

Subjective body awareness, interoceptive accuracy and well-being

Priska Emilia Pennanen
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Department of Psychology
University of Jyväskylä
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Department of Psychology

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Supervisor: Tiina Parviainen, PhD

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The relation between different interoceptive abilities and how they link with well-being is poorly understood. Further, the multidimensionality of subjective body awareness has rarely been considered. This study investigated firstly the relation of different aspects of subjective body awareness with interoceptive accuracy. Secondly, the relation between aspects of subjective body awareness as well as interoceptive accuracy with well-being was investigated.

Subjective body awareness was measured with five aspects from three different questionnaires. Interoceptive accuracy was measured with a heartbeat detection task. Well-being was measured with the individual's satisfaction with life and self. The relation of subjects ($n=37$) responses on questionnaires and performance on the heartbeat discrimination task was analyzed with Pearson's correlation coefficient and Multivariate linear regression analyses.

The first main result of this study was that two aspects of subjective body awareness associated in a statistically significant way with interoceptive accuracy. One aspect associate positively and the other negatively with interoceptive accuracy. The second main finding of this study was, that two aspects of subjective body awareness related significantly with measures of well-being. Both aspects related negatively with well-being. These two aspects were different from those, which related with interoceptive accuracy.

The results of this study indicate, that subjective body awareness and interoceptive accuracy can relate with each other. However, results do also imply, that aspects of subjective body awareness differ in if and how they relate with interoceptive accuracy. While high levels of one aspect of subjective body awareness associated with high interoceptive accuracy, high levels of another aspect of subjective body awareness associated with low interoceptive accuracy. Additionally, high or low levels of other aspects of subjective body awareness did not relate at all with levels of interoceptive accuracy. Further, results of this study support previous findings that increased subjective body awareness relates with diminished well-being.

Results highlight the need to investigate the nature and difference among aspects of subjective body awareness to bring clarification how they associate with the ability to accurately detect immediate body sensations. Further it needs to be investigated when subjective body awareness and interoceptive accuracy associate with increased or decreased well-being and when they do not associate at all with well-being.

Keywords: subjective body awareness, body vigilance, body awareness, private body consciousness, public body consciousness, body competence, interoceptive accuracy, heartbeat detection task, well-being

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Interoseptiivisten taitojen yhteydestä toisiinsa sekä hyvinvointiin on vähän tutkimustietoa. Lisäksi harva tutkimus on huomionnut subjektiivisen kehotietoisuuden eri aspekteja. Tämän tutkimuksen ensimmäinen tarkoitus oli tutkia subjektiivisen kehotietoisuuden eri aspektien yhteyttä interoseptiiviseen tarkkuuteen. Toiseksi, tässä tutkimuksessa tarkasteltiin niin subjektiivisen kehotietoisuuden eri aspektien kuin myös interoseptiivisen tarkkuuden yhteyttä hyvinvointiin.

Subjektiivista kehotietoisuutta mitattiin viidellä aspektilla kolmesta eri kyselylomakkeesta. Interoseptiivista tarkkuutta mitattiin sydämensyketehävällä. Hyvinvointia mitattiin tyytyväisyytenä itseensä ja elämäänsä. Koehenkilöiden (n=37) kyselylomakkeista saatujen pistemäärien sekä sydämensyketehävästä suoriutumisen yhteyttä analysoitiin Pearsonin korrelatiokertoimella sekä monimuuttujaisen lineaarisen regressioanalyysin avulla.

Tutkimuksen ensimmäinen päätulos on, että kahdella subjektiivisen kehotietoisuuden aspektilla oli tilastollisesti merkitsevä yhteys interoseptiiviseen tarkkuuteen. Yksi aspekti oli positiivisesti ja toinen negatiivisesti yhteydessä interoseptiiviseen tarkkuuteen. Tutkimuksen toinen päätulos on, että kaksi subjektiivisen kehotietoisuuden aspektia olivat tilastollisesti merkitsevästi yhteydessä hyvinvoinnin mittareihin. Molemmat aspektit olivat negatiivisesti yhteydessä hyvinvointiin. Nämä kaksi aspektia olivat eri kuin interoseptiiviseen tarkkuuteen yhteydessä olevat subjektiivisen kehotietoisuuden aspektit.

