Fresenius University

Department of Business & Media Degree

programme: Applied Psychology Place of

study: Düsseldorf

Short pause, big effect?

Effects of a mindfulness-based brief intervention on interoceptive awareness.

Approved BACHELORARBEIT for

the attainment of the academic degree

Bachelor of Science (B.Sc.)

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Submission date: 17.06.2019

Summary

This empirical research examines the effects of a mindfulness-based brief intervention on interoceptive awareness. Furthermore, the influence of intentional attention and the effect of the meditation position during the mindfulness-based brief intervention on interoceptive awareness was examined. Finally, the question of whether there is a significant difference in interoceptive awareness between meditation practitioners and non-meditation practitioners was investigated.

A self-created 20-minute mindfulness meditation was used as an intervention tool between one and four consecutive days. Interoceptive awareness was assessed daily using the validated *Multidimensional Assessment of Interoceptive Awareness* (*MAIA*) questionnaire. In the course of the mindfulness-based brief intervention, the total sample size was reduced from $N=182$ to $N=125$ participants. By observing the trends of the individual measured values, the entire sample size of all measurement periods could be used for the data evaluation.

The statistical findings showed that interoceptive awareness is significantly improved by the mindfulness-based brief intervention. It became clear that the intentional directing of attention to the mindfulness-based brief intervention had a significant positive influence on interoceptive awareness. The fact that sitting meditation positions in the mindfulness-based brief intervention have a significantly stronger positive effect on interoceptive awareness than lying, standing or walking meditation positions was partially confirmed. Complementary cross-sectional findings proved that non-meditation-experienced people achieve significantly higher values of interoceptive awareness than meditation-experienced people. In accordance with current research results, these findings also point to the subjectivity of interoceptive consciousness processes. Due to the significantly positive effect of the mindfulness-based brief intervention on interoceptive awareness, it can serve as a starting point for clinical and empirical use.

Abstract

This empirical research project examines the effects of a mindfulness-based brief intervention on the interoceptive awareness. Also the influence of intentional attention and the effect of the position during the meditation on the interoceptive awareness were checked. Additionally it was analysed whether there is a significant difference of the interoceptive awareness between people with and without meditation experience.

As a means of intervention a self-created 20-minutes mindfulness meditation practice was used during the time of one to four days. Thereby the interoceptive awareness was assessed with the validated questionnaire *Multidimensional Assessment of Interoceptive Awareness* (*MAIA*) on a daily basis. During the course of the brief mindfulness-based brief intervention the number of trial participants decreased from *N=182* to *N=125*. Due to the trend analysis of individually measured values the entire sample size of measurements could be used for data interpretation.

The statistical results showed that interoceptive awareness improves significantly through the mindfulness-based practice. It became apparent that the intentional attention steering of the mindfulness-based practice has a significant positive influence on the interoceptive awareness. Only partially observed was that a sitting meditation posi- tion during the practice had a significant positive effect on the interoceptive awareness than lying, standing or walking while meditating. Additional interdisciplinary findings showed that participants without meditation experience reached significantly higher measured values of interoceptive awareness than participants with previous meditation experience. Consistent with current empirical research results, these findings refer to the subjectiveness of the interoceptive awareness processes. Due to the significant positive effects of the mindfulness-based brief intervention on the interoceptive awareness, it can serve as a starting base for clinical and empirical application.

Acknowledgement

Whether I firmly believed in myself and my intentions or not, I was always right. Once my self became the mirror of intention and aligned with its frequency, growth emerged. I am infinitely grateful for this journey of self and manifestation that I am allowed to publish through this work.

At this point I would like to thank all those who have supported me on this journey and in the process of writing this bachelor thesis. Without the unconditional support of my family, especially my parents, much of this would not have been possible. I would like to thank all my instructors and teachers who trained me to become a tantra and yoga teacher and therapist, and all the inspiring people I met along the way. A heartfelt thank you goes to Dr. Vedamurti Olaf Schönert (*Yoga Vidya Cologne*), who provided me with exciting contact data and supported me in many ways. Since then, Dr. Ulrich Ott, as a psychologist and meditation researcher, has become a great inspiration for me. Through his decisive recommendation of the survey instrument used in this research work, I found helpful contact with Dr. Wolf Mehling and Dr. Boris Bornemann. I would also like to thank Dr. Harald Piron for giving me access to his informative dissertation and other helpful information.

I would also like to thank them for their comprehensive support in the distribution of the study. In this regard, my thanks go in particular to *Yoga Vidya e.v.*, which has been supporting me holistically for several years. Consequently, I would like to thank all the participants of the study and their feedback that they have been able to intensify their connection to their own consciousness through this study. Finally, I would like to thank my supervisors and assessors, Dipl.-Psych. Lutz Kolburg and Dr. Thomas Seppelfrike, who were helpful to me during my psychology studies and in the writing process of this thesis.

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List of abbreviations

AVDependent variable

H Hypothesis

M Mean value

N Total sample size

n Sub-sample size

p probability value, significance level

Rho Rank correlation coefficient

SD Standard deviation

SPSS Statistical Package for the Social Sciences

t1 Measurement time 1

t2 Measurement time 2

t3 Measurement time 3

t4 Measurement time 3

UVIndependent variable

1 Introduction

This empirical research paper is about your *consciousness*! Although we all currently have free access to our own consciousness (Damasio, 2011), this phenomenon has been studied for millennia. Especially in the clinical con- text, states of consciousness are of relevance on a daily basis (Ritter & Hess, 1999). In this context, good *body awareness* has been accentuated as beneficial with regard to many health aspects. *Interoceptive awareness* as a dimension of the body awareness construct (Mehling, Price, Kerr & Silow 2012) is very important for many psychological functions (Bornemann, Herbert, Mehling & Singer 2015). Mindfulness-based interventions are increasingly used on a scientific basis to positively influence psychological functions (Michalak, Heidenreich & Bo hus, 2006; Sedlmeier, 2016; Vaitl, 2012; Williams & Kabat-Zinn, 2013).

Topics such as *consciousness*, *mindfulness* and *meditation* are no longer exotic (Ott, 2015). Meditation procedures have developed as a mindfulness-based intervention (Bornemann 2019, see appendix p. XI) from original religious and esoteric contexts into a recognised field of research (Ott, 2010; Vaitl, 2012). By establishing itself in clinical contexts, a change in perspective within modern medicine and psychotherapy can be noted (Shapiro & Carlson, 2011). Most mindfulness-based interventions are based on a comprehensive intervention programme in terms of both time and content. However, it has been empirically proven that even a short mindfulness-based intervention has a positive impact on various areas of psychological functioning (Zeidan, Johnson, Diamond, David & Goolkasian, 2010). Although the improvement of interoceptive awareness is of high importance from a health and clinical perspective (Mehling et al., 2012), the influence of interoceptive awareness was not investigated.

Short pause, big effect? This research project aims to close this relevant gap in consciousness research. For this purpose, it was empirically investigated whether interoceptive awareness can be significantly increased through a mindfulness-based brief intervention. In addition, the effect of intentional attention and the influence of the meditation position were examined. Finally, it was examined whether there was a significant difference in interoceptive awareness.

There is no difference in the level of awareness between people who have experienced meditation and those who have not.

The intention of this empirical work is not to attempt to integrate into science experiential states that go beyond the mind, such as consciousness, mindfulness and meditation (Ott, 2010; Tang, 2019). Rather, as these constructs defy language and categorisation (Ott, 2010), the aim is to empirically elucidate the astonishing effects in order to meaningfully promote the clinical use of mindfulness-based brief interventions. "It is irrelevant how much you know about an apple - only after you have eaten an apple will you know what it tastes like" (Tang, 2019, p.16). Furthermore, mindfulness meditation as a daily intervention should be made as user-friendly as possible for a large part of the population.

At the beginning of this research work, the theoretical foundations of interoceptive consciousness and meditation, including mindfulness meditation, will be explained. Subsequently, the current state of research as well as the derivation of the need for research will be cited. The main part of this research work comprises the derivation of the hypotheses, the presentation of the methodology as well as the results of the empirical study conducted. The final conclusion first summarises the relevant results and their interpretation. This is followed by a critical appraisal of the methodological approach, with recommendations for future studies. Finally, the findings of this research are assessed and implications for practice are suggested. For the sake of consistency, the generic feminine or, alternatively, the feminine is used throughout this research. These formulations equally include female, male or differently gendered persons.

2 Theoretical Basics

In the following, the theoretical background of this empirical research work is described. First, basic terminology, theories and models are presented in sections 2.1 and 2.2. Subsequently, the current state of research is examined in section 2.3. Based on the theoretical findings presented, section 2.4 concludes by justifying the theoretical relevance of this research.

2.1 Interoceptive Awareness

Probably no other mental phenomenon has such a high relevance for every individual human life and experience as consciousness. The hete- rogeneity of the concept of consciousness encompasses a multitude of multi-layered psychological components. In addition to psychological components, such as personal self-perception or attitudes to moral and political issues, the quality of sensory perceptions of external and internal stimuli also shapes individual states of consciousness. Due to this heterogeneity of the concept of consciousness and

"the private nature of states of consciousness" (Kiefer, 2016, p. 154), scientific research on consciousness is often criticised (Kiefer, 2016). Nevertheless, researchers have been dealing with the question of what constitutes consciousness for centuries (Ritter, Hess, 1999). Only by addressing individual subcomponents of consciousness can this multi-layered psychological phenomenon be made accessible (Ritter, Hess, 1999). In particular, body consciousness and interoceptive consciousness are frequently addressed in psychology, medicine, neuroscience and philosophy. One dimension of the body consciousness construct is interoceptive consciousness (Mehling et al. 2012).

2.1.1 History and definition

Body awareness can generally be described "as a mental assessment of one's own body, its movement and sensory abilities" (Schneider, Etzold, Collatz, Dick- huth, Berg & Korsten-Reck, 2004, n.d.). Since ancient times, humans have been influenced by the meaningful interaction of mental and physical processes (Bornemann, 2017). However, the development of the body consciousness construct has changed considerably in recent times. From an earlier health science and clinical perspective, the term body awareness was often defined negatively. Body awareness was used, for example, to describe anxiety and depression. The rapidly growing preoccupation with the topic in the literature illustrates the development towards a positive understanding of body awareness. The construct of mindfulness is integrated into the understanding of body awareness (Mehling et al., 2012). In the philosophical context, mindfulness is also seen as a special feature of body awareness (Leder, 1990; Varela, Thomson & Rosch, 1991). For a unified understanding of body consciousness, it is particularly important from a physiological, neuroscientific

In this context, it is advantageous from a biomedical point of view to distinguish between different dimensions of the construct, such as different forms of attention (Mehling et al., 2012).

As emphasised in the introduction, interoceptive consciousness is a dimension of the body consciousness construct. Like the understanding of body consciousness, interoceptive consciousness describes an interaction process between body and mind (Mehling et al., 2012). Consequently, definitions of interoceptive awareness overlap with definitions of body awareness (Ott, 2019, see Appendix p. XI). There are also different and contradictory definitions of interoceptive consciousness depending on the respective field of application, including language (Mehling et al. 2012).

The term *interoception* was introduced by Sherrington in 1906 (Sherring- ton, 1906) and has been described in some definitions by two different forms of perception: *viscero*ception and *proprioception* (Jones, 1994; Vaitl, 1996; Mehling et al., 2012). Visceral perception includes the *perception* of one's own organ activity, such as heartbeat, breathing and stomach activity (Mehling et al., 2012), including the accuracy (*interoceptive sensitivity*) and intensity of the perception (Herbert & Pallatos, 2008). These perceptual processes of internal body reactions are also described as *interoceptive sensitivity* (Bornemann et al., 2014; Critchley et al., 2004) and *interoceptive accuracy* (Bornemann, 2017; Bornemann et al., 2014). Proprioception refers to the physiological perception of muscles, tendons and joints (Ott, 2019, see Appendix p. XI; Mehling et al., 2012; Fahrenberg, n.d.; Truffer, 2017). However, most pro- perceptive perceptions remain unconscious (Mehling, 2019, see Appendix XII). Based on current neuroanatomical research, interoception describes a physiological perceptual process that is triggered exclusively by vegetative sensory nerve states (Cameron, 2002; Craig, 2002; Wiens, 2005). Accordingly, a neuroanatomical discrepancy between interoception and proprioception is assumed (Mehling et al., 2012).

Interoceptive awareness describes the conscious perception of visceral signals (Bornemann et al., 2015, Mehling et al., 2012). This conceptualisation has been expanded to include higher-order psychological processes (Bornemann et al., 2015; Cameron, 2001). According to this, interoceptive awareness is influenced by learned cognitions, emotions, prejudices and experiences (Bornemann et al.,

2015; Mehling et al. 2012). The subjectivity of bodily perceptions (Ceunen, Vlaeyen, Van Diest, 2016; Mehling et al. 2012) and the inclusion of visceral and somatic pain perception is particularly emphasised in the current literature (Bornemann, 2014; Mehling e al. 2012; Truffer, 2017). In summary, interoceptive awareness can be defined as the subjective perception of sensations from within the body, including attribution processes (Bornemann et al., 2015; Cameron, 2001; Craig, 2002; Mehling et al., 2009). Despite the incomplete knowledge of these consciousness processes, a clear increase in interest is noticeable (Tsakiris & Critchley, 2016).

2.1.2 Neuropsychological specialisation

The foundation of fundamental neuropsychological findings on interoception was laid by James and Lange (Herbert & Pallatos, 2008). Within a century, interoceptive awareness has developed into a multimodal construct of the central nervous system (Fahrenberg, n.d.; Mehling et al., 2012).

Interoceptive awareness as a visceral perceptual process (see chapter 2.1.1) describes the afferent connection from the position senses to the cortex (Critchley & Harrison, 2013; Craig, 2002). In the brain, a physiological signal is generated by the excitation of a sensory receptor (Cameron, 2002; Wiens, 2005). The functioning of the brain is influenced by the continuous feedback of afferent signals (Critchley & Harrison, 2013). Stimuli emanating from organs are transmitted to the brain via afferents of the autonomic and motor nervous system (Fahrenberg, n.d.). In this process, interoceptive information converges centrally via the blood flow and via cranial and spinal nerves (Critchley & Harrison, 2013) in the anterior island (Ott, 2019, see appendix p. XI). Neurological studies point to a connection between the perception of inner bodily sensations and brain activities in the somatotopic and anterior insula cortex (Mehling, 2012). "The somatotopic cortex forms a map of the body, primarily based on sensory cells in the skin (homunculus)" (Ott, 2019, see Appendix p. XI). Further neurological research points to a correlation of interoceptive awareness and the thickness of the anterior right insula cortex (Critchley, Wiens, Rotshtein, Öhman, Dolan, 2004; Lazar, Kerr, Was- serman, Gray, Greve, Treadway, et al., 2005). Numerous neurotransmitters are encoded via these brain regions in such a way that dynamic interaction and integration with efferen-

perceptual expectations and voluntary motor skills (Critchley & Harrison, 2013). As soon as the processing of the integration of sensory and neurological information into a physical state is represented in the central nervous system, we can speak of interoception (Craig 2002; Critchley & Harrison, 2013).

2.1.3 Theoretical implication and findings

The *James-Lange theory*, which describes emotions as a concomitant of internal bodily signals, "was introduced into the hallowed hours of academic psychology in the late 19th and early 20th centuries" (Herbert & Pollatos, 2008, p.1). The *two-factor theory of* Schachter and Singer (1962) further assumed that the prerequisite for the development of emotions is the perception of physical states of arousal. The *Somatic Marker Theory* by Damasio (1991) complements the James-Lange theory and clarifies visceral perceptual processes as crucial for emotion processing (Blair & Cipolotti, 2000; Damasio, 1994), decision-making (Bechara, Damasio, Tranel & Damasio, 1997; Bechara, Damasio, Tranel & Damasio, 1997; Bechara, Damasio, Tranel & Damasio, 1997; Bechara, Damasio & Damasio, 1994), and emotion processing. Damasio, 1997; Bechara, Dama- sio, Damasio & Lee 1999; Bechara, 2004; Bechara, Damasio & Damasio, 2000; Blair & Cipolotti, 2000; Damasio, 1994) and motivational behavioural processes (Damasio, 1994; Damasio, 1999). The importance of interoceptive sensitivity has also emerged for the emergence of emotions, emotion processing and behavioural processes (Herbert & Pallatos, 2008). This assumption has been confirmed by neurological findings (Craig, 2009, Critchley, 2003; Critchley 2005; Herbert, Pollatos & Schandry, 2007).

Although the majority of interoception remains unconscious (Mehling et al., 2012), further findings demonstrate its relevant importance for emotion (Dunn, Dalgleish, Ogilvie & Lawrence, 2007; Silani, Bird, Brindley, Singer, Frith & Frith, 2008; Wiens, 2005) and behaviour regulation (Adolphs et al., 2000; Ekman & Davidson, 1995; Herbert, Ulbrich & Schandry, 2007; Pollatos, Kirsch & Schandry, 2005). The influence of interoceptive perceptions on pain perception has also been demonstrated (Craig, 2003; Fahrenberg, n.d.; Flor, 2012; Mehling et al. 2012). In- teroception has been shown to be important for the development of a subjective sense of self (Berlucchi & Aglioti, 2010; Craig, 2002, Craig 2009; Critchley et al., 2004; Park & Tallon-Baudry, 2014; Varela, Thompson & Rosch, 1991), empathy (Bird, Silani, Brindley, White, Frith & Singer, 2010; Lamm & Singer, 2010; Singer, Critchley & Preuschoff

2009; Terasawa, Moriguchi, Tochizawa & Umeda 2014) and found to be relevant for decision-making (Dunn, Galton, Morgan, Evans, Oliver, Meyer et al., 2010; Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003). According to these findings, improving interoceptive awareness is of high importance from a health and clinical perspective (Bornemann et al., 2014; Herbert & Pollatos, 2008; Mehling et al. 2012).

2.1.4 Operationalisation

Aspects of interoceptive awareness can be assessed with objective and subjective assessment methods (Mehling et al., 2012; Bornemann et al., 2014). Objective behavioural tests have been increasingly developed and applied in recent years (Mehling et al., 2012). Mostly, the dimension of interoceptive awareness is measured, which is also defined as interoceptive accuracy (see chapter 2.1.1; Bornemann, 2017; Bornemann et al., 2014). Behavioural tests can ob- jectively measure an individual's ability to notice signals from within the body such as breathing (Davenport, Chan, Zhang & Chou, 2007), heartbeat (Brener & Jones, 1974; Whitehead, Drescher, Heiman & Blackwell, 1977; Schandry, 1981) or stomach activity (Herbert, Muth, Pollatos & Herbert, 2012). Subjective data collection methods such as questionnaires have the advantage of capturing interoceptive awareness more comprehensively. Whereas objective survey methods only measure one aspect of interoceptive awareness (noticing physical sensations), subjective survey methods can assess interoceptive awareness as a multidimensional structure (Mehling et al., 2012).

