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Multistudy Report

Exploring the Utility of the Multidimensional State Boredom Scale

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Abstract. *Background*: State boredom–the experience of boredom in the moment – is related to a number of psychosocial issues. Until the recent creation of the Multidimensional State Boredom Scale (MSBS), research was constrained by the lack of a comprehensive, validated measure. However, the MSBS could benefit from further evaluation. *Aim*: To more thoroughly validate the MSBS. *Methods*: In two studies, participants were induced into a state of either boredom or non-boredom, and then completed the MSBS. *Results*: Discriminant analysis showed that the full MSBS was able to correctly classify 68.1% (Study 2) – 84.1% (Study 1) of participants into their experimental condition. Based on further DA analysis, a subset of eight items (a potential short form) is proposed. Differential item functioning (Study 1) found only one item to which responding differed by gender. *Discussion*: Use of the MSBS, including the full scale versus the short form, is discussed. Which experiential components of boredom may be particularly important for classifying bored individuals, and the issue of variability across boredom manipulations, are also considered.

Keywords: Multidimensional State Boredom Scale (MSBS), psychometric evaluation, the experience of boredom, short version

Boredom research has typically focused on the *trait* of boredom – that is, propensity to boredom as a stable feature of personality. This trait has been linked to a large number of behavioral and emotional problems (e.g., Mercer-Lynn, Hunter, & Eastwood, 2013; Vodanovich, 2003). *State* boredom – the experience of boredom in the moment – although much less extensively researched has also been linked with a number of psychosocial issues and maladaptive states. For example, participants induced into a state of boredom display increased eating after a full meal (Abramson & Stinson, 1977), and increased hostility/aggression (van Tilburg & Igou, 2011b). Experimental research has also suggested that state boredom may give rise to risky decision-making (Matthies, Philipsen, & Svaldi, 2012), and performance decrements on vigilance tasks (e.g., Scerbo, 1998). State boredom is associated with changes in autonomic arousal indicators such as heart rate and skin conductance levels (Merrifield & Danckert, 2013). Finally, a study of clinically depressed psychiatric inpatients found state boredom to be a key predictor of suicidal ideation (Ben-Zeev, Young, & Depp, 2012). Thus, it would appear that there is need for valid measures of state boredom.

However, tools for measuring state boredom have only very recently been developed. To our knowledge, there are currently only three measures of state boredom: van Tilburg and Igou's *experiential content of boredom items* (2011a), Todman's *State Boredom Measure* (2013), and Fahlman, Mercer-Lynn, Flora, and Eastwood's *Multidimensional State Boredom Scale* (2011).

van Tilburg and Igou's seven experiential content of boredom items (2011a, Study 4) do not assess state boredom broadly, but rather deliberately focus on two theoretically important experiential components of boredom: lack of challenge and lack of meaning. Items (e.g., "To what extent do you want to do something more meaningful?") were generated based on a review of the literature (van Tilburg & Igou, 2011a, Study 4, p. 189). Although these items were not intended to represent a psychometrically valid scale, they have undergone some evaluation. The scale has an alpha coefficient of .87 (van Tilburg & Igou, 2011a) and possesses construct validity: Participants scored higher on these items in a high than in a low boredom condition (van Tilburg & Igou, 2011a).

Todman's State Boredom Measure (SBM; 2013) does not attempt to ascertain subjects' experience in the moment but rather "is designed to inventory an individual's recollections and thoughts about their boredom experience during the recent past" (p. 33–34). In Todman's (2013) article on the SBM, participants responded to the measure with reference to the previous two weeks. Participants answered eight questions drawn from four broad categories: duration of boredom episodes, the ability to withstand long periods of boredom, attributions regarding the causes and consequences of boredom, and the degree of negative affect accompanying boredom. A "rational-theoretic process"

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was used to create these eight items and the four categories (Todman, 2013, p. 34). Todman describes the SBM as "a prototype" (2013, p. 32); thus, as with van Tilburg and Igou's (2011a) items, the SBM was not intended to represent a final, validated scale. Nevertheless, the SBM has undergone preliminary psychometric evaluation. The scale's alpha coefficient is .81, and its items demonstrate test-retest reliabilities over a two-week period ranging from .41 to .69 (Todman, 2013). The SBM's convergent validity has also been shown, with the majority of items correlated in the expected ways with theoretically important constructs. Lastly, select SBM items were correlated with alcohol use even when trait boredom was controlled for in a partial correlation analysis. However, the SBM was not related to cigarette use when trait boredom was controlled.

Published in 2011, Fahlman et al.'s MSBS was the first full-scale measure of state boredom. The scale is designed to assess the individual's experience of boredom in the moment; participants respond by agreeing or disagreeing with items such as "I feel bored" and "Time is dragging on" (Fahlman et al., 2011, p. 15). In creating the scale items, the authors drew on theoretical definitions of boredom as well as qualitative accounts from research participants. The MSBS is multidimensional by design so as to capture the multifaceted nature of boredom that emerged from the literature and from participants' emic knowledge. Specifically, the MSBS consists of five factors/subscales – Disengagement, High Arousal Negative Affect, Low Arousal Negative Affect, Inattention, and Time Perception – that load onto a single, higher-order factor. The full scale's alpha coefficient is .94, with subscale alpha coefficients of .87 (Disengagement), .85 (High Arousal Negative Affect), .86 (Low Arousal Negative Affect), .80 (Inattention), and .88 (Time Perception) (Fahlman et al., 2011). Its factor structure has been shown to be invariant across gender. Finally, the scale's validity has been demonstrated in several ways. In Fahlman et al.'s (2011) study, the MSBS was significantly correlated with theoretically related constructs (e.g., trait boredom, depression, and life satisfaction). Further, the MSBS was able to predict group membership (bored vs. not-bored) over and above measures of trait boredom, negative affect, and depression.

