Personality and Individual Differences 88 (2016) 225–229

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Overstating the effect of mindfulness on motivated perception: Comment on Adair and Fredrickson (2015)☆

Carol A. Nickerson [a,*], Nicholas J. L. Brown [b]

[a] 203 North Lynn Street #35, Champaign, IL 61820-3969, USA
[b] Department of Health Sciences, University Medical Center, University of Groningen, 9713 GZ Groningen, the Netherlands

ARTICLE INFO

Article history:
Received 10 June 2015
Received in revised form 21 August 2015
Accepted 31 August 2015
Available online 25 September 2015

Keywords:
Attention
Comment
Motivated perception
State mindfulness
Trait mindfulness

ABSTRACT

A recent article by Adair and Fredrickson (2015) concluded that both trait mindfulness and state mindfulness significantly predicted reduced motivated perception, and that these predictions were "strengthened" when participants who noticed the ambiguity of an image were excluded from the analyses and when mood was controlled. A comparison of the article with Adair's (2013) master's thesis, on which the article was based, reveals that Adair and Fredrickson (2015) have overstated their findings by (a) selecting without justification one of the two available methods of determining whether the ambiguity of the image was noticed, (b) inappropriately using one-tailed *p*-values, and (c) including in the analyses without theoretical justification a new predictor—mood—that resulted in a statistical suppression situation.

1. Introduction

A recent article by Adair and Fredrickson (2015) concluded that both state mindfulness and trait mindfulness significantly predicted reduced motivated perception,[1] and that these predictions were "strengthened" when participants who noticed the ambiguity of an image were excluded from the analyses and when mood was controlled. Although not stated in the article, the study reported by Adair and Fredrickson (2015) is clearly based on the first of three studies included in Adair's (2013, pp. 10–19, 54–55) master's thesis. A comparison of the study as described in the thesis and the study as described in the article reveals that Adair and Fredrickson (2015) appear to have overstated their findings as a result of "p-hacking," which "occurs when researchers try out several statistical analyses and/or data eligibility specifications and then selectively report those that produce significant results" (Head, Holman, Lanfear, Kahn, & Jennions, 2015, p. 1; see also Simonsohn, Nelson, & Simmons, 2014). Specifically, (a) the study in the thesis explored two different methods of determining whether participants noticed the ambiguity of the image presented to them, whereas the study in the article selected just one method and did not mention the other; (b) the study in the thesis used two-tailed *p*-values, whereas the study in the article used one-tailed *p*-values for the primary analyses; and (c) the study in the article included mood as a control variable in the analyses, which resulted in a statistical suppression situation that increased the magnitudes of the logistic regression coefficients, whereas the study in the thesis made no mention of mood. We first present the details of the study as described in the thesis, next present the details of the study as described in the article, and then discuss these three specific issues.

2. Adair's (2013) master's thesis

2.1. Tasks

Each of the 160 participants was told that a computer program would assign him or her at random to either a pleasant or an unpleasant task, identifying that assignment by flashing either a number or a letter on the computer screen. The pleasant task was described as watching a video clip of a comedian; the unpleasant task was described as solving mathematics and logic problems. Half of the participants were told that seeing a number meant assignment to the pleasant task and seeing a letter meant assignment to the unpleasant task; the other half of the participants were told the reverse.

Participants then completed the following tasks:

(a) Each participant was presented with an ambiguous image that could be interpreted either as the capital letter "B" or as the number "13," and asked to report whether he or she had

☆ Preparation of this article was not supported by any public or private funding.
* Corresponding author.
E-mail addresses: cnickers0202@gmail.com (C.A. Nickerson), nick.brown@free.fr (N.J.L. Brown).

[1] By "reduced motivated perception," Adair (2013) and Adair and Fredrickson (2015) meant fewer participants exhibiting motivated perception, not each participant (or the average participant) exhibiting a reduction of motivated perception.

http://dx.doi.org/10.1016/j.paid.2015.08.055
0191-8869/

seen a letter or a number.
(b) Each participant was asked to indicate to which task he or she hoped to be assigned.
(c) Each participant completed an instrument assessing trait mindfulness.
(d) Each participant completed an instrument assessing state mindfulness.
(e) Each participant answered three questions (p. 13):

(1). "What was the point of the letter or number that flashed earlier?" (open-ended response)
(2). "What do you think was the point of the study?" (open-ended response)
(3). "At any point did you notice that the number/letter that flashed earlier could be interpreted as a 'B' or a '13'?" (no/yes response)

2.2. Analyses

A participant was coded as showing motivated perception if he or she reported seeing the image that would lead to his or her being assigned to the task to which he or she hoped to be assigned. Eighty-eight of the 155 eligible participants (57%) showed motivated perception (Table 1, p. 54). Adair (2013) stated that the motivated-perception paradigm depends on the ambiguity of the image being unrecognized, but 74 of the 155 (48%) participants responded "yes" to question 3 when asked whether they had noticed that the image could be interpreted as a "B" or a "13" (Table 1, p. 54). Rather than excluding participants who stated that they had noticed the ambiguity of the image (as had Balcetis & Dunning, 2006, in their study of motivated perception using a similar image), Adair (2013) included in her primary analyses a dichotomous predictor indicating whether the ambiguity of the image was noticed.