As described in chapter 2.1.1, interoceptive awareness is influenced by learned cognitions, emotions, biases and experiences (Mehling et al. 2012; Bornemann et al., 2015). However, many standardised questionnaires on body awareness, such as the *Body Awareness Questionnaire* (Shields, Mallory & Simon, 1989) or the *Private Body Consciousness Scale* (Miller, Murphy, Buss, 1981), only ask about individual dimensions of interoceptive awareness (Bornemann et al., 2015). Other standardised questionnaires disregard the need to separate subscales to measure multidimensional aspects of interoceptive awareness (Mehling, Gopisetty, Daubenmier, Price, Hecht & Stewart, 2009). Interoceptive awareness can be assessed multidimensionally by the *Multidimensional Assessment of Interoceptive Awareness* (*MAIA*) questionnaire. The *MAIA* with 32 items

comprises eight dimensions of interoceptive awareness (Mehling, 2012). Bornemann and Mehling (2012) define these dimensions as: *Noticing, Not-Distracting, Not-Caring, Attention-Regulation, Emotional Being, Self-Regulation, Listening to the Body* and *Trust*.

2.2 Meditation

Neuroscientific meditation research often describes interoceptive awareness "as a key element in meditation and stress reduction" (Mehling, 2012, n.d.). From a psychosomatic perspective, the interaction of mental and psychological processes is of great importance for the understanding and treatment of mental and physical illnesses (Astin, 2004; Kuyken et al., 2015; Mehling, Wrubel, Daubenmier, Priece, Kerr, Silow et al., 2011; Röhricht, Gallagher, Geuten & Hutto, 2012; Wahbeh, Elsas & Oken, 2008; Wolsko, Eisenberg, Davis & Phillips, 2004). Today, meditation techniques are used on a scientific basis to positively influence human functional areas such as emotions, cognitions and bodily sensations (Vaitl, 2012). Body awareness, including interoceptive awareness, can be significantly increased through meditation procedures (Bornemann et al., 2015; Hart, 1987; Kabat-Zinn, 1990; Mehling et al., 2012).

2.2.1 History and definition

The term *meditation is* derived from the Latin MEDITARI and can literally be translated as 'to reflect' or 'to ponder' (Vaitl, 2012). In the past ten years, 59 per cent more scientific publications on meditation research have appeared than in the previous forty years. Neuroscientific research on meditation has been growing rapidly, especially since 2010. Despite this, meditation is often exclusively associated with religion or esotericism (Vaitl, 2012; Ott, 2010). In fact, the origin of meditation is religious. Today, meditation is still practised in all major religions and in many cultures (Sedlmeier, 2016; Walsh & Shapiro, 2006). Different meditation methods are practised and embedded in a specific understanding of faith and spiritual context. However, the spiritual framework of a meditation practice does not rely on a personal god. Although *Buddha is* sometimes worshipped as a god, *Buddhism* exists without a belief in a god. Meditation practices of Buddhism, Hinduism and, in some forms of Taoism, Taoist meditation.

ism, are a central component of spiritual practice. In Islam, Christianity and Judaism, on the other hand, meditation practices are seen as a secondary component of religion (Sedlmeier, 2016).

Regardless of the respective use of meditation methods and their integration into a spiritual context, the essential goal is a "direct experience of reality" (Sedlmeier, 2016, p.45). This goal is often described as *enlightenment*, *realisation* or *salvation.* Once this goal has been achieved, the existence of a spiritual framework is no longer necessary. Even today, most meditation practices are embedded in a spiritual context. In recent decades, however, meditation methods have increasingly been practised that break away from spiritual approaches. These are used especially in clinical contexts and within clinical interventions in psychotherapies (Sedlmeier, 2016).

It may be due to the existence of different meditation practices that there is no uniformly accepted definition of *meditation* (Ott, 2010). Walsh and Shapiro published an attempted definition in 2006 that distinguishes meditation from other therapeutic interventions such as relaxation techniques (Vaitl, 2012): "The term meditation refers to a family of self-regulation practices that focus on training attention and awareness in order to bring mental processes under greater voluntary control and thereby foster general mental wellbeing and development and/or capacities, clarity, and concentration" (Walsh & Shapiro 2006, p. 228). This western approach focuses in particular on the goal of self-control. In contrast to classical relaxation methods, for example, the primary goal is not to change attention, but to restructure mental content and behaviour (Vaitl, 2012). Meditation expands one's awareness of perceptions of physical and mental processes. The ability to change physical and mental processes is particularly trained through meditation procedures (Ott, 2010).

There are two main groups of meditation methods. The first main group includes all meditation *methods with movement,* such as Tai Chi or Qigong. In meditation methods with movement, the physical dynamics are used as an anchor or as an object of concentration for meditation. The second group includes all meditation *methods without movement* (Ott, 2009; Scholz, 2003; Vaitl, 2012). Its use within scientific research and as a clinical intervention is mostly based on Buddhism or traditions of yoga (Ott, 2009). Motionless

Meditation methods in turn comprise two different groups, which differ from each other in their primary orientation. In addition to *concentrative meditation,* in which attention is focused exclusively on one object, there is also *mindfulness meditation* (Dunne & Davidson, 2008; Lutz, Slagter, Dunne, & Davidson, 2008; Ott, 2009; Rishi Vivekananda, 2017), which is examined in more detail in chapter 2.2.4.

2.2.2 Five characteristics of meditation

For the operationalisation of a meditation procedure, Cardoso, Souza, Ca- mano & Leite (2004) propose five teachable and learnable characteristics of meditation. These characteristics should be fulfilled in order to use meditation in scientific studies (Vaitl, 2012). The first characteristic, *Specific technique,* specifies that meditation must be designed around a definable set of behavioural instructions (Cardoson et al., 2004). For example, meditation can be focused on attention to internal or external processes (Vaitl, 2012). The second characteristic, *muscle relaxation,* describes that psychophysical relaxation must occur during meditation (Cardoson et al. 2004). This muscular relaxation is a prerequisite for the desired change in consciousness (Vait, 2012). The third characteristic, *logic relaxation,* states that meditation must lead to a state of mental relaxation. Meditation should not aim to analyse psychophysiological processes within the practice. Psychophysiological processes should not be intentionally assessed or create expectations. The fourth characteristic, the *self-induced state*, specifies that the technique of meditation must be mastered to the extent that it can be performed without guidance. A dependence on guided meditation should not be created. The fifth characteristic, the *self-focus state*, describes the regulation of attention through positive anchors, such as directing attention to the breath. Attention should not be directed to negative anchors such as worries that arise or the tendency to fall asleep (Cardoson et al. 2004).

2.2.3 Five depths of meditation

The degree of change in consciousness and the extent of depth of meditation during and after meditation determine the quality of a meditation process (Vaitl, 2012). According to Piron (2003), depth ranges can determine different states of consciousness.

of meditators. Christian, Buddhist, Hindu and Daoist works were examined, which cover different depths of meditation practice. Similar items of verbalised meditation experiences were arranged by means of cluster analysis. 40 interviewed meditation experts from different traditions were asked to assign a depth range between one and five to each item. Due to the highly significant agreement of the judgements with the assumed depth ranges, five clusters of different depths of awareness of medi- tation emerged (Piron, 2003; Piron, 2019, see Appendix pp. XII-XIII).

The first depth range of *obstacles* marks emerging physical and mental obstacles during meditation. Meditators with little or no experience of meditation may, for example, notice signs of restlessness, tiredness, boredom, difficulty concentrating and motivation during this phase. Characteristics of the second deep area of *relaxation* are muscular relaxation, regular breathing, inner peace and well-being. The third depth range is called the *personal self.* The distanced perception of emerging thoughts, inner peace and intuitive insight are characteristics of this phase (Piron, 2003; Vaitl, 2012). Piron characterises the fourth depth range as a process of deep *transpersonal qualities*. Energy perceptions, intuitions and the dissolution of the sense of time can be special features.

The fifth depth describes a deepest state of consciousness as the *transpersonal self*. Subject, object and the process of meditation merge and become one. Emotions and cognitions are no longer perceptible. Consciousness becomes empty and a feeling of limitless expansion arises (Piron, 2003; Vaitl, 2012).

Patanjali, one of the best-known Indian scholars, also described the different phases of consciousness in meditation more than 2500 years ago. In his philosophical work, the *Yogasutras,* he describes the entry into *Diana,* the actual state of meditation, after mastering individual states of consciousness (Rishi Vivekananda, 2017; Woods, 1914). Although according to Piron a phasic transition of the depth domains would be a logical conclusion, this hypothesis was not em- pirically tested. However, the items of the depth domain *obstacles* were additionally reversed in Piron's research design and integrated into the survey. This revealed that "freedom from obstacles and relaxation in deeper meditations continue to be

are present, but are complemented by new qualities (e.g. devotion or joy)" (Piron, 2019, see appendix pp. XII-XIII).

2.2.4 Mindfulness meditation

As shown in chapter 2.2.1, meditation methods can be divided into two main groups. Besides concentrative meditation, mindfulness meditation is a non-moving meditation method. The latter is increasingly used within behavioural medicine and clinical psychology as an alternative and complementary intervention to classical treatment methods (Michalak, Heidenreich & Bohus, 2006; Sedlmeier, 2016; Vaitl, 2012; Williams & Kabat-Zinn, 2013). In the process, mindfulness-based interventions have been extracted as "adaptations of mental practices" (Vaitl, 2012, p. 16), from original faith teachings and worldviews (Ott, 2010; Sedlmeier, 2016).

2.2.4.1 History and definition

Since 2005, there has been an increase in published controlled and randomised studies on mindfulness (Ott, 2010). Although the integration of mindfulness approaches into Western traditions is relatively modern, the original concept of mindfulness dates back over 2,500 years to the teachings of Buddha (Shapiro & Carlson, 2011). According to Buddhism, mindfulness is the directing of attention to the perception of cognitions, emotions and physiological sensations. This type of metacognitive *awareness is* also called *open awareness.* The focus of mindfulness is not exclusively limited to a single object, but is as broad as possible. According to Buddhism, non-identification with perceptions and conscious regulation of attention and emotions are important characteristics of mindfulness meditation (Sedlmeier, 2016).

The *Pali Canon* is the oldest and still the only completely preserved collection of Buddhist teachings. According to this fundamental Buddhist tradition, the ability to be mindful is considered necessary for the cognition, formation and liberation of the mind. In the most widely published Buddhist tradition, mindfulness (*sati*) followed by clarity of knowledge (*sampajanna*) are the basic elements of meditation practice. Buddha defines sati as clear awareness and describes sampajanna as the connection of mindful practice and mindful awareness (Shapiro & Carlson, 2011; Williams & Kabat-Zinn, 2013). According to this

basic definition, sati is the process as well as the outcome of mindfulness meditation (Shapiro & Carlson, 2011).

The attempt to remove the construct of mindfulness from the ancient Buddhist tradition and transfer it to a scientific context is in contradiction to the meaning of mindfulness. However, according to Buddha, the non-traditional use of mindfulness in Western medicine and psychology is medically supportable (Shapiro & Carlson, 2011). According to Buddha, mindfulness-based interventions can help alleviate human suffering (Shapiro & Carson, 2011). Accordingly, mindfulness-based interventions are used in psychology to increase awareness and regulate various mental processes (Bishop et al., 2014). In this context, mindfulness is fundamentally described as non-judgemental and present attention (Kabat-Zinn, 1990; Tang, 2019). However, Buddhist tradition warns against a reductionist understanding of mindfulness. The roots of mindfulness should be respected as a religious and spiritual tradition by practitioners and researchers (Williams & Kabat-Zinn, 2013).

Probably due to the fact that there is still no recognised definition of meditation (Ott, 2015), a uniform definition of mindfulness meditation is also unknown (Sedlmeier, 2006; Vaitl, 2012). One problem with the definition is that mindfulness as an experiential state is "upstream of language and category formation" (Tang, 2019, p.16). From an experiential perspective, mindfulness can be defined as follows: "When you first become aware of something, there is a fleeting moment of pure awareness just before you conceptualise the thing, before you identify it" (Tang, 2019, p.16). Despite de- finitional limitations, however, there is a need to present the construct of mindfulness in more detail for empirical use as an intervention (Shapiro & Carlson, 2011).

2.2.4.2 Models

Several models of mindfulness meditation have been published (Sedlmeier; 2016; Ott, 2010) to clarify the components of mindfulness meditation (Bishop et al., 2004) and its mechanisms of action (Hölzel, Lazar, Gard, Schuman-Oliver, Vago & Ott, 2011). According to Bishop et al. (2004), mindfulness meditation is composed of two operationalised components: *self-regulation of attention* and *orientation to experience* (Vaitl, 2012). The self-regulation of attention

Focused attention describes the concentration on an object of meditation, such as focusing on one's own breath. The meditator should learn to repeatedly direct the focus of attention to the corresponding meditation object (Bishop et al., 2004) and to hold this *focused attention* (Lutz et al., 2008) for as long as possible. In doing so, the perceived dynamics of cognitions, emotions and physiological sensations should not be evaluated. This creates a feeling of present presence. The result is the ability to control and regulate cognitive processes (Bishop et al. 2004). The second component of mindfulness describes an inner and open attitude characterised by acceptance, curiosity and tolerance towards one's own perceptions (Bishop et al., 2004). This *open awareness* (see chapter 2.2.1.1; Lutz et al., 2008) can be equated with the original mindfulness practice from Buddhism.

In summary, the combination of both mindfulness components describes a metacognitive process (Bishop et al., 2014) through mental control and monitoring processes (Fernandez-Duque, Baird & Posner, 2000; Nelson, Stuart, Howard & Crowley, 1999; Schraw & Mosham, 1995). This metacognitive awareness can be trained through mindfulness-based interventions (Austin, 1998). Lutz and other American "market leaders of the mindfulness approach" (Sedlmeier, 2016, p.157) argue that *focused attention* weakens the intensity of emotional reactions and *open awareness* leads to an increase in body awareness (Lutz et al., 2008).

A frequently published model of the effects of mindfulness meditation on body awareness was published by the German meditation researcher Hölzel with colleagues (2011). The creation of the model is based on self-reports by meditators and neurophysiological research results. The effect model is also very close to the Buddhist understanding of mindfulness. In addition to the original components of mindfulness meditation such as non-identification, attention and emotion regulation (see chapter 2.2.4.1), body awareness has also been identified as an important goal and characteristic of mindfulness meditation (Sedlmeier, 2016). By directing attention to inner sensory perceptions within mindfulness meditation, an improvement in body awareness is aimed for and expected. In addition to this direct effect, the model also describes indirect effects on body consciousness through the regulation of attention. By consciously directing attention to opposing sensory percep- tions, the

The use of the "non-judgemental attitude" and the "non-judgemental perception" is thought to positively influence body awareness through attention regulation (Hölzel et al, 2011; Sedlmeier, 2016).

Through various perceptual processes, emotional reactions such as fears often occur during mindfulness meditation. These are physiologically perceptible, for example, as muscular tension, increased pulse or faster breathing. The failure to reconcile emotional reactions and the actual goal of maintaining focused attention triggers an inner conflict. Good body awareness helps to perceive the physiological symptoms of the emotion. Accordingly, body awareness is an important prerequisite for emotion regulation (Hölzel et al, 2011; Sedlmeier, 2016). A comparison of these mechanisms of action of mindfulness meditation with empirical research findings, which are cited in the following chapter 2.3, confirms Hölzel's assumptions.

However, not all people perceive the same degree of change after mindfulness meditation. In addition to dispositional discrepancies due to different brain structures, intentional aspects also have an influence on the effects of mindfulness meditation (Tang, 2019). Intentional attention guidance is considered highly important within many mindfulness-based interventions (Heidenreich & Michalak, 2003; Kabat-Zinn, 2013). Through top-down mechanisms, information is transmitted from the neocortex to the lim- bic system. Discipline and self-control are related to intentional attention (Spiecker, 2016). According to Kabat-Zinn (2013), people with high levels of intentional attention make the greatest therapeutic progress in the context of mindfulness-based interventions.

2.3 State of Research

In the following, the current state of research on meditation and mindfulness with regard to dimensions of interoceptive consciousness is presented. For a basic understanding, chapter 2.3.1 first introduces Kabat-Zinn's *Mindfulness Based Stress Reduction programme* (*MBSR programme*). Many of the empirical studies cited are based on the *MBSR programme* and are oriented towards its basic mindfulness-based interventions. The validity of subjective survey methods for measuring interoceptive awareness is then discussed. In chapter 2.3.3, cross-sectional studies are first presented which

conducted a group comparison of meditators and non-meditators with regard to dimensions of interoceptive awareness. Subsequently, chapter 2.3.4 presents an empirical longitudinal study that investigated the effects of a three-month mindfulness-based intervention on interoceptive awareness. In the following chapter 2.3.4.1, another longitudinal study is presented that investigated the effects of a mindfulness-based brief intervention. The final chapter 2.3.4 summarises all the research results presented and highlights the most important findings.

2.3.1 Scientific foundations

There are already numerous research results on mindfulness meditation (Vaitl, 2012). After Kabat-Zinn published his eight-week *MBSR programme in* 1979, validated mindfulness interventions are increasingly used. Within stress reduction, pain management and psychotherapy, mindfulness-based interventions based on the *MBSR programme* are increasingly used (Williams & Kabat-Zinn, 2013). Numerous empirical studies refer to the effectiveness of the *MBSR programme* (Vaitl, 2012). Through its comprehensive mindfulness-based interventions, the perception of physical sensations in particular is to be trained (Creswell, 2017; Tang, 2019). The learning of different mindfulness meditation techniques is an important part of this (Williams & Kabat-Zinn, 2013). A comparison of the validated *meditation on the breath from* the *MBSR programme* (Schneider, 2012) and the *component model of* Bishop et al. illustrates many parallels in content. Both components of mindfulness meditation (see chapter 2.2.4.2) were integrated into the content of *meditation on the breath.*

As noted in chapter 2.1.4, in recent years mainly objective survey procedures (Mehling et al., 2012) have been used to measure the noticing of body sensations (Bornemann et al., 2014). Results of empirical studies were able to clarify through objective measurements that the perception of one's own heartbeat could not be improved through the intervention of a meditation (Khalsa, Rudrauf, Damasio, Davidson, Lutz & Tranel, 2008; Melloni, Sedeño, Couto, Reynoso, Gelormini, Favaloro et al.; Nielsen & Kaszniak, 2006; Parkin, Morgan, Ros- selli, Howard, Sheppard, Evans et al., 2013). The perception of one's own breath could only be slightly increased in experienced meditators compared to a passive control group according to objective measurement results (Daubenmier, Sze, Kerr,

Kemeny & Mehling, 2013). Based on these findings, the possibility of being able to positively influence the noticing of body sensations through meditation has been critically questioned (Bornemann et al., 2015). However, a biofeedback method confirmed that a comprehensive mindfulness-based intervention (including meditation *on the breath*) significantly improves the noticing of body sensations. Additionally, it has been empirically demonstrated that *noticing* body sensations predicts *emotional awareness* (Bornemann, 2017) as another dimension of interoceptive awareness (see chapter 2.1.4; Bornemann & Mehling, 2012). These objective results go hand in hand with the results of subjective survey procedures. A high degree of agreement between subjective and objective data has been empirically proven (Bornemann, 2017). This finding enhances the following empirical findings regarding the validity of subjective survey procedures for measuring interoceptive awareness.