In sum, there are three relatively new tools that assess state boredom from slightly different perspectives. Of these tools, the MSBS has been the most extensively validated, likely because it is the only measure to be put forth as a finalized scale. However, the MSBS could benefit from further psychometric evaluation and development to more fully establish its utility. Three major areas exist for further investigation: First, although Fahlman et al.'s (2011) study attested to the MSBS's ability to predict group membership (bored or not-bored) over and above other theoretically important measures, the accuracy with which the MSBS can correctly classify participants is not known. Second, the MSBS's multidimensional nature also means that the full scale (29 items) is somewhat long for research designs that call for brief, repeated assessments of state boredom; a smaller subset of items might be more useful for this purpose. Finally, although the MSBS's factor structure is invariant across gender, it is not known whether gender influences responses to individual items, a concern made more pressing by the observation that men and women sometimes report different levels of trait boredom (e.g., Studak & Workman, 2006).

The present project seeks to provide validation of the MSBS by examining the following three questions: (1) How well does the MSBS discriminate between bored and not-bored individuals? (2) What subset of items from the MSBS best discriminates bored from not-bored individuals, and could these items be used to create a short version of the MSBS?, and (3) Do men and women respond differentially to any individual items of the MSBS?

Study 1

Methods

Participants and Procedure

The data analyzed in Study 1 was drawn from two previously collected and published data sets ([Data Set 1 – reference removed to preserve author anonymity], 2011, $N = 75$; [Data Set 2 – reference removed to preserve author anonymity], 2014, $N = 129$). The total sample contained 57 men (27.9%) and 147 women (72.1%). Participants identified with the following ethnicities: 45.6% White/Caucasian, 15.2% South Asian, 10.3% Arab/West Asian, 8.8% Black, 7.8% Chinese, 4.9% Other, 2% South East Asian, 1.5% Filipino, 1.5% Latin American, 1% Korean, 1% Unreported, 0.5% Aboriginal. The average age was 20 years ($SD = 4.5$, range 17–53). Three participants in Data Set 2 and two participants in Data Set 1 were excluded because of missing data, resulting in a total of 199 participants for the present analyses.

Both data sets employed the same boredom manipulation, which was created based on a careful review of the existing theoretical and empirical work. Briefly, participants in the boredom condition ($n = 136$) watched one of two 25-minute videos[1]: *SIGGRAPH 98: Computer graphics conference proceedings video tape*, a video on advanced computer graphics (Rose & McDermott, 1998); or *Easy English: Using numbers and money*, a video on learning English as a second language (Video Tutor, 1995). Participants in the non-boredom condition ($n = 63$) watched 25 min of the action video *Speed* (de Bont, 1994). To enhance participants' feelings of boredom or interest, perceptions of passage of time and choice were also manipulated, both of which have been shown to influence state boredom

[1] Results from the Data Set 1 (2011) study in which both videos were viewed showed no significant difference in MSBS scores between these two video conditions; that is, both videos induced equivalent levels of boredom. Consequently, participants in Data Set 2 watched only the *Easy English* video.

(London & Monello, 1974; Troutwine & O'Neal, 1981). Participants in the boredom condition were told that due to technical difficulties they could not choose between two different video clips as planned and would have to watch the only clip available, and that the clip would run for 20 min; participants in the non-boredom condition were led to believe they could choose between two video clips to watch (in actuality all participants in the non-bored condition watched *Speed*), and were told that the clip would run for 30 min.

The participants in each condition were compared across studies. The state boredom scores of the non-boredom condition participants in Data Set 1 (2011; $M = 84.7$, $SD = 24.8$) and Data Set 2 (2014; $M = 89.8$, $SD = 32.7$) were not significantly different, $t(61) = -.709$, $p = .481$. Similarly, the state boredom scores of the boredom condition participants in Data Set 1 (2011; $M = 121$, $SD = 32.7$) and Data Set 2 (2014; $M = 112.5$, $SD = 37.8$) were not significantly different, $t(85.51) = 1.31$, $p = .194$. Consequently, we have no reason to believe that a joint data set would present any obstacles in the computation of the present analyses. There were no outliers in the combined data set.

Measures

Following the video, participants completed the MSBS (see Appendix). The MSBS is a 29-item questionnaire for which responses are given on a 7-point Likert scale ranging from 1 (= *strongly disagree*) to 7 (= *strongly agree*). The scale's psychometric properties have been noted in the Introduction.

