direct and immedi-

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ate perception of the present moment with a state of non-judgemental awareness, voluntarily suspending evaluative cognitive feedback (Hayes & Shenk, 2004).

With increasing evidence of beneficial health effects of mindfulness training, assessment of mindfulness also became desirable. To date, different scales have been developed such as (1) *the Mindfulness and Attention Awareness Scale* (MAAS; 15 items, 1 factor,  $\alpha = .82-.87$ ,  $r_{tt}^1 = .81$ ; Brown & Ryan, 2003), (2) *the Kentucky Inventory of Mindfulness Scale* (KIMS; 39 items, 4 factors,  $\alpha = .83-.91$ ,  $r_{tt} = .65-.86$ ; Baer, Smith, & Allen, 2004), (3) *the Five Facets Mindfulness Questionnaire* (FFMQ; 39 items; 1 factor, 5 facets,  $\alpha = .71-.92$ ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) the (4) *Toronto Mindfulness Scale* (TMS; 39 items, 2 factors,  $\alpha = .95$ ; Lau et al., 2006), (5) *the Cognitive and Affective Mindfulness Scale, Revised* (CAMS-R; 12 items, 1 factor, 4 facets,  $\alpha = .74-.77$ ; Feldman, Hayes, Kumar, Greeson, and Laurenceau, 2007), or (6) *the Freiburg Mindfulness Inventory* (FMI; Walach, Buchheld, Büttenmüller, Kleinknecht, & Schmidt, 2006), available in a long (FMI-30, 30 items, 1 factor,  $\alpha = .93-.94$ ) and a short version (FMI-14, 14 items, 1 factor,  $\alpha = .79-.86$ ). The empirical status of these measures is comparable:

<sup>1</sup>  $r_{tt}$  = test retest reliability.

all were replicated in confirmatory analysis and have seen promising external validation in different types of populations (with the exception of the CAMS-R that draws from student samples only). However, there are considerable differences concerning the definition and operationalisation of mindfulness: Whereas most inventories include several aspects of mindfulness such as awareness or an attitude of Acceptance, the MAAS focuses exclusively on the subjective experience of awareness. The KIMS and the FFMQ are based on skills as defined in Dialectical Behavior Therapy (Welch, Rizvi, & Dimidjan, 2006). In contrast to the other inventories, the TMS measures mindfulness after meditation as a state-like construct. Finally, the FMI was developed by the help of experts of Buddhist psychology and may thus capture the essence of mindfulness more adequately (Grossman, 2008). For that reason we confined our research to this scale.

Whereas Buchheld, Grossman, and Walach (2001) argued for four interpretable factors of the FMI-30, Walach et al. (2006) have recently presented a one-dimensional short form (FMI-14). On the other hand, Ströhle (2006) found evidence for a two-factorial solution of the short form.

As there is ambiguity concerning the factorial structure, we have decided to further investigate the psychometric properties of the FMI-14 in another validation study to clarify its factorial structure. As mindfulness-based cognitive therapy has been advocated for depression and anxiety treatment (Finucane & Mercer, 2006; Segal et al., 2002), we sought evidence of criterion validity aspects of the scale by testing it together with a modified version of the Beck Depression Inventory (BDI-V; Schmitt, Altstötter-Gleich, Hinz, Maes, & Brähler, 2006) and the Trait-Subscale (STAI-T) of the Spielberg State-Trait Anxiety Inventory (Laux, Glanzmann, Schaffner, & Spielberger, 1981). This paper reports on the psychometric properties and factorial structure of the FMI as well as validity aspects with respect to the BDI-V and the STAI-T.

## 2. Method

### 2.1. Participants and data collection

The online questionnaire battery consisting of the FMI-14, BDI-V and STAI-T (described below) was presented on a German internet research portal for mindfulness research from November 2006 to January 2007. In order to recruit subjects, student unions were contacted. Subjects were not offered reimbursement but could participate at a prize draw for a pocket PC (Ipod). Additionally, subjects received an individual mindfulness profile. Students were also offered course credits. To ensure data quality, we followed the guideline for internet-based experimenting as presented by Reips (2002). We posted notes on our research project at different web sites to attract a variety of subjects. According to Gosling, Vazire, Srivastava, and John (2004) there is increasing evidence that results obtained using Internet methods are typically consistent with the effects from studies using traditional methods.