2.3.2 Cross-sectional studies

In a cross-sectional study by Sze, Gyurak, Yuan & Levenson (2010), the *noticing of* body sensations (AV) of experienced *Vipassana meditators was* examined in comparison to an active and a passive control group. Vipassana meditation can be used as a synonym for mindfulness meditation. The term vipassana ('insight') mainly emphasises the goal of meditation, whereas mindfulness focuses more on the process of meditation (Buchheld & Walach, 2001). The questionnaires *Private Body Consciousness Subscale* by Miller, Murphy & Buss (1981), *Body Awareness Questionnaire* by Shields, Mallory & Simon (1989) and the *Autonomic Perception Questionnaire* by Shields (1984) were used to measure this visceral *awareness.* The results of the experi- mental group of experienced meditators were compared with an active control group of experienced dancers and a passive control group without intervention. The highest scores in *noticing* body sensations were achieved by the experienced meditators. Values in the middle range were achieved by the experienced dancers. The lowest values were found among the participants without instruction. These empirical results illustrate the positive effect of mindfulness meditation on *noticing* body sensations (Sze et al., 2010). Since these research results only cover one aspect of interoceptive consciousness, the

(see chapter 2.1.4; Bornemann & Mehling, 2012), there is a need to measure interoceptive awareness multidimensionally.

Mehling, Price, Daubenmier, Mike, Bartmess & Stewart (2014) were able to assess interoceptive awareness multidimensionally cross-sectionally by using the *MAIA.* A total of 435 patients with current or past back pain were divided into two groups with and without meditation experiences (mixed meditation procedures). Patients with meditation experiences achieved higher scores in four of eight dimensions of interoceptive awareness than patients without meditation experiences. In particular, the dimension of *self-regulation* was significantly more pronounced in patients with meditation experiences compared to patients without meditation experiences (Bornemann et al., 2014, Mehling et al., 2014).

In the course of another cross-sectional study, a positive correlation between interoceptive awareness and mindfulness meditation was also found. By using the *MAIA,* a significant difference in *verbalisation experience* between mindfulness meditation practitioners and non-mindfulness meditation practitioners was proven. Mindfulness meditation practitioners were less likely to perceive a rubber hand illusion as part of their own body than non-mindfulness meditation practitioners. Here, interoceptive awareness influences the embodiment experience of the rubber hand illusion (Xu, A., Cullen, B. H., Penner, C. Zimmerman, C., Kerr, C. E., Schmalzl, L., 2018). However, all study results already presented are limited to the cross-sectional nature of the study design. In order to measure the effects of an intervention on interoceptive awareness, there is a need for a longitudinal research design (Bortz & Döring, 2006).

2.3.3 Longitudinal studies

The German version of the *MAIA* was used by Bornemann et al. (2015) within an empirical longitudinal study. Here, the influence of a three-month mindfulness-based intervention on in- teroceptive awareness (Bornemann et al., 2015) was investigated (Bornemann, 2019; see appendix p. XI). As part of the *ReSource project,* all 148 trial participants (Bornemann et al., 2015) had no regular meditation practice and less than two years of meditation experience (Max Planck Institute for Human Cognitive and Brain Sciences, 2016, see Appendix p. XIII). The daily exercises consisted of physical attention exercises

and mindfulness meditations. The latter intervention focuses on breath focus and physical attention (Bornemann et al., 2015). The meditation used is oriented towards the validated *meditation on the breath from* the *MBSR programme*. Through these components of the mindfulness-based intervention (Bornemann, 2019; see Appendix p. XI), five dimensions of interoceptive awareness (*attention regulation, emotional awareness, self-regulation, listening to the body* and *trust) were* significantly increased. It became clear that the *self-regulation of* physical sensations was most positively influenced by the mindfulness-based intervention. The duration of the intervention could only slightly influence the improvement of the dimensions of interoceptive awareness. The age and gender of the participants did not significantly influence the increase in interoceptive awareness. Participants who had low interoceptive awareness scores at the beginning of the study were able to improve their scores most significantly. No significant influence on the dimensions of interoceptive awareness was found in participants of a control group (Bornemann et al., 2015).

2.3.3.1 Mindfulness-based brief intervention

The findings of a longitudinal study by Zeidan, Johnson, Diamond, David & Goolkasian (2010) illustrate that not only long-term meditators benefit from the positive effects of meditation intervention. Their empirical study was linked to empirical findings on long-term meditators as well as to Kabat-Zinn's *MBSR programme.* It was investigated whether mindfulness meditation also promises positive effects as a short-term intervention. In total, the mood, cognitive performance, concentration, anxiety, fatigue, spatial-visual perception and stress resistance of 49 participants without meditation experience were examined. In the experimental group, participants performed a 20-minute mindfulness meditation on four consecutive days. An active control group listened to a neutral audio book for 20 minutes on each of four consecutive days. Before the start of each intervention, the functional areas of interest were measured in both groups (Zeidan et al., 2010).

The mindfulness meditations were led by an experienced instructor in a four-day classroom training. Within the first mindfulness meditati-

During the test, the participants should relax their body and direct their attention to their breath. Concentration should be directed to the tip of the nose. Thoughts that interrupt the focus of attention on the breath should be passively perceived and accepted. The following mindfulness meditations were to train specific aspects of mindfulness. The instruction was particularly focused on *noticing* and *not distracting from* bodily sensations. The participants were asked to adopt an accepting attitude towards arising emotions (Zeidan et al., 2010). This instructional guide to mindfulness meditation illustrates parallels in content to the *two-component model of* Bishop et al. (see chapter 2.2.4.2). Both components of mindfulness meditation (*self-regulation of attention* and *orientation to experience*; see chapter 2.2.4.2) have been integrated into the instructional guide for mindfulness meditation by Zeidan et al.

After completing the mindfulness meditation, the participants were asked whether they had actually felt that they had been meditating during the instruction. All participants stated that they had actually felt like they were meditating. The entrance tests were then repeated in both groups. The findings of this study show that mindfulness meditation is also effective as a brief intervention. After only four days of 20-minute mindfulness meditation, a significant increase in cognitive performance and concentration was observed. The scores for anxiety, fatigue, spatial-visual perception and stress resistance also improved significantly within the experimental group after mindfulness meditation. No significant increase in these values was found in the control group. Mood had significantly improved in both groups after the respective intervention (Zeidan et al., 2010).

2.3.4 Summary of the research results

The empirical findings presented in this chapter illustrate the possibility of significantly increasing interoceptive awareness through mindfulness-based interventions. Sze et al. (2010) were able to clarify in a cross-section that the *noticing of* body sensations of experienced mindfulness meditators is significantly more pronounced than in experienced dancers and a passive control group. However, *noticing body sensations* is only one dimension of interoceptive awareness (Bornemann et al., 2014). In a cross-sectional study by

Mehling et al. (2014) evaluated interoceptive awareness multidimensionally using the original English version of the *MAIA*. In line with the empirical findings of Xu et al. (2018), a positive correlation between interoceptive awareness and mindfulness meditation was found. Back pain patients with meditation experience achieved higher values in four dimensions of interoceptive awareness than back pain patients without meditation experience. The dimension *self-regulation* was influenced the most (Mehling et al., 2014).

This finding is similarly reflected in the longitudinal findings of Bornemann et al. (2015). Here, the effects of a three-month mindfulness-based intervention (Bornemann, 2019, see Appendix XI) on interoceptive awareness were investigated. The validated German translation of the *MAIA* was used as the subjective survey instrument. The mindfulness-based intervention consisted of daily physical attention exercises and mindfulness meditations. Five dimensions of interoceptive awareness were significantly positively influenced by this comprehensive mindfulness-based intervention (Bornemann et al., 2015). In particular, the dimension of *self-regulation* was significantly positively influenced. The total sample size consisted of participants with less than two years of regular meditation practice (Max Planck Institute for Human Cognitive and Brain Sciences, 2016, see appendix p. XIII).

A longitudinal study by Zeidan et al. (2010) shows that even four days of mindfulness meditation for 20 minutes each promises positive effects. Various psychological variables were significantly increased in inexperienced mindfulness meditators compared to an active control group (Zeidan et al., 2010).

2.4 Derivation of the research needs

This empirical research work builds on the findings of Bornemann et al. (2014) and Zeidan et al. (2010) in particular. In addition, other aspects are taken into account that have received little attention in previous research on meditation and mindfulness. Bornemann et al. (2015) prove that a three-month mindfulness-based intervention including mindfulness meditation significantly increases interoceptive awareness (see chapter 2.3.3). For

However, for the largest proportion of the population, it is not possible to participate in a comprehensive intervention programme (Zeidan et al., 2010). At the same time, the interest in and need for mindfulness-based interventions is clearly increasing (Ott, 2010). The empirical findings of Zeidan et al. (2010) show that even a four-day mindfulness meditation for 20 minutes each has a positive influence on various psychological variables. However, the effects on interoceptive awareness were not investigated. The construct of *mindfulness* (see chapter 2.2.4.1), however, promises effects on a multidimensional level. The positive influence of mindfulness meditation on interoceptive awareness can therefore be assumed (Bornemann, 2017). According to longitudinal findings of a comprehensive mindfulness-based intervention, the intervention duration could only weakly influence the increase in interoceptive awareness (see chapter 2.2.4; Bornemann et al., 2014). Whether interoceptive awareness can be positively influenced by a four-day mindfulness meditation for 20 minutes each is to be clarified within this research work.

Neuronal comparisons could clarify that the effects of mindfulness meditation are based on unique mechanisms of action and not on a placebo effect (Zeidan, Emerson, Farris, Ray, Jung, McHaffie et al., 2015). However, as noted in chapter 2.2.4.2, these mechanisms of action are influenced by the intensional focus of attention (see chapter 2.2.4.2; Heidenreich & Mi- chalak, 2003; Kabat-Zinn, 2013). According to Kabat-Zinn (2013), people with a high level of intentional attention make the greatest therapeutic progress within mindfulness-based interventions (see chapter 2.2.4.2). In order to confirm this claim empirically and to make practical implications, it is relevant to examine whether intentional attention is also relevant for influencing in- teroceptive awareness.

In addition, meditation research could benefit from empirical findings regarding the influence of the meditation position on the effects of meditation (Ott, 2010). Although numerous publications on meditation research exist (Murphy & Donovan, 1997), there are no scientific publications on a suitable meditation position (Ott, 2010). Nevertheless, in line with findings from embodiment research (Reichwein, 2012), it is assumed that body awareness and mindfulness can be particularly increased in a seated meditation position. However, this hypothesis has not yet been confirmed by empirical studies.

tested (Ott, 2010). Therefore, this research will additionally clarify a difference in the effectiveness of different meditation positions.

According to Zeidan & Vago (2016), mindfulness meditation can be practised not only by experienced meditators but also by the general population without meditation experience. Cross-sectional group comparisons could clarify that meditation-experienced people achieve higher values of interoceptive awareness than non-meditation-experienced people (see chapter 2.3.2; Xu, A. et al., 2018, Mehling et al., 2014, Sze et al., 2010). However, these empirical findings are either limited by narrowing the population to pain patients (see chapter 2.3.2; Bor- nemann et al., 2014, Mehling et al., 2014) or specifically focused on embodiment experiences through a rubber hand illusion (see chapter 2.3.2; Xu, A. et al., 2018). In order to increase the representativeness of the population, there is a need to examine a possible difference of the experience groups without a sample restriction. This research aims to fill the gaps in meditation and mindfulness research that have been identified. In order to support the current state of research and the use of validated mindfulness-based brief interventions in the long term, this empirical study was conducted.

3 Derivation of the hypotheses

Due to the preceding theoretical background (see chapter 2), some questions remain unanswered, which are listed in chapter 3.1. The hypotheses (H) derived from this are then presented in tabular form in chapter 3.2 and are justified by the theoretical relevance (see chapter 2.4).

Due to economic advantages, the following terms will be restricted in the further course of the text: The term *mindfulness-based brief intervention* describes a 20-minute mindfulness meditation that was conducted between one day and four consecutive days. Furthermore, the *interoceptive awareness scores* are self-reports that were subjectively measured by all subscales of the *MAIA*. Both terms are used in the following chapters on this basis of understanding.

3.1 Questions

1. Is it possible to positively influence the values of interoceptive awareness through a mindfulness-based brief intervention?

2. In addition to the intervention duration of the mindfulness-based brief intervention, are the values of interoceptive awareness positively influenced by high intentional attention?
3. Do sitting meditation positions actually have a stronger positive ef- fect on the values of interoceptive consciousness than lying, standing or walking meditation positions?
4. Do meditation-experienced people achieve higher levels of interoceptive awareness than non-meditation-experienced people?

3.2 Hypotheses

As discussed in chapter 2.1.4, interoceptive awareness as a multidimensional construct comprises eight different dimensions (see chapter 2.1.4; Mehlinger, 2012). In order to measure a change in the dependent variable, it is necessary to examine each dimension of interoceptive awareness separately (see chapter 4.4; Bornemann et al., 2014). For this reason, eight sub-hypotheses (H1a-H1h, H2a-H3h, H3a-H3h and H4a-h) were established for each main hypothesis (H1-H4). These are based on the subscales of the *MAIA* (see chapter 4.4).

H1	The values of interoceptive consciousness have changed through the mindfulness-based based brief intervention significantly improved.

H1a	The scores of the *Noticing* subscale have improved due to the mindfulness-based Short intervention significantly improved.
H1b	The scores of the *non-distraction* subscale have improved due to the mindfulness-based The results of the brief intervention were significantly improved.
H1c	The scores of the subscale *Don't Worry* have changed due to the eight- The results show a significant improvement in the quality of the treatment.
H1d	The scores of the *attention-regulation* subscale have changed due to the eight- The results show a significant improvement in the quality of the quality-based brief intervention.

H1e	The scores of the *Emotional Awareness* subscale have improved due to the mindful- The results show a significant improvement in the quality of the treatment.
H1f	The scores of the *Self-Regulation* subscale have improved due to the mindfulness-ba-. sierte Kurzintervention significantly improved.
H1g	The scores of the *listening-to-the-body* subscale have changed due to the mindfulness-based based brief intervention significantly improved.
H1h	The scores of the *trust* subscale have improved due to the mindfulness-based Short intervention significantly improved.

H2	The more intense the intentional attention on the mindfulness-based short intervention, the higher the values of interoceptive awareness.

H2a	The more intense the intentional attention to the mindfulness-based the higher the values of the subscale "Short Intervention" were. *Notice*.
H2b	The more intense the intentional attention on the mindfulness-based the higher the values of the subscale "Short Intervention" were. *Non-distraction*.
H2c	The more intense the intentional attention on the mindfulness-based the higher the values of the subscale "Short Intervention" were. *Don't worry*.
H2d	The more intense the intentional attention to the mindfulness-based the higher the values of the subscale "Short Intervention" were. *Attention regulation*.
H2e	The more intense the intentional attention to the mindfulness-based the higher the values of the subscale "Short Intervention" were. *Emotional Awareness*.
H2f	The more intense the intentional attention to the mindfulness-based the higher the values of the subscale "Short Intervention" were. *Self-regulation*.

H2g	The more intense the intentional attention to the mindfulness-based the higher the values of the subscale "Short Intervention" were. *Listening to the Body*.
H2h	The more intense the intentional attention to the mindfulness-based the higher the values of the subscale "Short Intervention" were. *Trust*.

H3	Sitting meditation postures have a great impact on the mindfulness-based short inter-. vention have a significantly stronger positive effect on the values of interoceptive consciousness than lying, standing or walking meditation positions.

H3a	Sitting meditation postures have a great impact on the mindfulness-based short inter-. vention had a significantly stronger positive effect on the subscale scores. *Notice* as lying, standing or walking meditation positions.
H3b	Sitting meditation postures have a great impact on the mindfulness-based short inter-. vention had a significantly stronger positive effect on the subscale scores. *Non-distraction* as lying, standing or walking meditation postures.
H3c	Sitting meditation postures have a great impact on the mindfulness-based short inter-. The effect of meditation on the scores of the subscale "*Don't worry" was* significantly stronger than that of lying down, standing or walking meditation positions.
H3d	Sitting meditation postures have a great impact on the mindfulness-based short inter-. The meditation positions had a significantly stronger positive effect on the *attentional regulation* subscale than lying, standing or walking meditation positions.
H3e	Sitting meditation postures have a great impact on the mindfulness-based short inter-. The effect of meditation on the *Emotional Awareness* subscale was significantly greater than that of lying down, standing or walking meditation.

H3f	Sitting meditation postures have a great impact on the mindfulness-based short inter-. vention had a significantly stronger positive effect on the subscale scores. *Self-regulation* as lying, standing or walking meditation positions.
H3g	Sitting meditation postures have a great impact on the mindfulness-based short inter-. vention had a significantly stronger positive effect on the subscale scores. *Listening to the body* as lying, standing or walking meditation positions.
H3h	Sitting meditation postures have a great influence on mindfulness-based short inter- vention had a significantly stronger positive effect on the subscale scores. *Trust* as lying, standing or walking meditation positions.

H4	Those experienced in meditation achieve significantly higher levels of interoceptive consciousness than non-meditation practitioners.

H4a	Experienced meditators score significantly higher on the *Bemer-* than those who are not experienced in meditation.
H4b	Experienced meditators score significantly higher on the *non-meditation* subscale. *Distracting* as a non-meditator.
H4c	Experienced meditators achieve significantly higher scores on the subscale *Self-* *Not worrying* as a non-meditator.
H4d	Those who are experienced in meditation achieve significantly higher scores on the subscale *Attentiveness.* *regulation* than non-meditation practitioners.
H4e	Experienced meditators score significantly higher on the *Emotio-* *nal awareness* than non-meditation practitioners.
H4f	Meditation-experienced people achieve higher scores on the *Self-Regulation* subscale than non-meditation practitioners.
H4g	Experienced meditators achieve significantly higher scores on the subscale *Up-* *Body listening* as a non-meditation practitioner.
H4h	Experienced meditators score significantly higher on the *Trust* subscale. than those who are not experienced in meditation.

4 Methodology

In the following, it will be explained how the hypotheses were tested within this empirical research work. For this purpose, chapter

3.1 explains the research design used. Chapter 3.2 then describes how this was implemented in practice. In chapter 4.3, the total sample size (*N*) of the empirical study is discussed in more detail. Chapter 3.3 describes the *MAIA*, which was used as a validated survey instrument. The final chapter 3.6 introduces the statistical data analysis.