Data Analysis Plan

Discriminant Analysis (DA)

DA uses a set of independent variables to predict participants' group membership, and, further, provides classification rates for each condition. Stepwise DA reduces the number of items in the scale by entering items into the equation according to their unique contribution to classification; items are no longer entered when the contribution that they add is nonsignificant. In the present study, a stepwise DA was used to measure how well each item of the MSBS was able to classify each participant into his or her corresponding experimental condition (bored vs. not-bored). The functioning of each item was determined based on their standardized canonical discriminant function coefficient, which provides a measure of unique discriminant ability.

Differential Item Functioning (DIF)

DIF is a procedure used to determine whether an item on a scale is biased, so that one group (i.e., men) consistently scores differently than the other group (i.e., females) after being matched on the level of the construct being measured (i.e., boredom). The *lordif* package in R was used to evaluate the items of the MSBS for DIF by gender. *lordif* makes use of a hybrid ordinal logistic regression and item response theory approach for DIF detection. The functioning of this package has been described in detail by its authors (Choi, Gibbons & Crane, 2011). Briefly, *lordif* uses three different models for DIF detection. Model 1 uses item observed total scores to predict item scores. Model 2 makes use of observed total scores as well as group membership (i.e., bored or not-bored) to predict item scores. Model 3 uses the observed total score, group membership, and their interaction term to predict item scores. *lordif* then compares these three models to test each item for DIF (Swaminathan & Rogers, 1990; Zumbo, 1999).

Results

Manipulation Check

There was a significant difference between the boredom and non-boredom experimental groups, with participants in the boredom condition ($M = 117.99$, $SD = 34.70$) reporting higher state boredom scores than participants in the non-boredom condition ($M = 86.70$, $SD = 28.06$), $t(147.02) = 6.77$, $p < .001$; degrees of freedom were adjusted due to significance of Levene's test ($F = 5.55$, $p = .02$).

Discriminant Analysis

A stepwise DA was run on the entire data set using all 29 items of the MSBS as predictors to determine which items best classified participants into their experimental condition. Table 1 shows the standardized canonical discriminant function coefficients of items that uniquely contributed to the differentiation of bored from not-bored participants in the stepwise DA. The DA found that items 1, 3, 9, 10, and 24 provided the best nonredundant ability to discriminate group membership. Items 1, 3, and 10 have a positive standardized coefficient, indicating that they help discriminate the bored group; and items 9 and 24 have a negative sign, discriminating the non-bored group.

Table 1. Standardized canonical discriminant function coefficients of significant MSBS items differentiating bored from not-bored participants, Study 1

Item	Coefficient
10	.775
1	.595
24	−.361
9	−.287
3	.232

All together, the full scale was able to correctly classify 84.1% of participants, with sensitivity of 82.5% (participants correctly classified as bored) and specificity of 87.5% (participants correctly classified as not-bored; *n* of participants completing the full scale = 199). The squared canonical correlation of the discriminant function was .50, and Wilks' $\lambda = .504$ (5, $N = 199$) = 133.08, $p < 001$. Taken together, the five items that provided the best unique predictive ability classified 84.6% of participants correctly, with sensitivity of 83.2% and specificity of 87.5% (*n* of participants completing these five items = 201).

Differential Item Functioning

Differential item functioning (DIF) was used to determine whether any items functioned differentially by gender. Men ($M = 109.5$, $SD = 33.1$) did not score significantly differently than women ($M = 107.6$, $SD = 36.9$) on their overall score on the MSBS, $t(197) = .334$, $p = .739$. The bored and non-bored conditions were analyzed together ($n = 199$). Consistent with Choi et al. (2011) and Zumbo (1999), the alpha threshold for identification of an item functioning differentially by gender was .01.

Item 2 ("I am stuck in a situation that I feel is irrelevant") was found to be a DIF item by the comparison of Models 1 and 3, χ^2 ($df = 1$) = 12.43, $p = .002$, McFadden pseudo-$R^2 = .018$. More specifically, this DIF is uniform, as can be seen by the comparison of Models 1 and 2, χ^2 ($df = 1$) = 12.11, $p < .001$, McFadden pseudo-$R^2 = .018$, meaning that the difference between men and women on item 2 is constant across all response levels. It is important to note that this test remains significant after performing a Bonferroni correction controlling for the number of items being evaluated. Men had higher scores ($M = 4.3$) than women ($M = 3.6$) across all levels of response to item 2, $t(197) = 2.582$, $p = .011$. Nonuniform DIF (one in which groups score differently, but this difference varies by the measured variable's level) was not detected, as revealed by the comparison between Models 2 and 3, χ^2 ($df = 1$) = 0.26, $p = .609$, McFadden pseudo-$R^2 < .001$. Choi et al. (2011) have outlined guidelines for measuring DIF magnitude with McFadden's pseudo-R^2: a negligible DIF has a McFadden's pseudo-R^2 below .13, a moderate DIF between .13 and .26, and a large DIF above .26. Although item 2 functioned differentially, by these guidelines the difference was negligible (pseudo-$R^2_{1-3} = .018$, pseudo-$R^2_{1-2} = .018$).

