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## Differential item function across meditators and non-meditators on the Five Facet Mindfulness Questionnaire

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### ABSTRACT

Mindfulness has been defined as a state of consciousness involving intentional attention and awareness of the present moment. Reporting on past conscious experience is inherently tricky and presents unique challenges to the assessment of mindfulness. Mindfulness-present and mindfulness-absent items may represent different aspects of the construct to different populations resulting from differential skill in assessing sustained or lapsed conscious attention. The current study shows that an online sample of meditators and non-meditators with similar overall levels of mindfulness differentially endorse response options for positively and negatively worded items. While meditators endorse mindfulness-present and mindfulness-absent items with nearly equivalent frequency, student non-meditators are much more likely to reject mindfulness-absent items than to accept mindfulness-present items. The differential item functioning between these two groups represents a potential problem regarding construct validity when comparing meditators to non-meditators and when assessing mindfulness as a pre-post measure with meditation practice.

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### 1. Introduction

Common definitions suggest that mindfulness is a state of consciousness involving present-centered attention or awareness (e.g. Brown & Ryan, 2003). Assessing this aspect of consciousness, however, proves tricky (see Grossman, 2008; Schooler, 2002). Assessing the frequency of one's own present-centered awareness may require complicated recall as well as metacognitive awareness of awareness (see Schooler, 2002). In addition, some reverse-scored items from mindfulness questionnaires assess lapses in attention rather than mindful moments. The number of lapses an individual might notice depends upon recognizing a lapse has occurred, which also requires meta-consciousness. Thus, people who are more *mindful* might actually be more adept at recognizing attentional lapses, creating odd relations between these items and the construct of interest. Trying to re-represent an experience one was potentially unaware of in the first place likely increases error and bias (Schooler, 2002). Recent work on negatively worded items assessing self-esteem reveals that impulsive, potentially less-mindful participants are less likely to endorse negatively worded items simply because of the way they are worded (DiStefano & Motl, 2009). Thus, negatively worded items may prove less accurate in assessing mindfulness than other items.

Evidence from meditators provides modest support for the validity of mindfulness questionnaires. Meditators score higher

than non-meditators on relevant scales (e.g., Baer, Smith, Hopkins, Krietemeyer, & Toney et al., 2006) – a result potentially consistent with genuine assessment of mindfulness. Alternatively, higher mindfulness scores in meditators might stem from a different understanding of the items. Interpreting group differences on a scale requires that the scale has equivalent meaning across the groups.

Important conclusions are often reached via comparisons between long-term meditating samples and samples of convenience (Grossman, 2008). These comparisons and the notion of mindfulness as dispositional (e.g., Brown & Ryan, 2003) seem to suggest measurement invariance. Unfortunately, data suggest that relationships between aspects of mindfulness may be different for meditators. For example, factor analyses identify an Observe subscale of the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) in meditators that does not appear in non-meditators. Similarly, the FFMQ subscales differentially relate to psychological well-being in comparisons of meditators and non-meditators (Baer, Smith, Lykins, Button, & Krietemeyer et al., 2008). While assessing factorial invariance can identify different response properties by group, differential item functioning (DIF) better assesses differential response bias or demand (Teresi, 2006), an issue of central concern for comparisons of meditators and non-meditators (Grossman, 2008).

DIF occurs when individuals with the same overall 'amount' of a given construct (as assessed by the relevant scale) have a different probability of selecting a given response option on an individual item. Under item invariance, overall scale score should be the

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primary predictor of which response option a participant selects, not group membership. Individuals with high levels of the construct (as assessed by the scale) should be more likely to choose response options that represent higher levels of the construct on a given item, regardless of any group affiliation. When an item lacks invariance (exhibits DIF), individuals with similar overall levels of the construct in question have different probabilities for choosing given response options, resulting from group membership. DIF has important implications for identifying out-group bias (e.g., Mazor, Clauser, & Hambleton, 1992) and is one means of testing item invariance across groups.

There are several ways to assess item invariance, including covariance modeling (factor analytic approaches), Item Response Theory (IRT), or nonparametric statistics (see Teresi, 2006). Covariance modeling and IRT approaches require large samples to satisfy assumptions and achieve convergence (e.g., Embretson & Reise, 2000; French & Finch, 2006). Additionally, these parametric models result in inflated Type I error given larger samples and model misspecifications (Teresi, 2006). In contrast, nonparametric statistics (e.g., the Mantel-Haenszel statistic; MH) have fewer assumptions; although they are “. . . generally less powerful. . . they may identify the most problematic [items] with large effect sizes ...” (Teresi, 2006, p. S164). Accordingly, nonparametric statistics like the MH are ideal in early stage exploration of DIF, particularly when access to out-group members is limited.