4.1 Research design

This empirical research experimentally tests the cause-effect relationship of a 20-minute mindfulness meditation on interoceptive awareness (IA). The AV was measured between one and four consecutive days (*t1*, *t2*, *t3* and *t4*) and associated with different UVs. To test H1, we examined whether the total intervention duration had a significant effect on interoceptive awareness. To test H2, the influence of intentional attention as a covariate on interoceptive awareness was measured in addition to the intervention duration. To test these hypotheses, a trend analysis was deliberately chosen. This has the advantage that the entire sample size of all measurement points could be used for the statistical evaluation. The consequence that the total sample size decreases over the measurement points was assumed. This causal research approach is based on longitudinal data, which is why this empirical investigation can be described as a longitudinal study. However, it is not a *true longitudinal study as the* sample size base was not constant across the measurements. H3 was tested by examining the influence of the meditation position (UV2) on interoceptive awareness in addition to the intervention duration (UV1). An independent group comparison of the ordinally scaled mean values of the AV was made. The first group adopted a seated meditation position during mindfulness meditation. The second group practised mindfulness meditation while lying down, standing or walking. Finally, to test H4, an independent group comparison of meditation experiencers and non-meditation experiencers was conducted. In addition, a correlative relationship between existing meditation experiences (UV1) and non-existing meditation experiences (UV2) on interoceptive awareness was investigated. For capacity reasons, a control group was not included in this bachelor thesis.

4.2 Implementation

Before the empirical research process began, a quantitative online survey was created using the *SoSci Survey* programme. The survey consisted of a total of four questionnaires, each of which could be accessed via a separate link. The questionnaires were designed using the survey method described in chapter 4.4.

instrument are almost identical. Additions of personal data and additionally collected variables are documented in Appendix 6. A 20-minute mindfulness meditation was also created as an intervention tool before the start of the data collection (see chapter 4.5). This was created by an appropriately trained and experienced instructor and professionally recorded as an audio file (Nuyken, 2019). A pretest with selected persons enabled methodological, content-related and technical corrections to be made to the survey and the mindfulness meditation.

Within the empirical research process, the questionnaires were to be completed by the participants in a predefined order on four consecutive days. Likewise, the mindfulness meditation was to be listened to as an audio file on these four consecutive days. In order to keep the intervention instrument constant, the same mindfulness meditation was used every day. In addition to increasing objectivity, possible interference effects were to be circumvented by using the mindfulness meditation without background music (Nuyken, 2019). On the first day (*t1*), the questionnaire should be administered first, followed by mindfulness meditation. On the following days (*t2, t3* and *t4*), the participants were instructed in writing to do the mindfulness meditation first and then the respective questionnaire.

The entire research procedure was programmed, the programme was accessed via the internet and the participants did not come into personal contact with the experimenter. For these reasons, this is an *Internet experiment,* the use of which increased the objectivity of the conduct of this study (Huber, 2005).

The study was largely distributed via social networks such as Instagram, Facebook, Whatsapp, various forums and blogs (see Appendix 7). Further trial participants were acquired via e-mail lists of larger companies. In addition, flyers were published in various universities, colleges and public places in the Düsseldorf area (see Appendix 8). Due to a *snowball procedure* (Bortz & Döring, 2006), it was possible to recruit a comprehensive number of trial participants. In addition, a monetary contribution of three times 25 euros was raffled among all participants. This incentive was pointed out in the di- stribution. Furthermore, students had the opportunity to receive three test person hours written down after complete participation in the study. The

The target group of the research was kept open, so that potentially every person could participate in the study. Since there was no explicit selection plan of participants, it was an arbitrary selection (Fantapiè Altobel- li, 2007).

Registration for participation in the study took place in the form of an e-mail sent to the investigator. The desired start date of the study had to be noted by the participants. Data collection began on 5 April 2019 and ended on 15 April 2019. Trial participants could choose a period of implementation within the specified period according to individual preferences. All participants received an e-mail one day before the individual start of the study and daily between the individual measurement points (see Appendix 9). The mindfulness meditation as an audio file and the current link to the online questionnaire were included in the attachment of the e-mail. The content of the first e-mail consisted of access to the materials and a written instruction of the experimental conditions. In addition, a written overview of hints and recommendations for the meditation practice was noted. In order to clarify personal questions, all participants had the opportunity to communicate with the experimenter by telephone or e-mail. The measures listed were intended to avoid interference with the Internet experiment as far as possible.

4.3 Sample

The links to the respective online questionnaires were called up a total of 902 times. Before data transfer to the *IBM SPSS Statistics* programme, participants who had already taken part in the pretest or who did not complete the questionnaire were selected.

A total of 586 questionnaires were completed with a completion rate of 86%. The first questionnaire was completed by 182 people, which corresponds to a completion rate of 84%. 58 persons (32%) stated that they had already had experience with meditation before the mindfulness-based brief intervention. The second questionnaire was completed by 144 people with a completion rate of 82%. The third questionnaire was completed by 135 people, which corresponds to a completion rate of 90%. The last questionnaire was completed by 125 persons, also with a completion rate of 90%.

As noted in chapter 4.1, the research design used has the consequence that the total sample size (*N*) of *t1*, decreases in the course of the further measurement time points (*t2*, *t3*, *t4*). The total sample size of the first measurement time point *N=182* comprises 136 (74%) female and 46 (25%) male test participants. The mean age was *M=31*.15 years (*SD=12*.73). Most of the participants (31%, *n=56*) reported A-levels as their highest educational qualification, followed by a completed apprenticeship (24%, *n=44*). A degree from a university or university of applied sciences (20%, *n=36*) and the entrance qualification for a university of applied sciences (10%, *n=19*) were then stated as the most frequent highest educational qualification. This was followed by a Realabschluss or mittlere Reife (7%, *n=12*) and a doctorate or higher (7%, *n=12*) as the highest educational qualification. Rarely, other degrees (1%, *n=2*) and the lower secondary school leaving certificate or elementary school leaving certificate (1%, *n=1*) were noted as the highest educational qualification achieved by the test participants in the questionnaire.

The most frequently reported current activity was a job (52%, *n=95*). Furthermore, according to the participants, the sample consisted of students (25%, *n=45*) and schoolgirls (7%, *n=13*). Other current activities (6%, *n=10*), as well as employment as a housewife (3%, *n=6*) and the indication of being unemployed (3%, *n=5*) were clarified by the participants. Participants also stated that they were doing a voluntary social year (2%, *n=4*). According to further information, the sample consisted to a small extent of pensioners (2%, *n=3*) and people who are currently engaged in voluntary work (1%, *n=1*).

4.4 Survey instrument

The subjective data collection of interoceptive awareness is based on the German version of the *MAIA* by Bornemann and Mehling (2012). Exploratory factor analyses and confirmatory factor analyses revealed a reasonable match between the original English version of the *MAIA* and the German version (Bornemann et al., 2014). As mentioned in chapter 2.1.4, eight dimensions of interoceptive awareness are distinguished from each other. These are assessed by eight different subscales of the *MAIA,* which were defined according to the dimensions (Bornemann & Mehling, 2012; Mehling et al., 2012). The differential results of the subscales from the longitudinal study by Bornemann et al. (2014) illustrate the need for multidimensional assessment of interoceptive awareness. Particularly in connection with an intervention to increase

interoceptive awareness, the

The importance of a multidimensional evaluation in the context of awareness must not be disregarded (Borne- mann, 2014).

The Noticing subscale measures the perception of various physiological sensations such as the perception of breath and heartbeat. The *Non-Distraction* subscale determines the tendency to pay attention to unpleasant sensations and not to be distracted by them. The subscale *Do Not Worry* determines the tendency not to worry emotionally because of unpleasant sensations. The subscale *Attention Regulation* measures the consistent directing of attention to physiological sensations. The subscale *Emotion-Awareness* defines the perception of an interaction between physical and mental processes. The *Self-Regulation* subscale measures the ability to regulate unpleasant sensations through physical attention control. The *Listening subscale* measures the behavioural tendency to actively work with physical sensations in order to learn from them. The last subscale, *Trust,* determines the tendency to rely on one's own body (Bornemann & Mehling, 2012).

The *MAIA* was specifically designed for prospective research studies to investigate mental and physical interaction processes. The *MAIA is* based on a comprehensive literature review of existing psychometric tests and standardised questionnaires. Various pretests confirm that the *MAIA* meets the relevant main quality criteria of psychodiagnostic procedures. The overall sample included practitioners of various body awareness exercises such as mindfulness meditation. A prerequisite for participation was an existing basic experience level of at least 20 hours of formal training. Mean comparisons of different experience levels revealed a homogeneous distribution of practitioners with many and few experiences (Mehling et al., 2012).

For the statistical data analysis of the *MAIA*, standardised scoring instructions are given (Bornemann & Mehling, 2012) in order to guarantee a high degree of objectivity in the evaluation. Since the *MAIA is* based on self-assessment, the results are understandably not independent of the test participants. In addition to the retest reliability, the reliability of the internal consistency was confirmed by Cronbach's alpha (Mehling, 2019, see appendix p. XII). Validation was carried out by means of exploration cluster and confirmatory factor analysis, group compara

same and correlations with existing survey instruments (Mehling, 2019, see Appendix p. XII; Mehling et al., 2012). Through these interactive processes, construct validity could also be confirmed (Mehling, 2019, see Appendix p. XII). According to Campbell and Fiske (1959), this comprises *convergent validity* and *discriminant validity*. Due to the correlation of the *MAIA* with established survey instruments that measure similar constructs (Mehling et al., 2012), a high *convergent validity* can be assumed according to Campbell and Fiske (1959). The *Five Facet Mindfulness Questionnaire* confirms that the subscales of the *MAIA* measure different aspects of mindfulness (Bornemann et al., 2012). As explained in chapter 2.1.1, the body awareness construct also includes the structure of mindfulness (Mehling et al., 2012). It can therefore be assumed that interoceptive awareness as a dimension of the body awareness construct (see chapter 2.1) also includes mindfulness. In addition, the convergent validity became clear through positive correlations of the *MAIA* subscales and the *Private Body Consciousness Scale.* Discriminant validity was demonstrated by negative correlations of the *MAIA* scales with the *Trait Anxiety Inventory* (Bornemann et al., 2014).

4.5 Mindfulness-based Brief intervention

The operationalisation of mindfulness meditation is based on the five characteristics of meditation by Cardoso et al. (see chapter 2.2.2). The concept is fundamentally based on the *two-component model of* mindfulness by Bishop et al. (see chapter 2.2.4.2). Due to parallels in content between validated meditation instructions and the *two-component model* (see chapter 2.3), the validity of mindfulness meditation could be optimised. In addition, Piron's *five deep areas of meditation* (see chapter 2.2.3) were integrated in order to increase the quality of the content of mindfulness meditation. A detailed description of the basic conditions and the concept of mindfulness meditation are documented in Appendices 10 and 11. Unlike in most other empirical studies, the participants were addressed by the instruction manual as *Du.* According to Ott, this personal address "conveys a greater closeness and familiarity (...) *It* simply sounds very distant and alienating when one is led by a voice into the private world of inner sensations" (Ott, 2019, see appendix 10).

appendix p. XI). The complete instruction manual of the mindfulness meditation is attached in appendix 12.

4.6 Statistical Data evaluation

The statistical evaluation of the data was carried out by the statistical software *IBM SPSS Statistics*. First, the individual variables were named and coded. Then the optimal scale level was entered. The dependent variable interoceptive awareness is measured by 32 items that were divided into eight subscales according to the scoring instructions provided by Mehling et al. (2012) (see chapter 4.4). Due to the need to assess interoceptive awareness multidimensionally (see chapter 4.4), each subscale was evaluated separately. The fifth, sixth and seventh items of the *Non-Distraction subscale and* the eighth and ninth items of the Don*'t Worry* subscale were inverted in the evaluation (Bornemann & Mehling, 2012).

5 Statistical Results

In the following, answers to the questions posed in chapter 3.1 are to be found. For this purpose, the respective sub-hypotheses from Chapter 3.2 were statically tested. At this point it should be noted that in the following chapter 6.1 the relevant results are summarised and interpreted in relation to the respective main hypotheses.

According to the results of the explorative data analysis, a normal distribution can be assumed as a prerequisite for the application of variance analyses and the t-test (Bortz & Döring, 2006; Fantapié Altobelli, 2007). These findings could be confirmed by further tests for normal distribution (see Appendix 13). A total of *N=586* valid cases were evaluated for each subscale.

5.1 Review of H1

H1 was tested by means of a single factor univariate analysis of variance. For this purpose, the mean values of the AV collected from the measurement points *t1*, *t2*, *t3* and *t4 were related* to each other as independent data (see chapter 4.1). Since the Levene test was significant for all subscales (see Appendix 14), there was no homogeneity of variation. The results of all subscales showed highly significant differences between all measurement times (p<.001), which after correction by

Welch/Brown-Forsythe was confirmed (see Appendix 14). In the absence of hypotheses about the specific differences in the measurement times, multiple comparisons were then used by the Scheffé test. The following sub-chapters present the results of each subscale. In this way, the sub-hypotheses of H1 (see chapter 3.2) were tested in more detail.

5.1.1 H1a: *Remark* subscale

A highly significant difference (*p<0*.01) was found between *t1* (*M=3*.79, *SD=* 1.34) and *t2* (*M=4*.18; *SD=.*86). Likewise, a highly significant discrepancy (*p*<.001) between *t2* and *t3* (*M=4*.71, *SD=*.73) could be proven. Furthermore, a significant difference (*p<.*05) emerged between *t3* and *t4* (*M=5.*08; *SD=*.89). Finally, highly significant differences (*p*<.001) were found between *t1* and *t3*, *t2* and *t4* as well as between *t1* and *t4.* The mean values increase significantly with each further measurement point, which is why H0 was rejected in favour of H1a.

5.1.2 H1b: *Non-Distraction* subscale

There was no significant difference (*p=*.169) between *t1* (*M=*.85, *SD=1.*12) and *t2* (*M=1*.15, *SD=.*95). Likewise, there was no significant discrepancy (*p=*.126) between *t2* and *t3* (*M=1*.49, *SD=1.*21). No significant difference (*p=*.353) emerged between *t3* and *t4* (*M=1*.76, *SD=1.*50). However, highly significant discrepancies (*p*<.001) were evidenced between *t1* and *t3*, *t2* and *t4,* and between *t1* and *t4.* Since the mean values consistently increase significantly across these measurement points, the H0 could be rejected in favour of the H1b.

5.1.3 H1c: *Do not worry* subscale

A significant discrepancy (*p*<.05) was confirmed between *t1* (*M=1*.5971, *SD=1.*17) and *t2* (*M=2.*00, *SD=.*84) and between *t2* and *t3* (*M=2*.45, *SD=1.*12). However, there was no significant difference (*p=*.287) between *t3* and *t4* (*M=2*.72, *SD=1.*31). Highly significant differences (*p*<.001) were evident between *t1* and *t3*, *t2* and *t4,* and between *t1* and *t4. The* mean values increase significantly over these measurement points, which is why H0 was rejected in favour of H1c.

5.1.4 H1d: *Attention-Regulation* subscale

A highly significant difference (p<.001) between *t1* (*M=3*.23, *SD=1.*11) and *t2* (*M=3*.78, *SD=.*79) as well as between *t2* and *t3* (*M=4*.26, *SD=*.81) was confirmed. Furthermore, a highly significant discrepancy (p<.01) between *t3* and *t4* (*M=4.*69, *SD=1.*07) could be confirmed. Finally, highly significant differences (p<.001) were found between *t1* and *t3, t2* and *t4* as well as between *t1* and *t4.* According to this, the mean values increase significantly with each further measurement time, which is why H0 was rejected in favour of H1d.

5.1.5 H1e: *Emotional Awareness* subscale

A significant difference (p<.05) emerged between *t1* (*M=4.*05, *SD=1.*45) and *t2* (*M=4*.42, *SD=.*91) and between *t2* and *t3* (*M=4*.84, *SD=.*69). However, no significant discrepancy (p=.057) was found between *t3* and *t4* (*M=5.*21, *SD=.*86). Highly significant differences (p<.001) were found between *t1* and *t3*, *t2* and *t4 and* between *t1* and *t4.* Since the mean values increase significantly at these measurement times, the H0 was rejected in favour of the H1e.

5.1.6 H1f: *Self-regulation* subscale

First, a highly significant difference (p<.001) emerged between *t1* (*M=3.*05, *SD=1.*28) and *t2* (*M=3*.76, *SD=.*90). Subsequently, a highly significant difference (p<.01) emerged between *t2* and *t3* (*M=4*.29, *SD=.*88). A significant discrepancy (p<.05) was also found between *t3* and *t4* (*M=4*.73, *SD=1.*12). Finally, highly significant differences (p<.001) between *t1* and *t3*, *t2* and *t4* as well as between *t1* and *t4* (p<.001) could be confirmed. The mean values increase significantly with each further measurement point, which is why H0 was rejected in favour of H1f.

5.1.7 H1g: *Listening to the body* subscale

A highly significant difference (p<.001) was evidenced between *t1* (*M=2*.95, *SD=2.*95) and *t2* (*M=3*.63; *SD=.*85). In addition, a highly significant discrepancy (p<.01) emerged between *t2* and *t3* (*M=4.*13, *SD=.*95) and between *t3* and *t4* (*M=4*.53, *SD=1.*18). Finally, highly significant differences (p<.001) were detected between *t1* and *t3*, *t2* and *t4,* and between *t1* and *t4.* The mean values

increase significantly with each further measurement time, which is why H0 was rejected in favour of H1g.

5.1.8 H1h: *Trust* subscale

The findings highlight a highly significant discrepancy (p<.001) between *t1* (M=3.62, SD=1.45) and *t2* (M=4.14, SD=1.04). A significant difference (p<.05) also emerged between *t2* and *t3* (M=4.60, SD=.96). However, no significant difference (p=.081) could be confirmed between *t3* and *t4* (M=4.98, SD=1.11). Finally, highly significant discrepancies (p<.001) were confirmed between t1 and t3, t2 and t4 as well as between t1 and t4. Since the mean values increase significantly at these measurement points, the H0 was rejected in favour of the H1h.

5.2 Review of H2

H2 was tested by means of an analysis of covariance. For this purpose, the effect of the intervention time from three measurement points (t2, t3 and t4) and the effect of the multiscaled covariate of intentional attention were related to each other as independent data (see chapter 4.1). Since the mindfulness meditation could not yet take effect at the first measurement point (see chapter 4.2), *t1 was* not included in the evaluation. The Levene test was significant for all subscales (see Appendix 14), which is why there was no homogeneity of variance. However, due to the robustness of the procedures, the statistical calculation could be continued (Bortz & Döring, 2006; Fantapié Altobelli, 2007). The following sub-chapters present the statistical findings of each subscale. In this way, the sub-hypotheses of H2 (see chapter 3.2) were tested in more detail.