Discussion

Study 1 established the MSBS's ability to discriminate between bored and non-bored experimental conditions, and revealed a subset of five items that uniquely contributed to the MSBS's classification ability. In addition, Study 1 found only one item that functioned differentially by gender. However, it is difficult to ascertain the extent to which these results are tied to the particular boredom manipulation used. Indeed, the full MSBS has not yet to date been used to measure state boredom after a boredom induction other than the one employed in Study 1. Thus, to determine the extent to which the MSBS's utility held across experimental manipulations, a second study was conducted. Study 2's objective was to replicate Study 1's discriminate function and differential item analyses, but to do so using a different boredom manipulation.

In particular, we sought to use a boredom manipulation that would differ from Study 1's boredom manipulation in both structure and intensity. Study 1's boredom manipulation induces boredom through three paths: content (boring video), time perception, and perception of choice. In addition, the manipulation is 25 min in length. Thus, the manipulation is a potent boredom inducer: as an illustration, in the original paper that debuted the MSBS, when asked to list four words describing their thoughts and feelings after watching the video 94% of participants used the word 'bored' or its synonym (Fahlman et al., 2011). However, not all research studies can accommodate a boredom induction of that length, and thus not all research studies may be able to produce such a marked group difference in boredom scores. It would therefore be useful to know if the MSBS can still discriminate between bored and non-bored groups if a less intense, simpler manipulation is used.

With these factors in mind, Markey, Chin, VanEpps, and Loewenstein's (2014) boredom induction was selected. The induction is a brief (4 min and 50 s long) video clip in which a man describes his routine workday as an employee in an office supply company in a monotone voice. In contrast to Study 1's manipulation, this manipulation induces boredom through one path (content), and does so in a short period of time.

Study 2

Methods

Participants and Procedure

The data analyzed in Study 2 was drawn from a larger, unpublished study on boredom and creativity, $N = 194$. The total sample contained 61 men (31.4%), 130 women (67%), and 3 individuals who did not identify a gender (1.5%). Participants identified with the following ethnicities: 32% South Asian, 21.6% White/Caucasian, 16% Black, 13.9% Arab/West Asian, 9.3% Chinese, 5.7% Other, 3.6% South East Asian, 3.1% Filipino, 2.6% Latin American, 1.5% Aboriginal, 1% Korean, and 0.5% Japanese. (Unlike in Study 1, participants were permitted to select more than one option. In being able to identify with multiple ethnicities, participants were enabled to provide us with a more complete and nuanced picture of their ethnic membership.) The average age was 21.64 years ($SD = 4.53$, range 17–49). Thirty-seven participants were excluded because of missing data, resulting in a total of 157 participants for the present analyses.

Participants were induced into a state of boredom or a control state (amusement) through a brief (4 min and 50 s long) video clip. Participants in the boredom condition ($N = 81$) watched the video described above in which a man outlines his workday (Markey et al., 2014). This clip has been shown to possess intensity (high reported boredom ratings) and discreteness (experiencing boredom as opposed to other emotions; Markey et al., 2014). Participants in the amusement condition ($N = 76$) watched the first 4 min and 50 s of the first episode of the comedy sitcom *Brooklyn Nine-Nine* (Goor, Schur, Lord, & Miller, 2013).

Measures

As in Study 1, following the video participants completed the MSBS.

Data Analysis Plan

The same analyses conducted in Study 1 (stepwise DA, and DIF) were planned for the Study 2 data.

Results

Manipulation Check

A comparison of the state boredom scores between experimental groups revealed a significant difference, $t(155) = -3.21$, $p = .002$. Participants who watched the boring movie clip reported higher state boredom scores ($M = 106.22$, $SD = 35.84$) than participants who watched the amusing movie clip ($M = 88.12$, $SD = 34.66$). As anticipated, the state boredom score for the boredom condition in Study 2 was lower than the state boredom score in Study 1 ((Study 1 $M = 117.99$, $SD = 34.70$; Study 2 $M = 106.22$, $SD = 35.84$), $t(215) = 2.39$, $p = .018$. No significant differences in mean state boredom scores were found across manipulations among participants in the non-boredom conditions (Study 1 $M = 86.70$, $SD = 28.06$; Study 2 $M = 88.12$, $SD = 34.66$), $t(136.93) = -0.26$, $p = .790$; degrees of freedom were adjusted due to significance of Levene's test ($F = 4.74$, $p = .031$)).

Discriminant analysis

A stepwise DA was run on the entire data set using all 29 items of the MSBS as predictors to determine which items best classified participants into their experimental condition. Table 2 shows the standardized canonical discriminant function coefficients of items that uniquely contributed to the differentiation of bored from not-bored participants in the stepwise DA. The DA found that items 1, 10, 22, and 23 provided the best nonredundant ability to discriminate group membership. Items 1, 10, and 23 have a positive standardized coefficient, indicating that they help discriminate the bored group; and item 22 has a negative sign, discriminating the non-bored group.

Table 2. Standardized canonical discriminant function coefficients of significant MSBS items differentiating bored from not-bored participants, Study 2

Item	Coefficient
22	−.721
23	.648
10	.564
1	.471

All together, the full scale was able to correctly classify 68.1% of participants, with sensitivity of 64.4% (participants correctly classified as bored) and specificity of 71.7% (participants correctly classified as not-bored). The squared canonical correlation of the discriminant function was .19, and Wilks' $\lambda = .814$ (4, $N = 157$) = 31.49, $p < 001$. Taken together, the four items that provided the best unique predictive ability classified 67.6% of participants correctly, with sensitivity of 66.7% and specificity of 68.5% (n of participants completing these four items = 182).

