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Gray's Behavioural Inhibition System as a mediator of mindfulness towards well-being

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ABSTRACT

The objective of the study was to test whether Gray's "Behavioural Inhibition System" (BIS) is a pathway from mindfulness towards well-being in a cross-sectional and correlational design, using online data collection. We administered the Freiburg Mindfulness Inventory (FMI) and the Kentucky Inventory of Mindfulness Skills (KIMS) to a non-clinical sample of German adults ($n = 211$). BIS was measured using the Action Regulation Emotion System Questionnaire (ARES), and well-being was measured using a compound variable consisting of the Marburg Habitual Well-being Scale (MHW) along with two subscales of the Questionnaire of General Habitual Well-Being (FAHW). We analysed two mediator models with the FMI or KIMS as independent variables, respectively. In both models, BIS was modelled as a mediator, and well-being served as the dependent variable. The total effect of mindfulness on well-being was found to be strong for both models. Also, the effect of mindfulness on the proposed mediator BIS was substantial, as was the effect of BIS on well-being. The study demonstrates that BIS can partially explain the pathway between mindfulness and well-being, suggesting that BIS may be a mediator of the effects of mindfulness.

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1. Introduction

Mindfulness can be defined as a state of mind that allows focusing on the present moment with a non-judgemental or accepting attitude, embracing a warm and friendly openness and curiosity (Kabat-Zinn, 2005). It can be contrasted with states of mind where attention is focused elsewhere, including preoccupation with the past or future, and behaving automatically without awareness of one' action (Brown & Ryan, 2003). In recent years there has been a substantial clinical interest, and hence increasing ambition, to study elements of mindfulness free from cultural or religious influence (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). A growing body of studies show that mindfulness training enhances health indicators relevant to a diverse set of clinical symptoms and different populations (Grossman, Niemann, Schmidt, & Walach, 2004). The field of interest within mindfulness research has extended from conceptual and measurement questions to identifying possible mechanisms of actions of mindfulness. Correspondingly, the crucial question is which psychological processes mediate the effects of mindfulness relevant for well-being?

1.1. Existing mediation models of mindfulness

The first models explaining how mindfulness conveys its seemingly beneficial effects for health have already emerged (Ivanovski & Malhi, 2007). One of the most prominent models is the reperceiving model, proposed by Shapiro, Carlson, Astin, and Freedman (2006). The authors define reperceiving as a shift in perspective leading to a more detached sense of self, thereby also inducing secondary beneficial mechanisms of change such as clarification of personal values and better self-regulation. This model is a promising candidate in so far as it is able to explain several effects of mindfulness training including self-concept dynamisation, more positive emotions, and increased openness towards unwanted personal experiences. However, the model is still somewhat unsatisfactory in regard to its ability to explain how reperceiving and the proposed secondary mechanisms actually act on each other. Additionally, data stemming from validation studies have only partly corroborated the model (Carmody, Baer, Lykins, & Olendzki, 2009).

In summation, existing models suffer from a lack of neurobiological evidence in addition to a lack of an obvious connection to

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the theoretical underpinnings of mindfulness (i.e., Buddhist theory of mind; De Silva, 2001). This is undesirable as new models should not only build on previous research in the area of interest, but also be compatible with findings from other research fields.

1.2. Gray's "Behavioural Inhibition System" (BIS)

Buddhist philosophy as the theoretical background of mindfulness claims that aversive emotions are based on a mental process called "sankhara" (De Silva, 2001). This process can be understood as dissatisfaction with a present state of affairs; it expresses a defensive "I don't want that!" response of the individual reflected by emotional-motivational (and ultimately behavioural) responses. Mindfulness is believed to weaken the intensity of the sankhara process, thereby reducing defensive motivation and, ultimately, related aversive emotions.

We propose that the "sankhara" reactions towards aversive stimuli may be understood in psychological terms on the basis of Gray's model of the "Behavioural Inhibition System" (BIS). Gray (1994) suggested that this system, together with the "Fight-Flight-Freeze System" (FFFS) and the "Behavioural Activation System" (BAS), control the sensitivity of an individual towards signals of punishment (BIS, FFFS) and gratification (BAS), and hence also influences the propensity of an approach or avoidance motivation (for a review and new developments see Corr, 2008). Although in recent reconceptualisations FFFS alone is now responsible for mediating reactions to aversive stimuli, existing scales still do not as yet capture this change. Hence, we refer to the BIS original concept (Corr, 2004).

A substantial amount of research builds on this model, linking it to health criteria, psychopharmacology, and neurobiology (Fowles, 1980). These findings suggest that BIS plays a central role in the development of psychopathology, e.g., anxiety (Harmon-Jones, 2003).