5.2.1 H2a: *Remark* subscale

A highly significant effect was found for the three-level temporal factor (F(2,400)=45.53, Eta^2 =.39, p<.001) and for the covariate (F(1,400)=57.96, Eta^2 =.13, p<.001) is confirmed. Subsequently calculated mean values show constantly increasing differences in the measurement time points between *t2* (M=4.18, SD=.86), *t3* (M=4.71, SD=.73) and *t4* (M=5.08, SD=.89) in the dependent variable. The H0 was therefore rejected in favour of the H2a.

5.2.2 H2b: *Non-Distraction* subscale

A highly significant effect was found for the three-step temporal factor ($F(2,400)=8.87$, $Eta^2=0.04$ $p<.001$). Likewise, a highly significant effect was found for the covariate ($F=32.67$, $Eta^2=.08$, $p<.001$). Finally, calculated mean values show constantly increasing differences between *t2* ($M=1.1458$, $SD=.95$), *t3* ($M=1.49$, $SD=1.21$) and *t4* ($M=1.76$, $SD=1.50$) in the dependent variable. Accordingly, H0 could be rejected in favour of H2b.

5.2.3 H2c: *Not worrying* subscale

A highly significant effect was confirmed for the three-step temporal factor ($F(2,400)=15.72$, $Eta^2=.07$, $p<.001$). A highly significant effect for the covariate was also confirmed ($F=32.26$, $Eta^2=0.08$, $p<.001$). Calculated mean values show constantly increasing differences between *t2* ($M=2.00$, $SD=.84$), *t3* ($M=2.45$, $SD=1.12$) and *t4* ($M=2.72$, $SD=1.31$) in the dependent variable. Thus, the H0 was rejected in favour of the H2c.

5.2.4 H2d: *Attention-Regulation* subscale

A highly significant effect for the three-level temporal factor ($F(2,400)=43.68$, $Eta^2=0.18$, $p<.001$) and the covariate was documented ($F=118.257$, $Eta^2=.23$, $p<.001$). Subsequently calculated mean values prove constantly increasing differences between *t2* ($M=3.78$, $SD=.79$), *t3* ($M=4.26$, $SD=.81$) and *t4* ($M=4.69$, $SD=1.07$) in the dependent variable. Thus, H0 was discarded in favour of H2d.

5.2.5 H2e: *Emotional Awareness* subscale

A highly significant effect was confirmed for the three-step temporal factor ($F(2,400)=33.52$, $Eta^2=.14$, $p<.001$). Likewise, a highly significant effect was confirmed for the covariate ($F=38.37$, $Eta^2=.09$, $p<.001$). Finally, calculated mean values show constantly increasing differences between *t2* ($M=4.42$, $SD=.91$), *t3* ($M=4.84$, $SD=.69$) and *t4* ($M=5.21$, $SD=.86$) in the dependent variable. Accordingly, the H0 could be rejected in favour of the H2e.

5.2.6 H2f: *Self-regulation* subscale

A highly significant effect was found for the three-level temporal factor ($F(2,400)=41.22$, $Eta^2=.17$, $p<.001$) and the covariate ($F=102.14$, $Eta^2=.20$, $p<.001$)

proves. Calculated mean values illustrate constantly increasing differences between *t2* (*M=3*.76, *SD=.*90), *t3* (*M=4*.29, *SD=.*90) and *t4* (*M=4*.73, *SD=1.*12) in the dependent-variable. Thus, H0 was rejected in favour of H2f.

5.2.7 H2g: *On-body listening* subscale

A highly significant effect was found for the three-step temporal factor ($F(2,400)=32.59$, $Eta^2=.14$, $p<.001$). Likewise, a highly significant effect was found for the covariate ($F=83.80$, $Eta^2=.17$, $p<.001$). Finally, calculated mean values show constantly increasing differences between *t2* (*M=3*.63, *SD=*.84), *t3* (*M=4*.13, *SD=.*94) and *t4* (*M=4*.53, *SD=1*.06) in the dependent variable. Accordingly, H0 was rejected in favour of H2g.

5.2.8 H2h: *Trust* subscale

A highly significant effect was found for the three-level temporal factor ($F(2,400)=24.16$, $Eta^2=.11$, $p<.001$) and the covariate ($F=43.25$, $Eta^2=.10$, $p<.001$). Mean comparisons reveal constantly increasing differences between *t2* (*M=4*.14, *SD=1*.04), *t3* (*M=4*.60, *SD=.*96) and *t4* (*M=4*.98, *SD=1.*11) in the dependent-variable. For this reason, H0 was discarded in favour of H2h.

5.3 Review of H3

The statistical test of H3 was carried out by a two-factor univariate variance analysis. First, the effect of the intervention time from three measurement time points (*t2*, *t3* and *t4*) was examined as UV1 on the AV. Then the effect of the *meditation position* (ordinally scaled mean of sitting meditation positions vs. lying, standing, walking meditation positions) was examined as UV2 on the AV (see chapter 4.1). Finally, it was statistically examined whether there was an interaction effect of these two factors on the AV. Analogous to the examination of H2, *t1* was not included in the evaluation because the mindfulness meditation could not yet take effect at the first measurement point (see Chapter 4.2).

The descriptive statistics show a total sample size of *N=144* participants at *t2.* Of these, *n=127* performed mindfulness meditation while sitting and *n=17* while lying down, standing or walking. At *t3,* the total sample size was *N=135* participants. Of these, n=120 practised mindfulness meditation while sitting and n=15 while lying down, standing or walking.

hen. At *t4,* the total sample size consisted of *N=125* participants. Of these, *n=* 113 practised mindfulness meditation while sitting and *n=12 while* lying down, standing or walking.

The variance homogeneity could only be partially confirmed by the Levene test. However, due to the robustness of the procedures, the statistical calculation could be continued (Bortz & Döring, 2006; Fantapié Altobelli, 2007). The following sub-chapters present the statistical findings of each subscale. In this way, the sub-hypotheses of H3 (see chapter 3.2) were tested in more detail.

5.3.1 Remark subscale

After Levene's test for equality of error variances, there was variance homogeneity (*F=1*.88, *p=*.098). A highly significant effect was found for the three-tailed temporal factor (*F*(2,398)=12.02, *Eta²* =.06 *p<*.001). However, no significant effect was found for the two-step meditation position factor (*F*(1,398)=.78, *Eta²* =.01 *p=*.378). Likewise, no significant interaction effect of the two factors could be proven (*F*(2,398)=.94, *Eta²* =.01, *p=*.392). Accordingly, only the effect of time became significant. The values constantly increase significantly with each further measurement time point. The meditation position has no significant influence on the subscale, which is why H3a was discarded and H0 was retained.

5.3.2 Non-Distraction subscale

Variance homogeneity was not present according to Levene's test (*F=14.*16, *p*<.001). No significant effect was found for the three-step temporal factor (*F*(2,398)=2.05, *Eta²* =.01, *p=*.130). In addition, no significant effect of the two-step meditation position factor was found (*F*(1,398)=3.50, *Eta²* =.01, *p=*.062). Finally, no significant interaction effect was found (*F*(2,398)=.19, *Eta²* =.01, *p=*.827.) The effect of time and the effect of meditation position did not significantly influence the subscale. For this reason, H3b was discarded and H0 was retained.

5.3.3 Do Not Worry subscale

According to Levene's test, there is no variance homogeneity (F=8.58, p<.001). No significant effect was found for the three-step temporal factor (*F*(2,398)=1.72, *Eta²* =.01, *p=.*181). However, a highly significant effect was found for the

two-level meditation position factor (F(1,398)=7.78, Eta^2 =.02 p<.01). No significant interaction effect of the factors could be clarified (F(2,398)=2.78, Eta^2 =.02, p=.063). Accordingly, only the effect of the meditation position became significant. Sitting meditation positions (*M=2*.42, *SD=1.*15) have a significantly stronger effect on the scores of the subscale *Do not worry* than lying, standing or walking meditation positions (*M=1*.96, *SD=.*88). For sitting meditation positions, a mean of *M=2*.01 (*SD=* .84) was evident at *t2*, a mean of *M=2*.48 (*SD=2.*16) at *t3* and a mean of *M=2*.82 (*SD=1.*31) at *t4.* For lying, standing and walking meditation positions, a mean value of *M=1*.94 (*SD=0.*88) emerged at *t2*, a mean value of *M=2.*16 (*SD=0.*91) at *t3 and* a mean value of *M=1*.75 (*SD=0.*88) at *t4.* The time factor, however, does not exert a significant influence on the subscale. The H0 could be rejected in favour of the H3c.

5.3.4 Attention-Regulation subscale

There was no variance homogeneity according to Levene's test (*F=4*.87, *p*<.001). A highly significant effect was found for the three-step temporal factor (F(2,398)=8.51, Eta^2 =.04, p<.001). However, no significant effect was confirmed for the two-step meditation position factor (F(1,398)=2.28, Eta^2 =.01 p=.132). A significant interaction effect did not become statistically clear (F(2,398)=.88, Eta^2 =.01 *p=.*417). Only a significant effect of the time factor was found. The values increase significantly with each further measurement time. The meditation position has no significant influence on the subscale, which is why H0 was retained and H3d was rejected.

5.3.5 Emotional Awareness subscale

According to Levene's test, there is no homogeneity of variance (*F=3*.12, *p*<.01). A highly significant effect was found for the three-step temporal factor (F(2,398)=8.98, Eta^2 =.04 *p<.*001). However, no significant effect was found for the two-step meditation position factor (F(1,398)=.05, Eta^2 =.01, *p=.*823). Finally, no significant interaction effect of the factors could be clarified (F(2,398)=1.05, Eta^2 =.01 *p=.*351). Accordingly, only the effect of time was significant. The values of the subscale increase significantly with each further measurement.

time point. The meditation position has no significant influence on the subscale, which is why H3e was discarded and H0 was retained.

5.3.6 Self-regulation subscale

Variance homogeneity was present according to Levine's test ($F=2.00$, $p=.077$). A highly significant effect was found for the three-step temporal factor ($F(2,398)=7.14$, $Eta^2=.04$ $p<.01$). However, no significant effect was found for the two-step meditation position factor ($F(1,398)=3.42$, $Eta^2=.01$ $p=.065$). A significant interaction effect was also not confirmed ($F(2,398)=1.31$, $Eta^2=.01$ $p=.272$). It could be shown that only the effect of time had become significant. The values of the subscales increase significantly with each further measurement time. The meditation position has no influence on the subscale, which is why H3f was discarded and H0 was retained.

5.3.7 Listening to the Body subscale

According to Levene's test, variance homogeneity could not be confirmed ($F=4.26$, $p<.001$). A highly significant effect was found for the three-step temporal factor ($F(2,398)=7.54$, $Eta^2=.04$, $p<.001$). However, no significant effect was confirmed for the two-step meditation position factor ($F(1,398)=2.02$, $Eta^2=0.01$, $p=.156$). Likewise, there is no significant interaction effect of the factors ($F(2,398)=.42$, $Eta^2=.01$, $p=.656$). The effect of time and the effect of meditation position have no significant influence on the subscale. For this reason, H3g was discarded and H0 was retained.

5.3.8 Trust subscale

Variance homogeneity was present according to Levene's test ($F=1.28$, $p=.27$). No significant effect was found for the three-step temporal factor ($F(2,398)=2.69$, $Eta^2=.01$, $p=.069$). Furthermore, no significant effect was found for the two-step meditation position factor ($F(1,398)=1.11$, $Eta^2=.01$ $p=.292$). Likewise, there is no significant interaction effect ($F(2,398)=2.62$, $Eta^2=.01$, $p=.074$). The effect of time and the effect of meditation position do not significantly influence the subscale, which is why H3h was discarded and H0 was retained.

5.4 Review of H4

The test of H4 was carried out by a cross-sectional comparison of *N=58* meditation-experienced and *N=66* non-meditation-experienced people. Since the two groups were two independent samples, the t-test for independent samples was chosen to test the difference between the group means. For this purpose, the values at one measurement point (*t1*), without prior intervention, were evaluated for each subscale of the *MAIA.* Subsequently, a correlative relationship between the correlation coefficient meditation experience and the AV was examined according to Spearman. The homogeneity of variance could only be partially confirmed. However, due to the robustness of the methods, the statistical calculation could be continued (Bortz & Döring, 2006; Fantapié, Altobelli, 2007). In the following, the results of each subscale are presented in order to test the sub-hypotheses of H4.

5.4.1 Remark subscale

There was variance homogeneity according to Levene's test (*F=3*.48, *p=*.064). There was a significant difference (*t*(122)=2.10, *p*<.05) between the mean values of the meditation-experienced (*M=4*.95, *SD=.*74) and non-meditation-experienced (*M=5*.25, *SD=.*85). The mean values of the non-meditation-experienced people show higher values compared to the mean values of the meditation-experienced people. A medium negative correlation between meditation experiences and noticing body sensations was proven (Sperman`s Rho *r=*-.24, *p<*.05). Since H4a was not statistically confirmed, it was discarded.

5.4.2 Non-Distraction subscale

According to Levene's test, there was no homogeneity of variance (*F=35*.62, *p*<.001). There was no significant difference (*t*(112.674)=1.56, *p=*.12) between the mean values of those who had experienced meditation (*M=1.*52, *SD=1.*13) and those who had not (*M=1*.93, *SD=1*.74). Furthermore, no significant correlation could be found between meditation experiences and the tendency to distract oneself from sensations (Sperman's Rho *r=*-.04, *p=.*689). Accordingly, H4b was discarded and H0 was retained.

5.4.3 Do Not Worry subscale

According to Levene's test, there was no homogeneity of variance (*F=11.*66, *p*<.01). A highly significant difference (*t*(121.044)=3.49 *p=*.001) between the mean values of the meditation-experienced (*M=2*.30, *SD=1.*11) and the non-meditation-experienced (*M=3.*08, *SD=1.*38) was proven. The mean values of the non-meditation-experienced persons showed higher values compared to the mean values of the meditation-experienced persons. A medium negative correlation between meditation experiences and the tendency not to worry due to feelings was proven (Sperman's Rho *r=*-.28, *p<*.05.). Accordingly, H4c could not be statistically confirmed, which is why it was rejected.

5.4.4 Attention-Regulation subscale

According to Levene's test, there was no homogeneity of variance (*F=6*.36, *p*<.05). No significant difference (*t*(120.912)=1.68, *p=*.10) was confirmed between the mean values of those who experienced meditation (*M=4.*56, *SD=.*89) and those who did not (*M=4*.86, *SD=1.*20). Furthermore, no significant correlation between meditation experiences and the tendency to distract oneself from sensations could be proven (Sperman's Rho *r=*-.18, *p=.*052). For this reason, H4d was discarded and H0 was retained.

5.4.5 Emotional Awareness subscale

According to Levene's test, there was variance homogeneity (*F=1*.96, *p=*.164). No significant difference (*t*(122)=1.24, *p=*.216) was found between the mean values of those who experienced meditation (*M=5*.15, *SD=.*71) and those who did not (*M=5*.32, *SD=.*82). No significant correlation was confirmed between meditation experiences and the awareness of an influence on bodily sensations and emotions (Sperman`s Rho *r=*-.16, *p=.*070). Accordingly, H4e was discarded and H0 was retained.

5.4.6 Self-regulation subscale

According to Levene's test, there was no homogeneity of variance (*F=6*.29, *p*<.05). There was no significant difference (*t*(119.531)=1.41 *p=*.161) between the mean scores of the meditation-experienced (*M=4.*62, *SD=.*90) and the non-meditation-experienced (*M=4*.88, *SD=1.*19). The result is a mean negative

correlation between meditation experiences and the ability to regulate sensations by directing attention (Sperman`s Rho r=-.18, p<.05). Consequently, H4f was discarded and H0 was retained.

5.4.7 Listening to the Body subscale

According to Levene's test, there was no homogeneity of variance (F=7.74, p<.05). A significant difference (t(119.602)=2.24, p<.05) between the mean values of the meditation-experienced (M=4.32, SD=.96) and the non-meditation-experienced (M=4.77, SD=1.26) was proven. The mean values of the non-meditation-experienced show higher values compared to the mean values of the meditation-experienced. A medium negative correlation was found between meditation experiences and the activity of actively listening to the body (Sperman`s Rho r=-.23, p<.05). Since H4g could not be confirmed, it was discarded.

5.4.8 Trust subscale

According to Levene's test, there was variance homogeneity (F=0.31, p=.580). A significant difference (t(122)=2.44, p<.05) between the mean values of the meditation-experienced (M=4.78, SD=.97) and non-meditation-experienced (M=5.23, SD=1.08) was proven. The mean values of the non-meditation-experienced persons show higher values compared to the mean values of the meditation-experienced persons. Furthermore, a medium negative correlation between meditation experiences and trust in one's own body became clear (Sperman's Rho r=-.29, p<.05). The H4h could therefore not be confirmed, which is why it was discarded.

6 Discussion

In the following, the relevant results and their interpretations are summarised in chapter 6.1. Then, in chapter 6.2, the methodological approach is critically reflected and discussed. In the process, recommendations are made for future studies in order to further investigate the topics dealt with empirically in the future. In the concluding chapter 6.3, practical implications and recommendations are made based on the findings of this research.

6.1 Summary and interpretation of the results

The statistical results from chapter 5.1 show that H0 was rejected in favour of H1. All sub-hypotheses (H1a-H1h) could be accepted. The interoceptive awareness scores improved significantly through the mindfulness-based brief intervention (see chapter 3.2).

What was striking about these results was that almost all subscales of the *MAIA* already showed significantly positive effects on the scores after a two-day intervention period of the mindfulness-based brief intervention (*t1* to *t2*). By the third day of intervention, these final values (*t2* to *t3*) were again significantly positively influenced for almost all subscales. Only the subscale *non-distraction* (H1b) could not clarify the significance of the upward trend through these measurement points (*t1* to *t2*, *t2* to *t3*). However, the scores of the *non-distraction* subscale show a significant increase after a three-day intervention period (*t1* to *t3*). This finding indicates that the scores of this subscale are more resistant to improvement by the eight-session brief intervention than the scores of other subscales. Furthermore, four out of eight subscales (*noticing, attention regulation, self-regulation* and *listening to the body*) showed a significant increase in the final scores of the third mindfulness meditation, by the fourth mindfulness meditation (*t3* to *t4*). It became clear that although the values of all subscales increase constantly with each further measurement point, the significance of the upward trend decreases over the course of the intervention. The following *figure 1* provides an overview of the mean comparisons of all subscales (H1) across the measurement points.