Differential item functioning

A comparison of the MSBS total score revealed that men ($M = 91.98$, $SD = 35.45$) did not score significantly differently than women ($M = 99.89$, $SD = 36.82$), $t(153) = -1.29$, $p = .201$. There were not enough cases per cell, however, (Likert response option) to complete a DIF as planned.

Discussion

The MSBS's Psychometric Properties

The full MSBS classified 68.1% (Study 2) to 84.1% (Study 1) of participants correctly, with correct classification of 64.4% (Study 2) to 82.5% (Study 1) of bored participants and correct classification of 71.7% (Study 2) to 87.5% (Study 1) of not-bored participants. Further, our results indicated which items provided the best unique discriminative ability. In Study 1, five items (1, 3, 9, 10, and 24) classified 84.6% of participants correctly, with correct classification of 83.2% of bored participants and correct classification of 87.5% of not-bored participants. In Study 2, four items (1, 10, 22, and 23) classified 67.6% of participants correctly, with correct classification of 66.7% of bored participants, and correct classification of 68.5% of not-bored participants.

Study 1 also found that response patterns for 28 out of the MSBS's 29 items (i.e., every item except for item 2) did not display gender differences. As noted earlier, Fahlman et al. (2011) found the MSBS's factor structure to be strictly

invariant across gender: that is, the relationship between individual items and their lower-order factor (e.g., Disengagement) does not vary by gender, nor does the relationship between the five lower-order factors and the second-order overall factor. The present results extend these findings by showing that responses to individual items, with the exception of item 2, are also invariant across gender. In other words, researchers using the MSBS can be assured that any differences among genders are a function of true gender differences, and not a gender bias of the MSBS (with the possible exception of item 2). In regard to item 2, researchers wishing to examine gender differences with the MSBS may consider omitting this item. This recommendation is conservative given that McFadden's pseudo R^2 was negligible for item 2 in Study 1 and that in both Study 1 and Study 2, total state boredom scores did not significantly differ across genders.

The Particular Distress of Boredom

In both Study 1 and Study 2, the items that provided unique discriminative ability between bored and non-bored experimental conditions were drawn from the same three factors of the full MSBS scale. In Study 1, the five items that provided unique discriminative ability were items 1 ("Time is passing by slower than usual"), 3 ("I am easily distracted"), 9 ("I seem to be forced to do things that have no value to me"), 10 ("I feel bored"), and 24 ("I want something to happen but I'm not sure what"). Three of these items (items 9, 10, and 24) belong to the Disengagement factor, one (item 3) to the Inattention factor, and one to the Time Perception factor (item 1). In Study 2, the four items that provided unique discriminative ability were items 1, 10, 22 ("I am wasting time that would be better spent on something else"), and 23 ("My mind is wandering"). Two of these items (items 10 and 22) belong to the Disengagement factor, one (item 23) to the Inattention factor, and one to the Time Perception factor (item 1). In both studies, items from the High Arousal Negative Affect and Low Arousal Negative Affect factors were not found to provide unique classification ability.

Empirical work has shown that boredom is a diffuse emotion that shares qualities with other emotional states such as depression (e.g., Goldberg, Eastwood, Laguardia, & Danckert, 2011). Despite this, boredom is a conceptually and psychometrically distinct phenomenon (e.g., Eastwood, Cavaliere, Fahlman, & Eastwood, 2007; Fahlman, Mercer, Gaskovski, Eastwood, & Eastwood, 2009; Goldberg et al., 2011). The present work suggests that the combination of disengagement, inattention, and time perception are the nonredundant components of state boredom that best discriminate bored and not-bored individuals; a finding consistent with other research. For instance, theory and research have supported disengagement as a fundamental element of the experience of boredom (e.g., Fahlman et al., 2009; Frankl, 1962), and even a *distinct* marker of boredom as compared to other affective experiences (van Tilburg & Igou, 2011a). Inattention has also been seen as a key experiential component of boredom. Recently, for instance, Eastwood and colleagues (Eastwood, Frischen, Fenske, & Smilek, 2012) proposed that boredom be defined in terms of inattention, and researchers have successfully induced boredom by disrupting subjects' ability to attend (Damrad-Frye & Laird, 1989). Finally, time perception has also been viewed as a fundamental element of boredom (e.g., Danckert & Allman, 2005). As previously noted, altering time perception can induce boredom (London & Monello, 1974), and, boredom-prone individuals tend to perceive time as passing more slowly (e.g., Danckert & Allman, 2005).