Long-term meditators prove difficult to recruit, yielding relatively small samples even for privileged contacts with meditation centers (119 – Baer et al., 2008; 50 – Brown & Ryan, 2003). Recruitment difficulties have led some researchers to use the internet to examine properties of mindfulness scales (e.g., Kohls, Sauer, & Walach, 2009). Difficulties in recruitment necessitate means of exploring potential DIF that are capable of handling discrepancies in sample distributions and sizes while maintaining a careful balance between Type I and Type II error.

To explore the potential for group bias with consideration of these limitations, we used nonparameteric DIF analyses to examine online responses on a popular self-report mindfulness scale, the FFMQ, in samples of non-meditating students and non-student meditators.

## 2. Methods

### 2.1. Procedure

Undergraduates at a state university in the northeastern United States participated via an online survey for course credit. Additionally, an email was sent to meditation and Buddhist list servers (see Kohls et al., 2009). Participants who were willing forwarded the email to others with meditation experience (the ‘snowballing’ technique; e.g., Van Dam, Earleywine, & DiGiacomo, 2008). Responses were not associated with individually identifying information. Procedures were approved by the local investigational review board.

### 2.2. Data screening

The Internet survey model provides advantages and disadvantages relative to other methods of assessment (see Van Dam et al., 2008). Careful data screening is extremely important; fraudulent data and duplicate responses can threaten experimental integrity. Forty-four participants in the student sample (10.6%) indicated that they were either impaired or did not take the study seriously; these subjects were removed. Eighteen Interpersonal (IP) addresses appeared more than once. Incomplete data sets from a repeated IP address were deleted. Potential duplicate data sets were carefully screened; there were no discernable duplicates.

Thirty-five (12.4%) students reported meditation experience. Twenty of those provided evidence that their ‘meditation’ practice may have involved mindfulness components. Data from these individuals were removed; they were not representative of a non-meditating student sample and the style of meditation reported was too disparate from the meditator population. The remaining ten provided descriptions of ‘meditation’ dissimilar to mindfulness-based practice; their data were included in the student non-meditator population. The final number of student non-meditators who completed the questionnaire was 283, though only 263 were included in the analyses for the above reasons.

Sixty-four individuals responded from meditation list servers. Data from six individuals were deleted because they reported no regular meditation practice or they did not engage in mindfulness meditation. The final number of meditator participants was 58.

### 2.3. Participants

The student non-meditator sample was 51.7% male, with an average age of 18.9 years ( $SD = 1.4$ ). The sample was largely Caucasian (76.8%), with Other (8.4%), Asian (6.4%), Hispanic (4.9%), and African American (3.4%). Over 95% had never read any books related to Buddhism, meditation, and/or mindfulness (here termed “Dharma” books), 3.8% reporting having read a few, 0.8% reading them as a low priority, and 0.4% reading them as a moderate priority. The majority of the sample was unfamiliar with the concept of mindfulness (61.2%).

The sample of meditators was 63.8% female, with an average age of 47.5 years ( $SD = 14.2$ ). The sample was 73.2% Caucasian, 12.5% Other, 7.1% Hispanic, and 7.1% Asian. The majority of the sample had exposure to Dharma books, 34.5% reporting reading them as a high priority, 39.7% as a moderate priority, 10.3% as a low priority, 13.8% reporting having read a few, and 1.7% reporting never having read any. The entire sample was familiar with the concept of mindfulness and the majority (67.2%) belonged to a meditation group. Most of the sample (61.4%) had been meditating for more than 5 years, with 28.1% reporting a meditation history between 1 and 5 years, 5.3% between 6 and 12 months, and 5.3% between 1 and 6 months. Nearly the entire sample had a regular personal meditation practice, 46.6% reporting a daily practice, 27.6% reporting practice 3–5 times a week, 15.5% reporting practice 1–2 times a week, 6.9% reporting weekly practice, and 3.4% reporting practice monthly or less.

### 2.4. Measures

#### 2.4.1. Mindfulness

Participants completed the 39-item version of the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006). The FFMQ has good psychometric properties in students, community members, and meditators (Baer et al., 2006, 2008). Internal consistency of the FFMQ among non-meditators (Cronbach’s  $\alpha = 0.86$ ) and meditators was high (Cronbach’s  $\alpha = 0.95$ ).

### 2.5. Statistical methods

#### 2.5.1. Differential item functioning

Several statistical approaches can identify DIF in polytomous items, but no one statistic is best in all situations (Mazor et al., 1992; Teresi, 2006). One of the most popular nonparametric methods is an extension of the Mantel-Haenszel (MH) statistic, the Mantel chi-square (Mazor et al., 1992). The Mantel chi-square is based on a group (2) x response options (5) contingency table for each item. The larger the chi-square, the more disparate the probability of response options across meditation groups at the same level of overall mindfulness (see Penfield, 2007b).

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