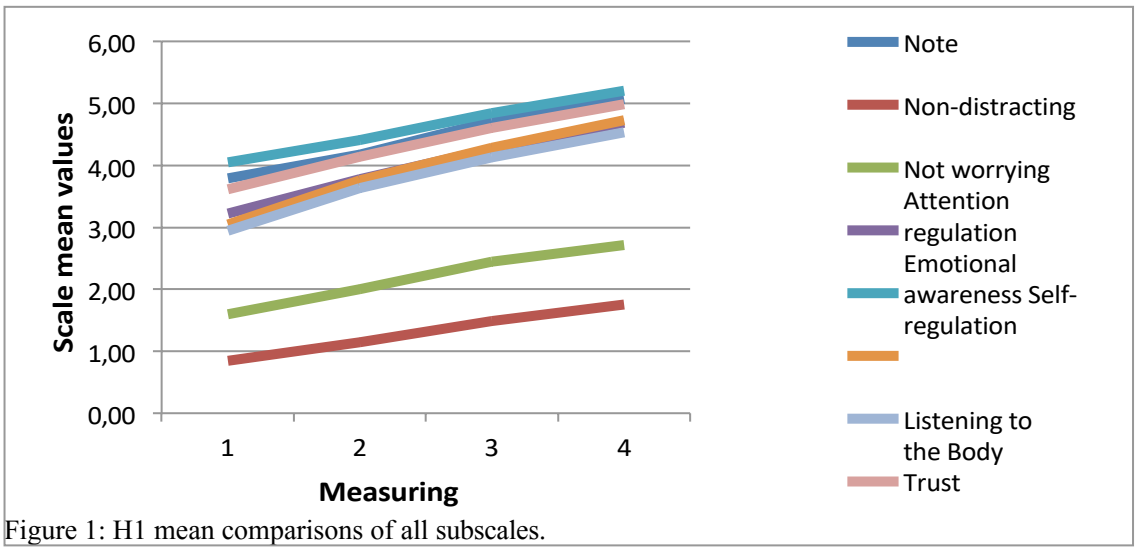

Figure 1: H1 mean comparisons of all subscales.

These empirical findings extend the findings of Zeidan et al. (2010). Their research results prove the effectiveness of a similar mindfulness-based brief intervention. They found that a four-day intervention significantly improved several psychological variables (see chapter 2.3.3.1; Zeidan et al., 2010). As the empirical findings of this research work made clear, interoceptive awareness could already be positively influenced by a significantly shorter intervention duration (see chapter 5.1).

Furthermore, the longitudinal findings of Bornemann et al. (2015) did not show a significant improvement in the scores of all subscales of the *MAIA.* Although the mindfulness-based intervention used there was much more comprehensive over three months, the scores of the subscales *Noticing, Not Distracting* and Not *Worrying did* not show any significant improvement (see chapter 2.3.3 Bornemann et al., 2015). Accordingly, these findings also indicate that the scores of the Do Not *Worry subscale* were more resistant to improvement compared to the scores of other subscales. The indication that Kabat-Zinn's *MBSR programme* could be an effective intervention to increase these scores was also given by Bornemann et al. (2015). As mentioned in chapter 2.3.1, *meditation on the breath from* the *MBSR programme* trains specific aspects of mindfulness (Schneider, 2012), which were summarised in the *component model* by Bishop et al. (2004) (see chapter 2.3.1). According to this, for example, the orientation of an accepting attitude towards unpleasant perceptions could increase the scores of the subscale *Do Not Worry (*Borne- mann et al., 2015). Although one intervention component of Borne- mann et al.'s study was oriented towards *meditation on the breath* (see Chapter 2.3.3; Bornemann, 2019, see Appendix p. XI), the mindfulness focus was only physical, in contrast to the mindfulness-based brief intervention of this research (see Appendices 11 and 12). Bornemann et al. note that purely physical interventions are not sufficient to significantly increase all dimensions of interoceptive awareness (Bornemann et al., 2015). The mindfulness-based brief intervention of this research is designed to positively influence multidimensional levels of awareness by establishing the *two-factor model of* Bishop et al. (2004) and other models (see Appendix 11) (see Chapter 4.5). From this

The reason could be a significant improvement of the scores of all subscales after statistical evaluation.

Using the statistical test from chapter 5.2, it was shown that H0 was refuted in favour of H2. All sub-hypotheses (H2a-H2h) could be accepted. The higher the intentional attention was assessed with regard to the attention-based brief intervention, the higher the values of the interoceptive awareness (see chapter 3.2). The values of all subscales show highly significant effects of the intervention time (*t2*, *t3* and *t4*) and the covariate intentional attention. By comparing the mean values of the different measurement points, a constant upward trend became clear through the values of all subscales. The following *figure 2* provides an overview of the mean comparisons (H2) of all subscales across the measurement points.

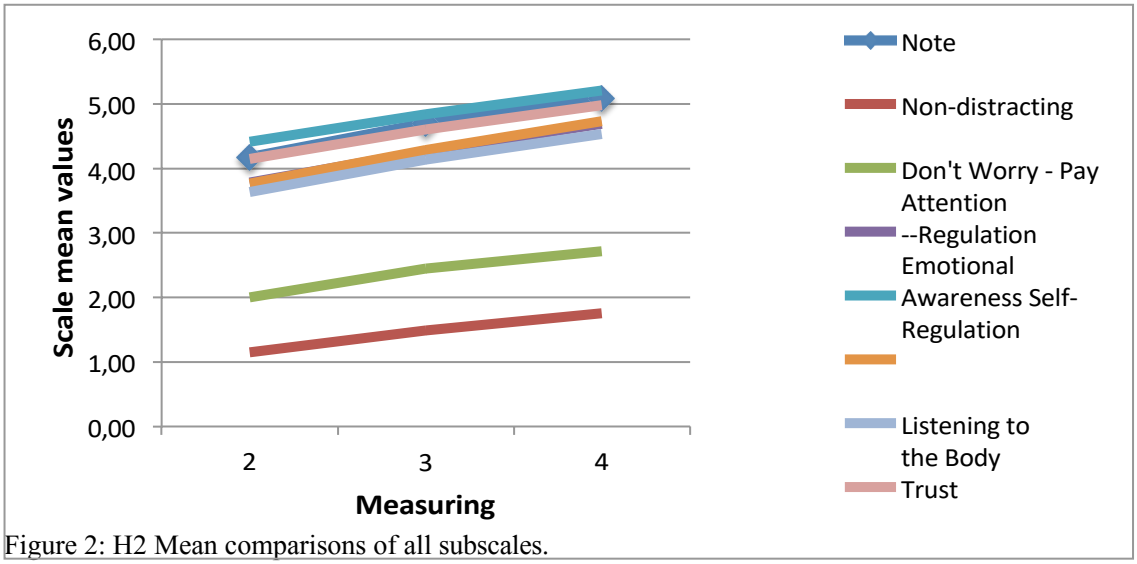

Figure 2: H2 Mean comparisons of all subscales.

This finding is in line with scientific findings from chapter 2.2.4.2. Intentional attention has been attributed a high significance in the context of mindfulness-based interventions (Tang, 2019; Heidenreich, Michalak, 2003; Kabat-Zinn, 2013). The fact that people with a high level of intentional attention make the greatest therapeutic progress in the course of a mindfulness-based intervention (see chapter 2.2.4.2; Kabat-Zinn, 2013) is also evident from the significant influence of the covariate.

The results from chapter 5.3 make it clear that only the values of one subscale could prove a significant effect of the meditation position (H3c): Sitting meditation positions (*M=2*.42, *SD=1*.15, *n=360*) have a significantly stronger positive effect on the scores of the subscale *Do not worry* than lying, standing or walking meditation positions (*M=1*.96, *SD=*.88, *n=44*). For sitting meditation positions, a mean of *M=2*.01 (*SD=*.84) was evident at *t2*, a mean of *M=2*.48 (*SD=2*.16) at *t3* and a mean of *M=2*.82 (*SD=1*.31) at *t4.* For lying, standing and walking meditation positions, a mean value of *M=1*.94 (*SD=0*.88) emerged at *t2*, a mean value of *M=2*.16 (*SD=0*.91) at *t3 and* a mean value of *M=1*.75 (*SD=0*.88) at *t4.* Analogous to the results of other subscales *(non-distraction* and *confidence*), however, it became clear that the three-step temporal factor (*t2, t3* and *t4*) did not prove any significant effects. The values of all other subscales could not prove any significant effects of the meditation position, which is why H3 could only be partially confirmed: Sitting meditation positions have a significantly stronger positive effect on the values of interoceptive awareness than lying, standing or walking meditation positions (see chapter 3.2). The following *figure 3* graphically depicts a comparison of mean values for the subscale "*not worrying" for sitting meditation* positions vs. lying, standing and walking meditation positions across the individual measurement points (*t2*, *t3* and *t4*).

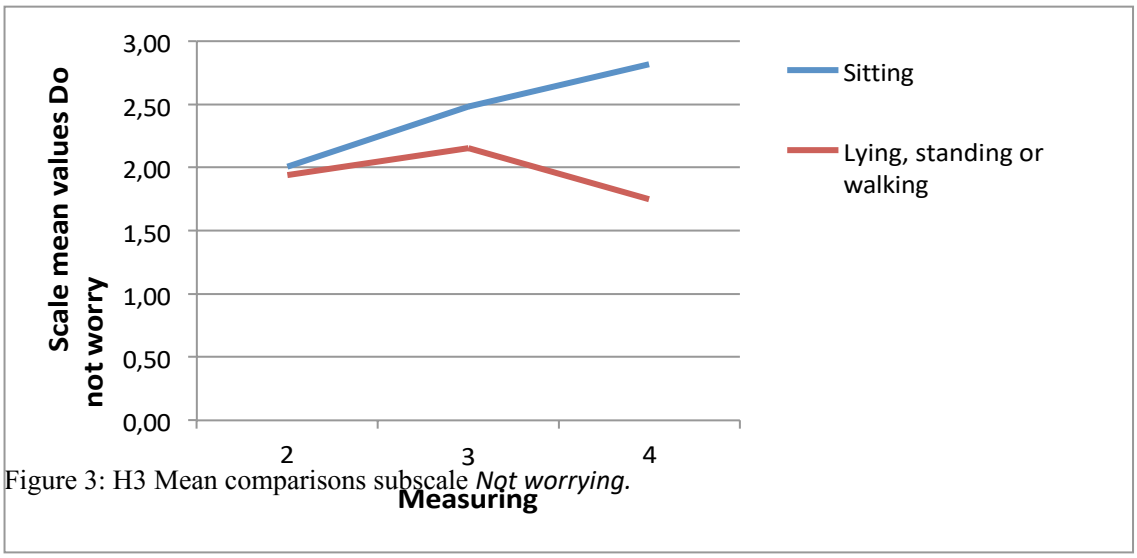

Figure 3: H3 Mean comparisons subscale *Not worrying.*

Although the three-step temporal factor does not show a significant effect, it is noticeable that the mean value decreases from *t3* (*M=2*.16; *SD=0*.91) to *t4* (*M=1*.75; *SD=0*.88) for lying, standing and walking meditation positions. It should be noted here that these findings are based on a small sample size (see chapter 5.3). Furthermore, it is possible that participants made changes to their original meditation position during the course of the mindfulness-based brief intervention. This calls into question whether a comparison of the mean values between the measurement points would promise meaningful findings. As can be seen in chapter 5.3, the ordinally scaled mean values of participants in sitting meditation positions (*M=2*.42, *SD=1*.15) were compared with participants in lying, standing or walking meditation positions (*M=1*.96, *SD=*.88) (see chapter 5.3). On the basis of the study of in- teroceptive awareness, it can therefore only be assumed that body awareness and mindfulness can be particularly increased in a sitting meditation position (see chapter 2.4). Empirical findings from embodiment research indicate that an upright posture (Reichwein, 2012), rather than the specific form of the meditation position, could be important for increasing interoceptive awareness. However, since this effect has not been explicitly investigated, this assertion is only a logical conclusion from existing empirical findings.

Due to the cross-sectional results of the group comparison of experienced and non-experienced meditators from chapter 5.4, the H0 was initially retained: Experienced meditators do not achieve significantly higher values of interoceptive awareness than non-experienced meditators. Based on the scores of the subscales *Non-Distraction*, *Attention-Regulation*, *Emotional Awareness* and *Self-Regulation,* there is no significant difference between meditation-experienced and non-meditation-experienced people. However, the scores of the *Noticing*, Not *Worrying*, *Listening* and *Trust* subscales show that non-meditation practitioners score significantly higher than meditation practitioners. The subscale *Confidence* (Sperman's Rho *r=*-.29, *p*<.05) shows the strongest effects. Based on these findings, H4 could not be confirmed, which is why it was discarded. The following *figure 4* shows the mean values of the experienced meditators (*M=4*.78; *SD=*.97) in comparison to the mean values of the non experienced meditators (*M=5*.23, *SD=1*.08).

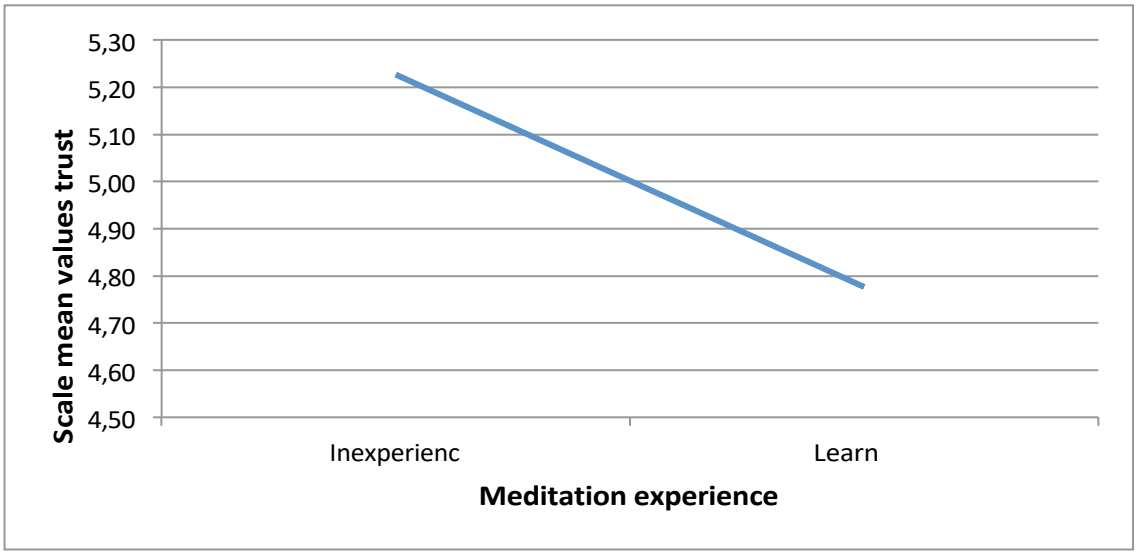

Figure 4: H4 Mean comparisons of *trust* subscales.

These results are not consistent with the cross-sectional findings presented. The empirical findings of Mehling et al. (2014) show higher values for four subscales of the *MAIA for those who are* experienced in meditation than for those who are not (see chapter 2.3.2). However, the sample of Mehling et al. (2014) consisted exclusively of pain patients, which is why a strong population restriction was made (Bornemann et al., 2014). However, the sample of the present research was intended to be as accurate a representation of the total population as possible, which is why there were no exclusion criteria for trial participants (see chapter 4.3). Other cross-sectional findings illustrating higher interoceptive awareness in medita- tion-experienced individuals (see Chapter 2.3.2) have measured AV under experimental influences through embodiment experiences (Xu et al., 2018) or not as a multidimensional construct (Sze et al., 2010). However, due to the finding that meditation practices significantly increase interoceptive awareness (see chapter 2.2; Bornemann et al., 2014; Hart, 1987; Kabat-Zinn, 1990; Mehling et al., 2012), it would be logical to assume that meditation experiencers achieve higher levels of interoceptive awareness than non-meditation experiencers. There are possible cognitive-psychological explanations for the fact that the results of the present research work did not confirm this causal conclusion: The subjective self-assessment of interoceptive awareness could have been distorted by anchor effects and feedback errors. These arise from the encoding of interoceptive perceptions and the recon-

struction of past self-evaluations (Pohl, Hardt & Eisenhauer, 2000). Since me- ditation trains interoceptive awareness (see chapter 2.2; Bornemann et al. 2014; Hart, 1987; Kabat-Zinn, 1990; Mehling et al., 2012), meditation-experienced individuals might have evaluated in- teroceptive perceptions more critically and accurately through past comparative values than non-meditation-experienced individuals. This could mean that non-meditation-experienced people have less experience with interoceptive perceptions and were not able to orient themselves to a cognitive comparison value during the self-assessment process. Higher values of interoceptive awareness among non-meditation-experienced people could have come about through the fascination with new unknown interoceptive perceptions.

6.2 Critical appraisal and Need for research

In order to sustain mindfulness research and the use of mindfulness-based interventions, there is a need to consider methodological difficulties (Davidson, 2010), which can be seen in Chapter 4. Although the research design used to test H1 and H2 is based on longitudinal data, no repeated measures were calculated. Since a conscious decision was made to observe trends in the measured values, the total sample size decreased across the measurement points. However, as already emphasised, a dependent data structure was available, which is why the entire sample size of all measurement points could be used statistically (see chapter 4). A repeated-measures design would have had the disadvantage that the total sample size would have been reduced from *N=182 test* participants (*t1*) to *N=125* test participants (*t4).* Due to this loss of more than 30 per cent of the original total sample size, it is assumed that the statistical effect sizes would also have been significantly reduced. To test this assumption, a comparison of the statistical findings from this research with results from a repeated-measures design could be useful. A total sample size of *N=125* participants would probably also have been a sufficient basis for a repeated-measures design.

As can be seen in chapter 4.2, interoceptive awareness was not measured *after the* first mindfulness meditation (*t1*). The question of whether mindfulness meditation would already have an effect after a single intervention can therefore not be answered on an empirical basis. However, a significant increase in the scores of all subscales from *t2* to *t3* became clear from the statistical results (see

Chapter 5.1). Only one mindfulness meditation was practised between these measurement points. Although only one mindfulness meditation was practised between the measurement points *t3* and *t4* (see chapter 4.2), not all subscales showed a significant improvement in the scores. However, it became statically clear that the significance of the upward trend decreases slightly over the course of the intervention (see Chapter 5.1), which explains these values. Bornemann et al. (2014) were also able to prove in their study that the intervention time only weakly influenced the changes in interoceptive awareness (see chapter 2.3.3). Accordingly, it is possible that interoceptive awareness can be significantly improved by a single session of mindfulness meditation. This hypothesis could be empirically tested in future studies.