In contrast, the present findings suggest that high and low arousal negative affect do not provide unique discriminative ability. This might be because disengagement, time perception, and inattention better capture all the variance that is captured by high and low arousal negative affect when discriminating bored from non-bored individuals. Alternatively, perhaps high and low arousal negative affect are not particularly discriminating because various levels of arousal can occur during boredom. Eastwood et al. (2012) articulated how the bored individual may oscillate between high and low arousal negative affect during a given instance of boredom; furthermore, empirical research has shown that boredom's psychophysiological "signature" includes both high arousal (increased heart rate) *and* low arousal (decreased skin conductance levels; Merrifield & Danckert, 2013). Nevertheless, although high and low arousal negative affect may not provide unique ability to distinguish bored from non-bored people, they remain important experiential features and should be included in any exhaustive measurement of boredom. For example, knowing that a bored individual is experiencing high or low arousal negative affect could be important to understanding and responding to the instance of boredom. Indeed, the work of Malkovsky, Merrifield, Goldberg, and Danckert (2012) suggests that it may be important to determine if a person is experiencing high or low arousal negative affect because different cognitive impairments may be associated with each particular type of boredom.

Using the MSBS: Considerations

Full Scale Versus Short Form

In creating and validating a scale, the driving question of course is: for what purpose? We encourage researchers not to search for the one "best" measure, but to consider which measure is *best suited* for a given research design. Thus, although we feel that the MSBS is exhaustive for measuring the experiential components of boredom, we acknowledge that it may be unwieldy for use in some circumstances.

In such instances, a short form comprised of select items from the full MSBS scale may be preferred for simply classifying participants into conditions (bored vs. not-bored). Speaking to this need, researchers (Markey et al., 2014) have already begun to create their own "short forms" by

using select items from the MSBS rather than the full scale to assess boredom. Drawing on the present quantitative results to address this gap, we propose firstly that the short form includes the exhaustive list of uniquely discriminative items from Study 1 and Study 2 (i.e., items 1, 3, 9, 10, 22, 23, and 24). Since these items are drawn from two studies employing two different boredom manipulations, we can have some confidence that their discriminative ability will hold for other boredom inductions researchers may use (e.g., see the set of validated inductions outlined in Markey et al., 2014). We further propose that the short form include, for theoretical purposes, item 28 ("I feel like I'm sitting around waiting for something to happen"). As was discussed in the paper that introduced the MSBS (Fahlman et al., 2011), disengagement is theorized to contain the experiences of: (a) having nothing to do, (b) not knowing what one wants to do, and (c) being forced to do something unwanted. The seven uniquely discriminative items found in the present analyses cover categories (b) (item 24), and (c) (items 9 and 22), but not (a). This may be due to the fact that an experimental manipulation was used: by definition, all participants in the boredom conditions were "forced" to undergo the induction – there was, by nature of the experiment, something they had to do. However, not all manipulations may force a specific activity (e.g., waiting as a boredom induction; Matthies et al., 2012); or, boredom may be assessed in the natural environment instead of manipulated. We thus feel that the inclusion of item 28 ("I feel like I'm sitting around waiting for something to happen") will improve ecological validity when boredom is not manipulated, or is manipulated through the absence of prescribed activity.

In addition to classifying participants into conditions, this eight-item short form (the MSBS-8) may also have greater utility in experimental designs that call for the frequent, brief assessment of state boredom. For example, the measure may track state boredom over time, and help determine when a boredom induction "wears off" (i.e., the point at which mean boredom scores of different groups fail to significantly differ). Conversely, a researcher wishing to more fully explore and describe the experience of boredom would be better served with the full MSBS, as this version preserves all five factors of the state boredom experience that research has uncovered (Fahlman et al., 2011).

Participant Factors

The present paper and other emerging work suggest that participant factors should be taken into consideration when employing the MSBS. As discussed earlier, researchers wishing to examine gender differences with the MSBS may consider omitting item 2: in Study 1, men consistently scored more highly than women across all levels of response to this item. In addition, a recent paper (Ng, Eastwood, Liu, & Chen, 2014) investigating culture and boredom has suggested that the MSBS may need to be adapted for use in non-North American contexts. In this paper, 10 items (1, 5, 7, 12, 14, 19, 21, 23, 27, and 29) had to be eliminated to ensure that across the two samples used (European Canadians; Chinese) the MSBS was equivalent in factor structure and factor loadings, and that its individual items were invariant (European Canadians, Chinese; Ng et al., 2014).

All Boredom Manipulations are not Created Equal

Markey et al.'s (2014) work assessing the relative merit of a series of boredom inductions points to the fact that not all procedures designed to induce boredom do so equally. As these authors emphasize, use of standardized boredom inductions is an important next step in boredom research to improve the ability to generalize and compare across studies (Markey et al., 2014). Although not as extensive as Markey et al.'s (2014) research, our own findings here also speak to the potential variability across boredom inductions. As discussed previously Study 1's procedure is theoretically more intense than Study 2's. Consistent with this, a *t*-test found a significant difference in mean state boredom scores across manipulations among participants in the boredom conditions. Thus, given boredom was less intensely experienced in Study 2, it is perhaps not surprising that the MSBS provided lower classification rates in Study 2.