We believe that BIS is a promising candidate as a mediator variable conveying the pathways between mindfulness and well-being. BIS builds on a large basis of well-accepted literature and fits into the existing research body, as it has been shown that mindfulness has a relieving influence on BIS-related negative emotions such as anxiety (Evans et al., 2008).

Gray (2004) proposed a hypothetical mental function, the "comparator" that distils conscious experience out of the flux of unconsciously processed data. In essence, this comparator examines the deviation of sensory data from expected and desired states – deviations and salient feedback for ongoing behaviour become, as a consequence, conscious. Such experience may indicate the presence of potential punishment stimuli – the basis for BIS behaviour. Hence, this comparator instance may be a conceptual link between consciousness and emotional reactions. Moreover, Buddhist psychology also states that the basis for emotional reactions is a comparator like process called "sanna" (De Silva, 2001). Hence, there is a substantial conceptual overlap between Buddhist psychology and Gray's model.

1.3. Aims and hypotheses

The present study aims at testing whether BIS mediates the effects of mindfulness on well-being. Fig. 1 depicts the proposed mediation model. We hypothesise that mindfulness (1) has a positive total effect on well-being, and (2) also exerts an indirect effect on well-being conveyed by the ability of mindfulness to diminish BIS, as a consequence thereby also reducing the negative effect of BIS on well-being. This model was tested using the method of Baron and Kenny (1986). Furthermore, if BIS acts as a mediator in the proposed way, group comparisons should reveal that mindfulness practitioners demonstrate higher levels of mindfulness and well-being but lower levels of BIS, compared to non-practitioners.

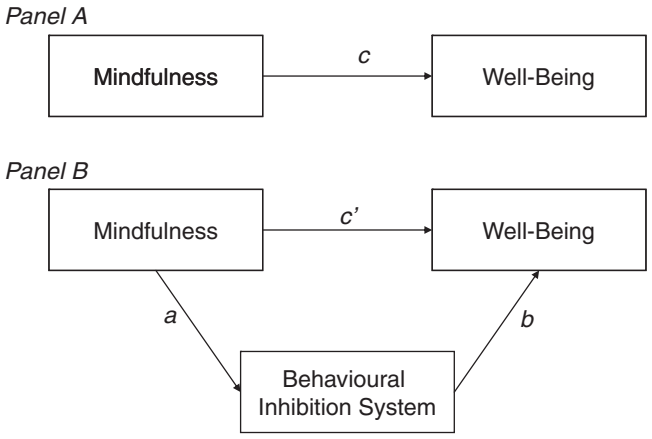

Fig. 1. Mediation model. Panel A: Illustration of total effect (path *c*). Panel B: Illustration of mediation effect; mindfulness affects well-being directly (path *c'*) and indirectly through the Behavioural Inhibition System (path *ab*).

2. Method

2.1. Sample

A questionnaire battery consisting of the measurement instruments described below was presented on a German internet research portal for mindfulness research from November 2006 to February 2007 (www.mindfulness-research.net; see procedure below). Inclusion criteria were age of 18 or older, and agreement to the informed consent and instructions. Both individuals with and without prior experience of mindfulness were explicitly addressed as participants. The sample consisted of $N = 221$ non-clinical individuals, 71% ($N = 157$) of whom were women. The mean age was 36.0 years (SD = 10.0). Forty-four percent of the subjects ($N = 97$) practiced some form of mindfulness training on a regular basis (e.g., meditation). Forty-two percent ($N = 92$) were private sector employees, 24% ($N = 52$) were students, 21% ($N = 46$) were self-employed, 3% ($N = 7$) were public sector employees, 2% ($N = 5$) were unemployed, and 9% ($N = 19$) were in unspecified employment. All participants were German.

2.2. Procedure and design

Participants were asked to answer the online questionnaire battery during a quiet moment. In order to control for multiple data submission, we checked the IP and email addresses of the questionnaires that were electronically returned. Furthermore, at the end of the questionnaire battery we confirmed with the participants that they had adhered to the instructions and had completed the questionnaires once only. There was no personal communication with the participants. Four participants were excluded as they failed to fulfil these requirements. To attract a variety of participants, the study was advertised on different websites such as student union boards, chat rooms, as well as on websites related to health and psychotherapy. To avoid self-selection bias, participants were awarded with benefits that could be seen as attractive to people with and without an interest to mindfulness. Reward consisted of course credits for psychology students, a feedback of individual mindfulness and well-being scores, and participation in a prize draw for a pocket computer. Ethical approval was obtained by our institutions' respective review boards. The design was correlational and cross-sectional.

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