In addition, more randomised and actively controlled longitudinal designs should be used in the future to investigate the effects of mindfulness-based interventions (Tang et al., 2015). As can be seen in appendices 6 and 9, participants were able to choose a meditation position during the mindfulness-based brief intervention according to their individual preferences. Since the participants were not subject to randomised group allocation (sitting vs. lying, standing or walking meditation positions), the respective group sizes could not be controlled. As was made clear in chapter 5.3, the descriptive statistics show a relatively small total sample size of *N=17* participants who practised mindfulness meditation while lying down, standing or walking. In the course of the mindfulness-based brief intervention, this total sample size was reduced to *N=12*. It is therefore questionable how representative this sample is with regard to the population (Bortz & Döring, 2006). At this point it should be emphasised again that interoceptive awareness describes a subjective process of perception (see chapter 2.1.1), which is why the use of a subjective survey instrument was necessary (see chapter 2.1.4; Mehling et al., 2012). However, due to the layout of the research design, it was not possible to investigate the effect of the meditation position through a group comparison of dependent samples (sitting vs. lying, standing or walking meditation positions). As shown in chapter 5.3, the effect of meditation position was measured by comparing the ordinally scaled mean of sitting meditation positions vs. lying, standing and walking meditation positions. Although this partially confirmed hypothesis H3, it is questionable what added value this would have.

statement promises practical implications. Due to the subjectivity of interoceptive consciousness processes (see chapter 2.1.1; Bornemann et al., 2015; Cameron, 2001; Craig, 2002; Mehling et al., 2012), prospective studies are recommended to test the effect of the meditation position by a group comparison of dependent samples.

As shown in chapter 5.4, the cross-sectional findings of this research do not give any indication of the different changes in in- teroceptive awareness of meditation-experienced and non-meditation-experienced people. Future studies could investigate a longitudinal comparison of interoceptive awareness processes of meditation-experienced and non-meditation-experienced people in more detail. Due to the cross-sectional findings not adopted for the time being (see chapter 6.1), these findings would probably be beneficial for further interpretations.

According to the current state of research, the *MAIA* is the only survey instrument that covers all dimensions of interoceptive awareness (Mehling et al., 2012). As explained in chapter 4.4, it meets the relevant quality criteria of psycho-diagnostic procedures (see chapter 4.4). However, the *MAIA* was designed for participants who had at least 20 hours of practical experience with body awareness exercises (Mehling et al., 2012). As the sample selection of this research was arbitrary (see chapter 4.2; Fantapiè Altobelli, 2007), participants without experience with body awareness exercises could also have been included. These could in turn have had difficulties in completing the *MAIA,* which is why the results from chapter 5 could be critically discussed. In addition, the arbitrary sample selection could be criticised by the fact that the interoceptive awareness values of some test participants were already strongly marked before the mindfulness-based brief intervention. This could have resulted in the difficulty of additionally increasing these high initial values through the mindfulness-based brief intervention (see chapter 2.3.3; Bornemann et al., 2015). However, the statistical findings of this research could not reflect this point of criticism.

Although the findings of this research (*H1, H2* and *H4*) are based on a comprehensive total sample size (see chapter 4.3), it is questionable whether the results of the internet experiment can be generalised to the entire population. Since the mindfulness meditation was only available to the participants as an audio format, it is not

(see chapter 4.2), it was not possible to control for possible confounding variables during the implementation (Huber, 2013). Although the dependent variable was determined by standardised questions of the *MAIA* (see chapter 4.4), the longitudinal data (see chapter 4.1) could have been distorted by the experimental situation (Birnbaum, 2004). For example, the participants could have been hindered in meditating by flatmates, noises from the environment or complications in playing the audio file. However, written instructions & recommendations for the meditation practice were given in advance (see Appendix 9), which should avoid possible interfering variables. However, the use of mindfulness meditation in audio format also promises relevant advantages. Bornemann et al. (2015) were able to empirically prove that the degree of integration of the intervention into everyday life strongly influences the increase in interoceptive awareness. Although external interfering variables could be better controlled within a classroom training, the participants would be bound by time and place. According to the empirical findings of Bornemann et al. (2015), this could reduce the statistical effect sizes. It is assumed that the degree of integration of a flexibly applicable audio meditation into everyday life is significantly higher than with a meditation course that is limited in time and space. In order to empirically investigate this assumption, future studies could use the mindfulness-based short intervention from this research within a classroom training.

Furthermore, it should be critically noted that a control group was not used in this bachelor thesis (see chapter 4.1). For this reason, possible interferences could not be controlled. For example, the results could have been distorted by expectations, personal preferences, motivational or personality traits (Tang, Hölzel & Posner, 2015). In addition, the statistical findings could have been influenced by conscious or unconscious incidental interventions. The use of control groups is recommended in order to separate out confounding factors, such as diet, sport or relaxation methods, from the meditation-specific effects.

In addition to the critical aspects of the applied research design listed so far, the concept of the mindfulness-based brief intervention (see Appendix 11) should also be critically examined. Nuyken (2019) assumed the possibility of mentally going through Piron's *five depth domains* in the process of mindfulness-based brief intervention (see Appendix 11). Although the findings from Chapter 5

no significant disadvantages of this experiential assumption, it could be criticised that it has never been empirically investigated (see chapter 2.2.3, Piron, 2019 see appendix pp. XII-XIII). Longitudinal studies could test this assumption through qualitative comparisons of different depth ranges during and after a meditation intervention, as well as across the lifespan.

During the implementation of the mindfulness-based brief intervention, the same mindfulness meditation was used daily (see chapter 4.2). This constant use is said to have many advantages: Changes in interoceptive awareness could largely be attributed to a consistent intervention measure. Thus, interoceptive conditioning could be due to the constant repetition of the same intervention. Confounding of conditioning by the intervention time and conditioning by the varia- tions of the intervention measure are therefore excluded. Ultimately, the intention of this research was to make mindfulness meditation accessible to a large part of the population in a user-friendly way as an intervention that can be implemented daily (see Chapter 1). For most people, implementing a consistent meditation practice is likely to be easier than varying meditation practice. Although the implementation of the same mindfulness meditation promises many benefits, mindfulness meditations that build on each other in terms of content could also be a possible intervention measure. As explained in chapter 2.3.3.1, Zeidan et al. (2010) also used mindfulness meditations that build on each other as an intervention measure within a mindfulness-based classroom training. Future empirical studies could investigate the effects of varying the content of a mindfulness-based brief intervention on interoceptive awareness. In order to avoid confounding by the intervention time and the variations of the intervention measure, control groups would have to be used (Bortz & Döring, 2016; Tang et al., 2015).

Finally, it should be emphasised that the differential results of the *MAIA* subscales indicate the need for a multi-dimensional assessment of interoceptive awareness (Bornemann et al., 2015). Further research findings could encourage further refinement of the conceptualisation of interoceptive awareness (Mehling et al., 2012). Neuroscientific studies have the advantage of being able to more precisely assess changes in the activity and structure of the brain.

(Ott, 2010). In combination with experimental conditions, the resulting findings would certainly promise more comprehensive insights.

According to Ott (2015), states of consciousness change after a few weeks without meditation, which is why interoceptive consciousness is not a change-resistant structure. According to Mehling et al. (2012), interoceptive awareness deteriorates with longer breaks in intervention. Accordingly, it would be relevant from a clinical and health perspective to investigate how long the values of interoceptive awareness remain constant after a significant increase without a continued intervention. Following this research approach, it could additionally be investigated what a long-term intervention would have to look like in order to maintain the values of interoceptive awareness. Ultimately, meditation research could benefit from findings regarding the influence of the sincerity of the body pose in order to publish practical implications.

6.3 Implications for the practice

Due to the significant positive effect of the mindfulness-based brief intervention on interoceptive awareness (see chapter 5.1), it is advocated for clinical and empirical use. An intervention duration of at least three days is recommended in order to have a significant positive effect on all dimensions of interoceptive awareness. The covariating effect of *intentional attention* (see chapter 5.2) should not be disregarded in the practical use of mindfulness-based brief interventions. The self-assessed intentional directing of attention to the mindfulness-based brief intervention exerts a significant positive influence on interoceptive awareness (see chapter 3.2). Motivational psychological measures that train discipline and self-control (see chapter 2.2.4.2; Spicker, 2016) could have an additional positive influence on interoceptive awareness. Whether a specific meditation position can actually be advocated for increasing interoceptive awareness is questioned. In line with embodiment research, it is assumed that the sincerity of the meditation position (see chapter 2.4; Reichwein, 2012) and not the specific form of the meditation position could be important for increasing interoceptive awareness.

7 Conclusion

The present empirical research aims to extend consciousness research by adding it to a chain of studies on mindfulness and meditation. The effects of a mindfulness-based brief intervention on interoceptive awareness were investigated. In addition, the influence of the intensive attention and the meditation position on the interoceptive awareness was examined in the course of the mindfulness-based brief intervention. Finally, the question was investigated whether there is a significant difference between meditation-experienced and non-meditation-experienced people with regard to interoceptive awareness.

Short pause, big effect? The assumption that interoceptive awareness is significantly improved by the mindfulness-based short intervention was confirmed. Seven out of eight dimensions of interoceptive awareness could be significantly positively influenced by a two-day intervention of a 20-minute mindfulness meditation. All dimensions were significantly positively influenced by a three-day intervention (see chapter 5.1). Empirical findings that examined the change in interoceptive awareness through a significantly longer and more comprehensive mindfulness-based intervention did not show a significant increase in all dimensions (see chapter 2.3.3, Bornemann et al., 2014). The mindfulness-based brief intervention that was carried out as part of this research work can therefore be evaluated as very effective for increasing interoceptive awareness. Accordingly, it is advocated for clinical and empirical use. Furthermore, it has been confirmed that a high level of intentional attention to the mindfulness-based brief intervention has a significant positive influence on all dimensions of interoceptive awareness. For the clinical and empirical use of the mindfulness-based brief intervention to increase interoceptive awareness, the positively influencing effect of intentional attention should therefore not be disregarded.

The assumption that sitting meditation positions in the mindfulness-based brief intervention have a significantly stronger positive effect on interoceptive awareness than lying, standing or walking meditation positions could be partially confirmed. Only one of a total of eight dimensions of interoceptive awareness was significantly more strongly influenced by a sitting meditation position.

positively influenced than by a lying, standing or walking meditation position. However, these findings are based on independent sample groups. For this reason, the relevance of a specific meditation position to increase in- teroceptive awareness continues to be questioned.

The last assumption, according to which meditation-experienced people demonstrate a significantly higher interoceptive awareness than non-meditation-experienced people, was not confirmed. On the contrary: four dimensions of interoceptive awareness made it clear that non-meditation-experienced people achieve higher values than meditation-experienced people. In line with empirical research results, these findings point to the subjectivity of interoceptive consciousness processes. As Mehling et al. (2012) have already pointed out, interoceptive consciousness is influenced by higher-order attribution processes, which could justify these results.

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Annex directory

Annexes

Appendix 1: Interview protocol 1

Bornemann, B. 06.05.2019. Written interview with Jana Nuyken.

Dr. Boris Bornemann (post@borisbornemann.de); psychologist and meditation researcher; translator of the Multidimensional Assessment of Interoceptive Awareness (MAIA) into German.

N. J.: "Can meditation generally be described as a mindfulness-based intervention?

B. B.: "Yes."

N. J.: "Within your longitudinal meditation research you used the interventions "Breath Meditation" and "Body Scan". Did you use the MBSR programme as a scientific basis for this?"

B.B.: "Yes."

N. J.: "Can "Breath Meditation" be summarised as a mindfulness meditation with a focus on the b r e a t h and the body?

B. B.: "Yes."

N. J.: "Can your three-month intervention (2014) be described as a mindfulness-based intervention?"

B. B.: "Yes."

Appendix 2: Interview protocol 2

Ott, U. 12.04.2019. Written interview with Jana Nuyken.

Dr Ulrich Ott (ulrich.ott@psychol.uni-giessen.de), Bender Institute of Neuroimaging, Gießen; psychologist and meditation researcher.

N. J.: "Why is the direct address *You* used within most meditations and why is this recommended?"

O. U.: "In meditation instructions, the *you is* often used because it conveys a greater closeness and familiarity. *It* just sounds very distant and alienating when you are led by a voice into the private world of inner sensations."

N. J.: "I have read that interoceptive information runs centrally via blood flow, cranial and spinal nerves into the cortex. Which area is particularly affected? The somatotopi- cal and anterior insular cortex ?"

O. U.: "The information from the internal organs (visceral afferents) converge in the ante- rior insula. The somatotopic cortex forms a map of the body, mainly based on the sensory cells in the skin (homunculus)."

Appendix 3: Interview protocol 3

Mehling, W. 05.05.2019. Written interview with Jana Nuyken. Mr Wolf Mehling M.D. (Wolf.Mehling@ucsf.edu) Osher Center for Integrative Medicine, University of California; author of the Multidimensional Assessment of Interoceptive Awareness (MAIA).

N. J.: "Is it right that Interoceptive Awareness describes only the viscerоception and not the proprioception because of neuroanatomical discrepancies?"

M. W.: "Interoception's definition is not that sharp, some use a narrow, some a broader definiti- on. The MAIA is only about what you feel or sense and are aware of; the very most of proprio- ception is unconscious."

N. J.: "Is it right that a comprehensive pretest confirmed that the MAIA meets all three main quality criteria of psychodiagnostic procedures? Can I conclude that your field test with a self-managed online survey, confirm the objectivity and reliability of the MAIA ?"

M. W.: "With self-report questionnaire we do not speak about "objectivity". WE only talk about validity and reliability.Validity is confirmed with FA, comparison to other instruments, and sensitivity to change. Reliability is confirmed by test-retest (we did not perform that but others did) and by Cronbach's alpha (we did that)."

N. J.: "Can you please tell me more about construct validity of the MAIA?"

M. W.: Construct validity was confirmed by factor analysis, correlations with other scales (con- vergent and discriminatory validity: pre-test hypothesis, is it confirmed), sensitivity to change. More details are published in the original paper of 2012.

Appendix 4: Interview protocol 4

Piron, H. 13.04.2019. Written interview with Jana Nuyken.

Dr. phil. Dipl.-Psych. Harald Piron (H.Piron@web.de), psychotherapist, meditation researcher and author of The Deep Realms of Meditation.

N. J.: "In which research work of yours is your phase model of meditation to be found? I can only find this summarised on a secondary literature basis in books and would very much like access to your original source."

Piron, H: "The publication is called "Meditation und ihre Bedeutung für die seelische Gesundheit". BIS-Verlag, Oldenburg, 2003. BIS is the university publishing house of the University of Oldenburg (...) You can use the page numbers of the pdf document, they correspond to the printed book (...) However, I must point out that it is not a phase model in the true sense. Similar deep items (verbalised meditation experiences) are grouped by means of cluster analysis. The result is 5 depth ranges. The raters were meditation experts (authorised teachers of different traditions). They were asked to assign a depth value between 1 and 5 to each item. The agreement was highly significant.

It would be logical to assume that the depth ranges are passed through in order, but this has not been verified. Incidentally, emergent logic applies: the previous depth range (obstacles reversed) is integrated. This means, for example, that freedom from obstacles and relaxation are still present in deeper meditations, but are supplemented by new qualities (e.g. devotion or joy)."

Appendix 5: Max Planck Institute for Human Cognitive and Brain Sciences (2016). The ReSource Project; Background, Design, Samples, and Measurements, 2, p. 48

Exclusion criteria for the study were as follows:

. Not between 20 and 55 years old

. Regular spiritual practice in the last 2 years

. Regular meditation practice in the last 2 years, participation in meditation retreats

. (...)

Appendix 6: Relevant additions made to the questionnaires

Personal information in questionnaire 1 (t1):

- "Gender" by dropdown selection: "male, female, other".
- "Age" through open test input
- "Highest educational attainment" by drop-down selection: "Doctorate or higher, university/technical college degree, completed training, A-levels, university entrance qualification, Realabschluss (mittlere Reife), Haupt-/Volksschulabschluss, other".
- "Current occupation" by drop-down selection: "Occupation, student, pupil, pensioner, housewife, voluntary social year, voluntary work, unemployment, other".

Additions made to questionnaires 2, 3 and 4 (t2, t3 and t4):

- Question on intentional attention: "How intensively did you want to engage in the mindfulness meditation?" Answer by horizontal selection: "0 (not at all) - 5 (I wanted to be very present)".
- Question on meditation position: "In which physical position did you perform the meditation?" Answer by dropdown selection: "sitting on chair/armchair/couch, sitting on floor (with/without meditation cushion), sitting in lotus position (with/without variation), lying down, standing up, walking".

Appendix 7: Distribution of the study in social networks

HOCHSCHULE FRESENIUS
UNIVERSITY OF APPLIED SCIENCES

Empirisch psychologische MEDITATIONSFORSCHUNG !!!

Ich suche Teilnehmerinnen und Teilnehmer, die an meiner empirischen Studie zu Meditation, Achtsamkeit & Bewusstsein teilnehmen !

Die Studie besteht aus einer täglichen Achtsamkeitsmeditation (Audiodatei) und einem Fragebogen. Diese beiden Elemente müssen an vier aufeinander folgenden Tagen im Zeitraum vom 5.April bis zum einschließlich 14.April bearbeitet werden. Dafür sende ich nach Anmeldung per Mail, an die Teilnehmer/innen vor Teilnahmebeginn, eine separate E-Mail mit Anleitung raus.
Zeitaufwand 4mal täglich maximal 25 Minuten!

Warum teilnehmen?
-Auslosung unter allen Teilnehmern: 3x25€ direkt Überweisung (alternativ auf Wunsch-Spendenkonto z.B. Yoga Vidya e.V/ Kinderdorf Dar Bouidar Marrakech,...).
-Mit JEDER Teilnahme wird die empirische Forschung zur Meditation in einem neuen Feld wissenschaftlich unterstützt.
-einmalig kostenlos zugesendete Audiomeditation für die Erweiterung des eigenen Bewusstseins und Auswirkungen auf die persönliche Gesundheit.
-Der Teilnehmer erhält auf Wunsch nach Beendigung der Studie Zugriff auf die empirischen Ergebnisse.

Die Teilnahme ist freiwillig, vollkommen anonym & die Daten werden lediglich zu wissenschaftlichen Zwecken ausgewertet. Dabei können keine Rückschlüsse auf einzelne Personen gezogen werden. Bei dieser Studie wird höchster Wert auf Vertraulichkeit gelegt!

•Anmeldung (Betreff "Teilnahme"; Inhalt: Wunschzeitraum 4 Tage im Zeitraum 5.April bis einschließlich 14.April -> z.B. "5.April bis 8.April") bitte mit einer E-Mail an: nuyken.jana@stud.hs-fresenius.de

Herzlichen Dank,

Jana Nuyken

Studentin der Hochschule Fresenius

Angewandte Psychologie (B.Sc)

Appendix 8: Distribution of the study through notices

!! TEST SUBJECTS WANTED !!!

! for empirical meditation research !

!! inside psychology bachelor thesis !!!

Participate anonymously now, relax & win !

On 4 consecutive days

a short online questionnaire & a mindfulness meditation (20 minutes audio recording).