Limitations and New Directions for Boredom Research

The original article that presented the MSBS found that the MSBS was able to predict group membership (bored vs. not-bored) over and above negative affect (Fahlman et al., 2011). On the one hand, it might be considered a virtue that the MSBS predicted group membership over and above a broad concept like negative affect. On the other hand, it might be useful to know to what extent the MSBS is able to predict membership and classify participants when specific mood states are included in the statistical analyses. Furthermore, the present findings highlight how different kinds of boredom manipulations may give rise to different experiences and patterns of MSBS scores; thus, continued work is needed to validate a short form version of the MSBS with more and more diverse boredom manipulations. Finally, continued work on establishing the cultural invariance of the MSBS is needed.

Consistent with prior recommendations (Malkovsky et al., 2012; Mercer-Lynn et al., 2013; Vodanovich, 2003), we further advise that researchers consider incorporating validated measures of state boredom into studies examining trait boredom. As an example, empirical work exists on trait boredom and trait anger (e.g., Dahlen, Martin, Ragan, & Kuhlman, 2004; Mercer-Lynn et al., 2013), and on state boredom and state anger (van Tilburg & Igou, 2011b). However, no research to date has examined state and trait boredom's relative contribution to and/or interaction in the experiences of state and trait anger. Given the ubiquity of state boredom, determining the degree to which state

boredom might be involved in these and other effects is critical.

As a final note, we wish to emphasize that although investigation of van Tilburg and Igou's (2011a) and Todman's (2013) measures was beyond the scope of this study, future development and examination of these measures are encouraged. Since all three instruments map state boredom from a slightly different perspective, each will have a unique contribution to make to the field.

Conclusion

The current study presents further validation of the Multidimensional State Boredom Scale in hopes of inspiring future research on state boredom: across two different boredom manipulations, the MSBS was found to be accurate in classifying participants into bored and not-bored groups. Further, Study 1 found that responses to all items except one were invariant across gender. A set of eight items comprised of the seven items that provided unique discriminative ability across the two studies and an additional item added for theoretical reasons, was proposed as a potential short form. In addition, the present results cast light on which aspects of the boredom experience may be particularly important for classifying bored individuals (Disengagement, Inattention, Time Perception), and which may not (High Arousal Negative Affect, Low Arousal Negative Affect). The present findings also provoke important thought on the issue of boredom inductions' varying effects. We expect that the MSBS and the MSBS-8 will prove useful to researchers setting out to study boredom.

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References

Abramson, E. E., & Stinson, S. G. (1977). Boredom and eating in obese and non-obese individuals. *Addictive Behaviors, 2*, 181–185.

Ben-Zeev, D., Young, M. A., & Depp, C. A. (2012). Real-time predictors of suicidal ideation: Mobile assessment of hospitalized depressed patients. *Psychiatry Research, 197*, 55–59.

Choi, S. W., Gibbons, L. E., & Crane, P. K. (2011). Lordif: An R package for detecting differential item functioning using iterative hybrid ordinal logistic regression/item response theory and monte carlo simulations. *Journal of Statistical Software, 39*(8), 1–30.

Dahlen, E. R., Martin, R. C., Ragan, K., & Kuhlman, M. M. (2004). Boredom proneness in anger and aggression: Effects of impulsiveness and sensation seeking. *Personality and Individual Differences, 37*, 1615–1627.

Damrad-Frye, R., & Laird, J. D. (1989). The experience of boredom: The role of the self-perception of attention. *Journal of Personality and Social Psychology, 57*, 315–320.

Danckert, J. A., & Allman, A.-A. A. (2005). Time flies when you're having fun: Temporal estimation and the experience of boredom. *Brain and Cognition, 59*, 236–245.

de Bont J. (Director). (1994). *Speed [Motion picture]*. CA, USA: Twentieth Century Fox.

Eastwood, J. D., Cavaliere, C., Fahlman, S. A., & Eastwood, A. E. (2007). A desire for desires: Boredom and its relation to alexithymia. *Personality and Individual Differences, 42*, 1035–1045.

Eastwood, J. D., Frischen, A., Fenske, M. J., & Smilek, D. (2012). The unengaged mind: Defining boredom in terms of attention. *Perspectives on Psychological Science, 7*, 482–495.

Fahlman, S. A., Mercer, K. B., Gaskovski, P., Eastwood, A. E., & Eastwood, J. D. (2009). Does a lack of life meaning cause boredom? Results from psychometric, longitudinal, and experimental analyses. *Journal of Social and Clinical Psychology, 28*, 307–340.

Fahlman, S. A., Mercer-Lynn, K. B., Flora, D. B., & Eastwood, J. D. (2011). Development and validation of the Multidimensional State Boredom Scale (MSBS). *Assessment*. Q3 Published online September 8, doi: 10.1177/1073191111421303

Frankl, V. E. (1962). *Man's search for meaning* (2nd ed.). New York, NY: Simon & Schuster.

Goldberg, Y. K., Eastwood, J. D., Laguardia, J., & Danckert, J. (2011). Boredom: An emotional experience distinct from apathy, anhedonia, or depression. *Journal of Social and Clinical Psychology, 30*, 647–666.

Goor, D. J., Schur, M. (Writers), Lord, P., & Miller, C. (Directors) (2013). Pilot [Television series episode.] In D. J. Goor, C. Miller, D. Miner, P. Lord, & M. Schur (Executive producers), *Brooklyn Nine-Nine*. New York, NY: Fox Broadcasting.