In total, 244 individuals participated in the study, with 3 data sets erroneous or incomplete to a degree that they were excluded from the analysis.

### 2.2. Statistical analysis

We used SPSS 11.0 for the descriptive analysis of raw data as well as intra-sample differences, first order and partial correlations as well as an exploratory factor analysis.

The factorial structure of the FMI as well as its criterion validity with BDI-V and STAI-T was additionally investigated by means of structural equation modeling (SEM), utilizing the maximum likelihood minimization (Bollen, 1989).

For the SEM analysis, AMOS 4.0 was used and a covariance matrix based on the 215 cases with no missing data was calculated (25 iterations). This also allowed for further investigating model (mis)specifications by means of modification indices (MIs). For the confirmatory SEM analyses, no ad hoc changes have been made. In contrast, the explanatory factor analysis was strictly data driven in a sense that MIs were used as a criterion for improving the model fit.

We assessed the model fit of the SEM models using the ratio of chi-square value to degrees of freedom (CMINI/df), the Comparative Fit Indices (CFI), the Tucker-Lewis-Index (TLI) and the root mean square error of approximation (RMSEA) (Kline, 2005). In order to assess model fits, conventional cut-off criteria (good fit: CMINI/df < 2; CFI > .97; TLI > .97, RMSEA < .10; acceptable fit: CMINI/df < 3; CFI > .95; TLI > .95, RMSEA < .05) were employed (Schermelleh-Engel, Moosbrugger, & Müller, 2003).

### 2.3. Measures

#### 2.3.1. Freiburg mindfulness inventory (FMI)

The development of the FMI is reported in detail elsewhere (Buchheld et al., 2001). The original 30 item form of the scale has been conceptualized on Buddhist psychology and hence requires such knowledge from the individuals being tested. Results of a validation study implied that a one-dimensional solution is an alternative to the original four factor model (Buchheld & Walach, 2002).

Thus, Walach et al. (2006) have presented a one-dimensional 14 item short form (FMI-14) which proved to be semantically independent from knowledge of a Buddhist or meditation context; this version also shows acceptable internal consistency ( $\alpha = .86$ ). Meanwhile, both forms have been validated empirically in German and English speaking populations (Heidenreich, Ströhle, & Michalak, 2006; Leigh, Bowen, & Marlatt, 2005);

Nevertheless, the factor structure remains unclear, as empirical evidence has cast doubt on the one-dimensionality: Recently, Ströhle (2006) found evidence for a two-factorial solution comprised of the two intercorrelated subfactors Presence and Acceptance.

In this study, we employed the short form as not all our participants were supposed to have knowledge of Buddhist psychology.

#### 2.3.2. Beck depression scale – simplified version (BDI-V)

The BDI is one of the most frequently used self assessment instruments for measuring depression (Beck, Steer, & Garbin, 1988). In this study the simplified version of the BDI was used, which consists of only 20 items and has a good internal consistency ( $\alpha = .91$ ; Schmitt et al., 2006).

#### 2.3.3. Trait subscale of the state trait anxiety inventory (STAI-T)

The STAI is a widely used 20 item self-report assessment device for measuring state and trait anxiety independently on two subscales (Spielberger & Gorsuch, 1983), which has been validated in more than 30 languages for cross-cultural research and clinical practice (Barnes, Harp, & Jung, 2002; Sesti, 2000). In this study, as we were mainly interested in the relationship between self assessment of habitual mindfulness and habitual anxiety, only the trait scale of the STAI was used ( $\alpha = .90$  for men and .91 for women).

## 3. Results

### 3.1. Sample sociodemographics

Out of the 241 participants, 150 were female and 89 male (2 missing). The mean age was 28.7 years (SD = 8.76); 120 individuals were students.

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