Participation period: 5 April up to and including 14 April.

Last opportunity to participate: is on 11 April.

Both elements (meditation and questionnaire) MUST please be sent to

4 FOLLOWING DAYS to be fully processed.

Draw among all participants: 3x25€ direct bank transfer

(alternatively to the desired donation account, e.g. Children's Village Dar Bouidar Marrakech,...).).

Registration by e-mail: nuyken.jana@stud.hs-fresenius.de

PLEASE INCLUDE YOUR REQUIRED START DATE IN YOUR REGISTRATION (see above)!443

nuyken.jana@stud.hs-fresenius.de (Specify start date 5-11 April) nuyken.jana@stud.hs-fresenius.de (Specify start date 5-11 April) nuyken.jana@stud.hs-fresenius.de (Specify start date 5-11 April) nuyken.jana@stud.hs-fresenius.de (Specify start date 5-11 April) nuyken.jana@stud.hs-fresenius.de (Specify start date 5-11 April) nuyken.jana@stud.hs-fresenius.de (specify start date 5.-11.April) nuyken.jana@stud.hs-fresenius.de (specify start date 5.-11.April) nuyken.jana@stud.hs-fresenius.de (specify start date 5.-11.April) nuyken.jana@stud.hs-fresenius.de (specify start date 5.-11.April) nuyken.jana@stud.hs-fresenius.de (specify start date 5.-11.April) nuyken.jana@stud.hs-fresenius.de (specify start date 5.-11.April) nuyken.jana@stud.hs-fresenius.de (specify start date 5.-11.April)

Appendix 9: E-mail for trial participants

Dear participant,

Thank you for choosing to participate in the following meditation study.

Your FOUR DAY MEDITATION PRACTICE BEGINS TOMORROW !

The daily time required for this is about 30 minutes.

Please read the following instructions on the study procedure in detail.

If you have any problems understanding the questionnaire, please send me an e-mail at: nuyken.jana@stud.hs- fresenius.de. In the next four days you will receive a short reminder by e-mail to participate in the study with the link to the online questionnaire and the audio file of the

mindfulness training.

meditation. After you have completed the study, your e-mail address will be deleted from the system.

Instructions for participants:

1. In the appendix you will find a 20-minute mindfulness meditation as an audio recording (for all four days).
2. The link below will take you to a short online questionnaire (for tomorrow).

IMPORTANT!

Both elements (meditation and varying questionnaire) MUST please be completed by you on **FOUR FOLLOWING DAYS.**

Therefore, it is to be noted that from your start date, you will complete the above described process exactly in FOUR FOLLOWING DAYS.

Day 1: First thing tomorrow, please fill out **the online questionnaire** completely.
THEN please consciously devote yourself to the **20-minute mindfulness meditation** (see appendix).
Day 2 to Day 4: Please **first** consciously devote yourself to the **20-minute mindfulness meditation** (see appendix). **THEN** please complete the **online questionnaire in** full**.**

Advice & recommendations for your meditation practice:

1. Please try to practise your meditation at the same time and place during the following four days in order to avoid distortions within the data evaluation.
2. Please find a quiet and safe environment for your 20-minute meditation practice. Make sure that you are undisturbed by external sources of disturbance (doorbell, telephone, flatmates, ...) for the next 20 minutes.
3. Make a conscious decision to do your 20-minute meditation practice and take precautions to avoid being pulled out of it (e.g. switch off your mobile phone, inform your flatmates, switch off the doorbell).
4. Before you start meditating, decide in which sitting position you would like to practise (1. sitting on a chair 2. sitting on the floor, if necessary with a meditation cushion 3. sitting in a lotus position, if necessary with variation 4. kneeling, if necessary with a small bench). Find a posture that makes you feel comfortable and at the same time mentally present, awake and concentrated. (Sitting on a chair is recommended for participants without meditation experience). IMPORTANT: Please do not change your meditation position during the 20-minute mindfulness meditation. Please

In the following days, take the same meditation position that you took on the first day.

5. Within the meditation, I will invite you for a direct and personal address with Address *you.*

Here you can access the first online questionnaire (for tomorrow):

Click here for the audio mindfulness meditation (for all 4 days):

Thank you very much for your participation!
I wish you a good start in your meditation practice for TOMORROW!
(Please remember: only on day 1 (tomorrow) fill in the questionnaire first, then practise the meditation. On day 2 to 4 the order is reversed; see above).

Kindest regards,
Jana Nuyken
Student at Fresenius University of
Applied Sciences Applied Psychology
(B.Sc.) nuyken.jana@stud.hs-
fresenius.de

Appendix 10: Basic Conditions of Mindfulness Meditation

The operationalisation of mindfulness meditation is based on Cardoso et al.'s (2004) *five characteristics of meditation.* Since the content of mindfulness meditation integrates the *two-component model of* mindfulness by Bishop et al. (see Appendix 11), the mindfulness meditation used is based on defined behavioural rules. For this reason, the *first characteristic of a meditation* by Cardoso et al. (2004) could be fulfilled. Within the mindfulness meditation, the instruction manual (see Appendix 12) focused on psychophysical relaxation. This also enabled the *second characteristic of meditation to be* fulfilled. Through this relaxation process, as well as the perception and distancing of thoughts, a mental state of relaxation should also be achieved. The meditator should not cognitively focus on expectations during mindfulness meditation and observe psychophysical processes in a value-free way. By integrating these aspects, the *third characteristic of meditation* is also fulfilled (Cardoso et al., 2004). As already described, mindfulness meditation is based on certain basic qualities. It is therefore assumed that mindfulness meditation could also be practised independently without an instructor. Zeidan & Vago (2016) also found that the techniques used in mindfulness meditation can be practised by the general population (Zeidan & Vago, 2016). Accordingly, the *fourth characteristic of meditation is* also

according to Cardoso et al. (2004). The directing of attention to the breath, an important characteristic of mindfulness (Bishop et al., 2004), was integrated into the instruction of mindfulness meditation. This positive anchoring also fulfils the *fifth characteristic of meditation (*Cardoso et al., 2004).

Appendix 11: Concept of Mindfulness Meditation

The general concept of mindfulness meditation used is based on the *two-component model of mindfulness* by Bishop et al (2004). According to this model, the components of mindfulness meditation are *self-regulation of attention* and *orientation to experience* (Bishop et al., 2004). Both components were integrated into the mindfulness meditation of the present research. *Self-regulation of attention* was incorporated into the mindfulness meditation by focusing on a meditation object. Within the mindfulness meditation, the concentration on one's own breath was repeatedly introduced. The perception of cognitions, emotions and physiological sensations should not be evaluated. Being present in the present moment was focused on several times within the mindfulness meditation to regulate attention: "The time in the here and now, the only time that really counts is now and here" (Nuyken, 2019, 0:35-0:42; see Appendix 12). After establishing the presented aspects as the first component of mindfulness meditation, the aspects of the second component were integrated. *Orientation to experience* characterises an inner and accepting attitude towards one's own perceptions (Bishop et al., 2004). "Everything that is and everything that comes may be and is right" (Nuyken, 2019, 1:46-1:51; see Appendix 12). As this *open awareness* should lead to an increase in body awareness (Lutz et al., 2008), aspects of this, alongside aspects of *focused attention,* were integrated into the mindfulness meditation.

In order to optimise the quality of the content of mindfulness meditation, the *five depth areas of meditation* by Piron (2003) were included in the concept of mindfulness meditation. It was assumed that it would be possible to systematically go through individual depth ranges during and after mindfulness meditation. Through the integration of the deep areas, the individual state of consciousness of the participants was to be positively influenced. The intention was to positively influence the interoceptive consciousness (AV) through the deepest possible state of consciousness. At the same time, contrary qualities of previous depth ranges were integrated in the course of the instruction. As described in the chapter
2.2.3 of this bachelor thesis, "reversed polarity depth ranges", such as
Obstacle freedom and relaxation present in further depth ranges (Piron, 2019, cf.

Appendix pp. XII-XIII). For this reason, new qualities such as *devotion* and *trust were* added to the mindfulness meditation: "You are safe, you may trust" (Nuyken, 2019, 8:53-8:59; see Appendix 12). The following is an example of how Piron's (2003) *five deep areas of meditation* have been incorporated into the systematic concept of mindfulness meditation. In order to overcome the first depth range of *obstacles* as quickly as possible, the modera- tion of mindfulness meditation is very flowing at the beginning. Moderation pauses are limited to a few seconds and were also deliberately minimised in quantity. The volume of the speech is slightly increased compared to the rest of the instruction. The dynamics of voice frequency and expression were also deliberately focussed within the instruction. Physical and mental obstacles such as boredom, fatigue and motivational difficulties are to be overcome (Piron, 2003). By directly addressing the participants at the beginning of the instruction, they were motivated to participate intentionally: "Welcome to your private time-out" (Nuyken, 2019, 0:04; see Appendix 12). Test participants who have already overcome the first obstacle area before the start of the mindfulness meditation are to be invited into a state of *relaxation.* Subsequently, the second deep area of physical and mental *relaxation* was focused on in the further course of instruction. The participants were asked to notice the flow of their breath and the physical sensations associated with it, such as the expansion of the lungs. In this part of the mindfulness meditation, participants who were already in a state of relaxation were guided into the third depth range, the *personal self.* Participants were asked to take on the role of a distancing observer. In the further course of the instruction, the participants were not supposed to identify with the thoughts and sensations that arose. Extended moderation sessions can evoke processes of deep *transpersonal qualities in* the further course of the mindfulness meditation. For example, test participants could perceive energy perceptions or the dissolution of the sense of time in the fourth depth range. At the same time, subjects can be guided into the deepest state of consciousness *Transpersonal Self* through longer pauses in facilitation. The following aspects of facilitation are specifically aimed at perceiving the fusion of subject, object and the meditation process:
"connect with who you really are" (Nuyken, 2019, 11:16-11:20; see Appendix 12).

Appendix 12: Instruction Manual of Mindfulness Meditation

Welcome to your private time-out! The following 20 minutes are intended for you, your holistic well-being, your health and also for individual personal intentions. *Short break.* This time is dedicated only to you. *Short break.* Gently close your eyes and become aware that you have already prepared yourself for this meditation.

practice. *Short break.* The time in the here and now, the only time that really counts now and here. *Short break.* You have adopted a sitting position that is optimal for you, in which you feel comfortable, relax more and more and at the same time are mentally awake and present with concentration. Perhaps this is your first meditation. Or maybe you already have some meditation experience. It doesn't matter. What matters now is this eye gaze. What counts now is this moment, with all that is. Try to let go of all ideas, concepts and expectations of this meditation practice and of yourself. *Short pause.* There is no right and no wrong here and now. There is no better and no worse here and now. Everything that is and everything that is to come may be and is right. *Pause.*

Notice your natural breathing. Notice how your lungs fill with the inhalation and how your lungs empty again with the exhalation. *Short pause. Take* on the patient and non-judgemental role of a detached observer. *Pause*. Notice what you can perceive in the present moment in terms of sensations, feelings and thoughts, without losing yourself in them, without identifying with them. What is there? What is present right now? *A short pause.* Everything is allowed to be. Everything is okay. You are only the observer and perceive what is there right now. *Pause.*

Your breath is your anchor. Your breath always brings you back to the present moment and connects you with who you really are. *Pause.* Notice how your lungs fill with the inhalation and how your stream cover gently lifts. With the exhalation you let go and become completely empty. With the inhalation notice the cool air at the tip of your nose and the wings of your nose and with the exhalation let the warm, old and used air flow out again. Let the breath flow naturally. *Pause.*

With your eyes closed, consciously perceive the place where you are at the moment. Imagine the room and everything that is around you. What do you see in your mind's eye? *Pause for a moment.* Inhale deeply and exhale completely. *Short pause*. Can you perhaps still perceive sounds and smells from outside? *Short pause.* Everything you can perceive right now is correct and may be part of your meditation practice. Breathe in deeply and breathe out completely. *Short pause.* Can you taste something? Be very mindful and observe any perceptions very attentively and patiently. Connect with your breath again and again, with every single breath. *Short pause.* How does your skin feel? How does your skin feel in contact with the air? *Pause.*

Focus your attention on your physical body. How does your body feel right now? All that is now, may be now. Feel into any physical sensations that arise to learn from your own body. What is present right now? *Short pause.* Try to accept everything and not judge anything. *Pause.*

Try not to judge anything and not to identify with any sensations that arise. Continue to breathe naturally while observing in a non-judgemental way. *Pause.* By

If you relax more and more physically, the emotions that arise will also regulate themselves. You don't have to actively change anything now. You don't have to do anything now. You can just be. *Pause.* Feel the weight of your own body and connect with the ground beneath you. You are safe, you may trust. *Pause.*

Be aware of every breath. Each inhale and each exhale. *Breath audible*. No breath can ever be repeated. Each breath is unique and a gift to you, it is the life within you. How does your breath flow? *Pause.* You don't have to do anything, you don't have to change anything. You may observe and perceive in a non-judgemental way. You may perceive how you are breathing right now, how everything comes, how everything goes. Just observe, completely patiently and without judgement. Sensations, thoughts, feelings, ... Everything is allowed to be. Everything is right. Don't hold on to anything. *Pause.*

Keep returning to your breathing and connect with who you really are. Breathe in and breathe out. Breathe in and breathe out. Breathe in and breathe out. Open yourself to the experience that everything is allowed to come and everything is allowed to go, that nothing remains. Explore this way of experiencing in a very mindful way. Connect more and more with your breath. *A short pause.* You don't have to control anything, change anything, improve anything. Accept for everything what is. Thoughts, feelings, sensations. Take an open and accepting attitude for everything that is. *Longer pause.*

Observe your mind, the state of your mind. Let the breath flow naturally and return to your breathing whenever your attention and awareness is distracted by something else. Do not hold on to anything. Everything is allowed to come, everything is allowed to go. *Longer pause.*

Inhale. *Audible.* Exhale. *Audible.* Breathe in and accept. Exhale and let go. Breathe in, open up. Exhale, let it all go. Breathe in and allow, say yes. Exhale and let go, become empty, be free. *Pause.* Your time in mindfulness. *Longer pause.*

Notice how your mind, body and heart feel. *Pause.* Let this meditation slowly come to an end by inwardly thanking yourself for taking the time to do something good for yourself. Thank yourself for using this time wisely for your overall wellbeing, your health and perhaps your individual personal intention. You may want to make a decision at this moment to take this mindfulness into your everyday life. *Short pause.* Notice the contact with your sitting surface, with the floor. Notice how you can continue this mindfulness in every moment of your everyday life as you slowly open your eyes and move your body.

Appendix 13: Exploratory data analysis

Table 1: Descriptive statistics

Subscale	Mean value	Std. deviation	Skew	Kurtosis
Note	4,3690	1,12945	-1,113	1,301
Non-distracting	1,2622	1,24252	0,585	-0,078
Don't worry	2,1308	1,19938	0,184	-0,303
Attention regulation	3,9135	1,11163	-0,350	0,003
Emotional Awareness	4,5700	1,14449	-1,250	1,716
Self-regulation	3,8669	1,24687	-0,441	-0,329
Listening to the Body	3,7270	1,19994	-0,234	-0,306
Trust	4,2645	1,28886	-0,799	0,210

Table 2: Supplementary tests for normal distribution

	Kolmogorov-Smirnova			Shapiro-Wilk		
Subscale	Statistics	df	Significance	Statistics	df	Significance
Note	0.137	586	<.001	0.910	586	<.001
Non-distracting	0.135	586	<.001	0.946	586	<.001
Sich-Keine-Worry-Making	0.078	586	<.001	0.978	586	<.001
Attention-Regulation	0.078	586	<.001	0.980	586	<.001
Emotional Awareness	0.128	586	<.001	0.966	586	<.001
Self-regulation	0.083	586	<.001	0.976	586	<.001
On-life Listen	0.076	586	<.001	0.928	586	<.001
Trust	0.116	586	<.001	0.891	586	<.001

Appendix 14: Statistical Evaluation

Table 3: Test of homogeneity of variances based on the mean (H1).

Subscale	Levene statistics	df1	df2	Significance
Note	19.350	3	582	<.001
Non-distracting	13.664	3	582	<.001
Don't worry	12.057	3	582	<.001
Attention regulation	9.997	3	582	<.001
Emotional Awareness	31.101	3	582	<.001
Self-regulation	13.255	3	582	<.001
Listening to the Body	7.768	3	582	<.001
Trust	15.729	3	582	<.001

Table 4: Single factor ANOVA (H1).

Subscale	df1	df2	F	Significance
Note	3	582	46.706	<.001
Non-distracting	3	582	16.561	<.001
Don't worry	3	582	29.417	<.001
Attention regulation	3	582	64.410	<.001
Emotional Awareness	3	582	33.607	<.001
Self-regulation	3	582	69.652	<.001
Listening to the Body	3	582	66.500	<.001
Trust	3	582	37.929	<.001

Table 5: Robust test procedures for testing the equality of means (H1).

Subscale	Test procedure	F	df1	df2	Significance
Note	Welch test	44.828	3	319.187	<.001
	Brown-Forsythe	51.133	3	531.995	<.001
Non-distracting	Welch test	14.450	3	304.746	<.001
	Brown-Forsythe	15.985	3	469.984	<.001

To-be-no-Worry-Making	Welch test	25.310	3	307.644	<.001
	Brown-Forsythe	29.166	3	503.201	<.001
Attenti-regulation	Welch test	54.238	3	313.359	<.001
	Brown-Forsythe	66.000	3	530.941	<.001
Emotional-Awareness	Welch test	32.974	3	319.145	<.001
	Brown-Forsythe	37.536	3	504.249	<.001
Self-regulation	Welch test	58.854	3	315.445	<.001
	Brown-Forsythe	72.557	3	547.765	<.001
On-life Listen	Welch test	56.712	3	311.492	<.001
	Brown-Forsythe	66.963	3	524.959	<.001
Trust	Welch test	33.937	3	318.344	<.001
	Brown-Forsythe	40.277	3	563.344	<.001

Table 6: Test of homogeneity of variances based on the mean (H2).

Subscale	Levene statistics	df1	df2	Significance
Note	10.968	2	401	<.001
Non-distracting	15.832	2	401	<.001
Don't worry	13.094	2	401	<.001
Attention regulation	4.994	2	401	<.01
Emotional Awareness	11.170	2	401	<.001
Self-regulation	3.221	2	401	<.05
Listening to the Body	3.762	2	401	<.05
Trust	4.607	2	401	<.05

Affidavit

I hereby certify that I have written this thesis independently and without outside help and that I have not used any aids other than those indicated.

The passages in the work, including the tables and illustrations, which are taken from other works in terms of wording or meaning, have been marked in each individual case and the origin has been proven.

The work has not yet been submitted in the same or similar form to any other examination office and has not yet been published.

Hünxe, 17.06.2019 _____

Place, date Signature