London, H., & Monello, L. (1974). Cognitive manipulation of boredom. In H. London & R. Nisbett (Eds.), *Thought and feeling* (pp. 44–59). Chicago, IL: Aldine.

Malkovsky, E., Merrifield, C., Goldberg, Y., & Danckert, J. (2012). Exploring the relationship between boredom and sustained attention. *Experimental Brain Research, 221*, 59–67.

Markey, A., Chin, A., VanEpps, E. M., & Loewenstein, G. (2014). Identifying a reliable boredom induction. *Perceptual and Motor Skills, 119*, 237–253.

Matthies, S., Philipsen, A., & Svaldi, J. (2012). Risky decision making in adults with ADHD. *Journal of Behavior Therapy and Experimental Psychiatry, 43*, 938–946.

Mercer-Lynn, K. B., Bar, R. J., & Eastwood, J. D. (2014). Q4 Causes of boredom: The person, the situation, or both? *Personality and Individual Differences, 56*, 122–126.

Mercer-Lynn, K. B., Hunter, J. A., & Eastwood, J. D. (2013). Is trait boredom redundant? *Journal of Social and Clinical Psychology, 32*, 897–916.

Merrifield, C., & Danckert, J. (2013). Characterizing the psychophysiological signature of boredom. *Experimental Brain Research*. Published online November 8, doi: 10.1007/s00221-013-3755-2

Ng, A. H., Eastwood, J. D., Liu, Y., & Chen, J. (2014). *Culture and state boredom: A comparison between European Canadians and Chinese*. Manuscript submitted for publication.

Rose, J., & McDermott, R. (Video tape cochairs) (1998). *SIG-GRAPH 98: Computer graphics conference proceedings video tape [Video recording]*. New York, NY: ACM SIGGRAPH.

Scerbo, M. W. (1998). What's so boring about vigilance? In R. R. Hoffman, M. F. Sherrick, & J. S. Warm (Eds.), *Viewing Psychology as a whole: The integrative science of William N. Dember* (pp. 145–166). Washington, DC: American Psychological Association.

Studak, C. M., & Workman, J. E. (2006). Fashion groups, gender, and boredom proneness. *International Journal of Consumer Studies, 28*, 66–74.

Swaminathan, H., & Rogers, H. J. (1990). Detecting differential item functioning using logistic regression procedures. *Journal of Educational Measurement, 27*, 361–370.

Todman, M. (2013). The dimensions of state boredom: Frequency, duration, unpleasantness, consequences and causal attributions. *Educational Research International, 1*, 32–40.

Troutwine, R., & O'Neal, E. D. (1981). Volition, performance of a boring task, and time estimation. *Perceptual and Motor Skills, 52*, 865–866.

van Tilburg, W. A. P., & Igou, E. R. (2011a). On boredom: Lack of challenge and meaning as distinct boredom experiences. *Motivation and Emotion*. Published online July 1, doi: 10.1007/s11031-011-9234-9

van Tilburg, W. A. P., & Igou, E. R. (2011b). On boredom and social identity: A pragmatic meaning-regulation approach. *Personality and Social Psychology Bulletin*. Published online August 15, doi: 10.1177/0146167211418530

Video Tutor, Inc. (1995). *Easy English: Using numbers and money [DVD]*. Manasquan NJ: Author.

Vodanovich, S. J. (2003). Psychometric measures of boredom: A review of the literature. *Journal of Psychology, 137*, 569–596.

Zumbo, B. D. (1999). *A Handbook on the theory and methods of differential item functioning (DIF): Logistic regression modeling as a unitary framework for binary and Likert-type (ordinal) item scores*. Ottawa, ON: Directorate of Human Resources Research and Evaluation, Department of National Defense. Retrieved from http://www.educ.ubc.ca/faculty/zumbo/DIF/handbook.pdf

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Appendix

MSBS Items

Item Number	Item
Disengagement Factor	
2	I am stuck in a situation that I feel is irrelevant.
7	Everything seems repetitive and routine to me.
9	*I seem to be forced to do things that have no value to me.
10	*I feel bored.
13	I am indecisive or unsure of what to do next.
17	I want to do something fun, but nothing appeals to me.
19	I wish I was doing something more exciting.
22	*I am wasting time that would be better spent on something else.
24	*I want something to happen but I'm not sure what.
28	*I feel like I'm sitting around waiting for something to happen.
High arousal negative affect factor	
5	Everything seems to be irritating me right now.
12	I am more moody than usual.
14	I feel agitated.
21	I am impatient right now.
27	I am annoyed with the people around me.
Inattention factor	
3	*I am easily distracted.
16	It is difficult to focus my attention.
20	My attention span is shorter than usual.
23	*My mind is wandering.
Low arousal negative affect factor	
4	I am lonely.
8	I feel down.
15	I feel empty.
25	I feel cut off from the rest of the world.
29	It seems like there's no one around for me to talk to.
Time perception factor	
1	*Time is passing by slower than usual.
6	I wish time would go by faster.
11	Time is dragging on.
18	Time is moving very slowly.
26	Right now it seems like time is passing slowly.

Note. Items comprising the short form (MSBS-8) are denoted with an asterisk.