In a binary logistic regression, motivated perception was regressed on trait mindfulness (centered), whether the ambiguity of the image was noticed (no = 0, yes = 1), and the interaction of these two predictors. Adair (2013) reported a "marginally significant" main effect of noticing ambiguity ($b = -.642$, $n = 155$, $p = .052$, two-tailed), no significant main effect of trait mindfulness ($b = -.564$, $n = 155$, $p = .242$, two-tailed), and no significant interaction effect of these two predictors ($b = .810$, $n = 155$, $p = .220$, two-tailed) on motivated perception.[2] An analogous analysis was performed substituting state mindfulness for trait mindfulness. Adair (2013) reported a significant main effect of noticing ambiguity ($b = -.721$, $n = 155$, $p = .035$, two-tailed), a significant main effect of state mindfulness ($b = -.668$, $n = 155$, $p = .045$, two-tailed),[3] and a significant interaction effect of these two predictors ($b = .825$, $n = 155$, $p = .044$, two-tailed) on motivated perception. For participants who did not notice the ambiguity of the image, state mindfulness predicted motivated perception ($b = -.67$, $n = 81$, $p = .04$, two-tailed); for participants who did notice the ambiguity of the image, state mindfulness did not predict motivated perception ($b = .16$, $n = 74$, $p = .51$, two-tailed). Note that Adair's (2013) characterization of the effects of trait mindfulness and state mindfulness on motivated perception as "main effects" in these analyses was not correct. These effects were not main effects but simple effects, indicating the effect of mindfulness on motivated perception for the noticed-ambiguity value of zero, that is, for the participants who did not notice the ambiguity.[4]

In a subsequent analysis appearing in the discussion of her first study, Adair (2013) replaced the noticed-ambiguity predictor based on responses to the direct no/yes question (question 3) with a predictor based on responses to the two indirect open-ended questions (questions 1 and 2). A coder categorized responses to these two questions based on whether participants spontaneously mentioned noticing the ambiguity of the image; 12 participants were coded as having noticed the ambiguity. When these participants were excluded from the analysis, and state mindfulness was regressed on motivated perception, there was no significant effect of state mindfulness ($b = -.336$, $n = 148$, $p = .078$, two-tailed), although Adair (2013) considered this effect to be "marginally significant" and to bolster the conclusion from the earlier analysis that state mindfulness was related to reduced motivated perception. An analogous analysis for trait mindfulness was either not conducted or its results not reported; if conducted, presumably it did not find a significant effect of trait mindfulness.

3. Adair and Fredrickson's (2015) article

3.1. Tasks

Adair and Fredrickson's (2015) description of the study differed from that of Adair (2013) in several ways. First, Adair and Fredrickson (2015) reported a sample size of 161 rather than 160. This difference is not important in and of itself and does not indicate that two different samples of participants were used; the sample descriptions were virtually identical in the thesis and the article. Second, Adair and Fredrickson (2015) indicated that they performed a manipulation check after task (a); the omission of this manipulation check from Adair (2013) is inconsequential for our purposes. Third, following this manipulation check, the pleasantness of the participant's mood was assessed, and this self-rating of mood was used in Adair and Fredrickson's (2015) analyses. Adair (2013) made no mention of mood. Finally, Adair and Fredrickson (2015) made no mention of question 3 asking participants whether they had noticed that the number/letter that flashed could be interpreted as a "B" or a "13"; only the two questions requiring open-ended responses were described.

3.2. Analyses

Adair and Fredrickson (2015) omitted Adair's (2013) two binary logistic regressions predicting motivated perception from (trait or state)

[2] Adair (2013) reported regression coefficients using β, perhaps having misinterpreted the capital "B" in the SPSS output as beta, the standardized regression coefficient, whereas in fact "B" is in log-odds units. We have substituted b for Adair's (2013) β.

[3] Adair (2013) reported that the b coefficient for state mindfulness equaled −.688 (p. 16, l. 12). This seems to have been a typographical error. Elsewhere in the thesis, this same coefficient was reported as −.668 (p. 15, fn. 3) and as (rounded) −.67 (p. 16, l. 17).

[4] In moderated regression (regression with an interaction or product term), be it ordinary least squares or logistic, the effect of each predictor is computed at the value of zero for the other predictor, not at its mean value, unless both predictors have been centered. Adair's (2013) analyses centered only the trait-mindfulness and the state-mindfulness predictors; the predictor indicating whether ambiguity was noticed was not centered. Thus, the effect of trait mindfulness or state mindfulness was not a main effect, but a simple effect indicating the effect of mindfulness on motivated perception for the noticed-ambiguity value of zero, that is, for the participants who did not notice the ambiguity. That is why Adair's (2013, fn. 3) supplementary analysis of the effect of trait mindfulness and of state mindfulness for only those participants who did not notice the ambiguity gave exactly the same results as the moderated regression for the effect of trait mindfulness ($b = -.564$, $n = 81$, $p = .242$, two-tailed) and the effect of state mindfulness ($b = -.668$, $n = 81$, $p = .045$, two-tailed) on motivated perception. If a main effect for a mindfulness predictor was desired, then the noticed-ambiguity predictor should have been centered also. Strictly speaking, this would not yield a main effect but a weighted-average simple effect, but that is usually close enough (Aiken & West, 1991, ch. 2–3). Adair's (2013) misunderstanding of moderated regression meant that the interpretation of the interaction for the effect of state mindfulness on motivated perception for the participants who did not notice the ambiguity merely repeated the result of the "main effect" in the moderated regression (although rounded to $b = -.67$, $n = 81$, $p = .04$, two-tailed). To obtain a result akin to a main effect, mindfulness should have been centered; to interpret the interaction, mindfulness could have been coded as no = 0, yes = 1, and then reverse-coded as no = 1, yes = 0, giving the same results as Adair (2013) obtained by performing separate analyses for participants who did not, and did, notice the ambiguity of the displayed image, respectively.