Tulokset antavat ymmärtää, että subjektiivinen kehotietoisuus ja interoseptiivinen tarkkuus voivat olla yhteydessä toisiinsa. Toisaalta tulokset viittaavat myös siihen, että subjektiivisen kehotietoisuuden aspektit eroavat toisistaan siinä, ovatko yhteydessä ja millä tavalla ovat yhteydessä interoseptiiviseen tarkkuuteen. Kun yksi kehotietoisuusaspektin korkeus oli yhteydessä korkeaan interoseptiiviseen tarkkuuteen, toisen kehotietoisuusaspektin korkeus oli yhteydessä matalaan interoseptiiviseen tarkkuuteen. Lisäksi toisten kehotietoisuus aspektien korkeudella tai mataluudella ei ollut lainkaan merkitystä interoseptiivisen tarkkuuden tasoon. Lopuksi tämän tutkimuksen tulokset tukevat aikaisempia tutkimuksia siinä, että subjektiivinen kehotietoisuus on yhteydessä heikkoon hyvinvointiin.

Tulokset korostavat tarvetta tutkia tulevaisuudessa lisää, miten subjektiivisen kehotietoisuuden eri aspektit eroavat toisistaan. Näin voidaan saada lisää tietoa siitä, miten subjektiivisen kehotietoisuuden eri aspektit ovat yhteydessä kehon tarkkaan aistimiseen. Lisäksi on tarpeen tuoda tutkimuksen avulla

tarkennusta siihen, milloin subjektiivinen kehotietoisuus ja tarkka kehon aistiminen ovat yhteydessä korkeaan tai matalaan hyvinvointiin ja milloin ne eivät ole lainkaan yhteydessä hyvinvointiin.

Avainsanat: Subjektiivinen kehotietoisuus, kehovalppaus, kehotietoisuus, yksityinen kehotietoisuus, julkinen kehotietoisuus, kehokompetenssi, interoseptiivinen tarkkuus, sydämensyke tehtävä, hyvinvointi

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INTRODUCTION

Sight, smell, hearing, taste and touch are traditionally recognized as the five human senses (Møller, 2003). These five senses receive information from the outside world and can be classified as exteroceptive senses. Contrarily to the exteroceptive senses, interoceptive senses perceive information from organs within the body. Relative to the exteroceptive senses, interoceptive senses have not been studied a lot empirically, although already early physiologists have considered interoceptive modalities (as presented by Craig, 2002: Weber, 1846; Sherrington, 1900; James, 1890). Earlier interoception has been referred to as only visceral awareness (Cameron, 2002; Vaitl, 1996). However, as there is evidence from functional anatomic studies that all sensations from the body are processed in the same afferent-neural system, a more recent definition of interoception suggests that it is ‘the sense of the (entire) physiological condition of the body’, i.e. not only the viscera, (Craig, 2002; Craig, 2004).

Garfinkel et al. (2015) devised a three-dimensional model of interoception, pointing out that there are different interoceptive processes. Together they are treated as interoceptive abilities. Garfinkel et al. called these three dimensions interoceptive sensibility, interoceptive accuracy, and interoceptive awareness. How these different interoceptive abilities relate with each other is not well known. It seems like there are also contradicting points of view on whether or not interoceptive abilities associate with well-being. For a long time an increased focus on physiological processes has been associated with mental distress, such as panic and anxiety (Schmidt, Lerew, & Trakowski, 1997; Cioffi, 1991). However, many interventions aiming at increasing well-being have made use of training sensitivity within the body (Mehling, 2011). They propose that awareness of the body is beneficial for health. Recent developments in the research field attempt to point out how sensing and consciously paying attention to the body can benefit well-being (Farb et al., 2015).

Interoceptive abilities represent awareness of internal body processes. There are however also other aspects to awareness of the body, such as paying attention to the appearance of the body and cognitive evaluation of the body (Miller, Murphy, & Buss, 1981). There is some evidence that a focus on the appearance of the body associates with interoceptive accuracy (Ainley & Tsakiris, 2013; Emanuelsen, Drew, & Köteles, 2015).

In the following interoceptive abilities, such as interoceptive sensibility and interoceptive accuracy, are first described in more detail together with what is known about how they relate with each other. Also different points of view about how interoceptive abilities associate with well-being

are pointed out. Interoceptive awareness as identified by Garfinkel et al. (2015) is not considered, as it is not the focus of this study. Further, in order to consider the multidimensionality of awareness of the body, other aspects of bodily awareness are described along with a description of how they relate with interoceptive abilities and well-being.

Internal subjective body awareness (i.e. interoceptive sensibility)

Interoceptive sensibility is one dimension among interoceptive abilities as identified by Garfinkel et al. (2015). Garfinkel et al. refer to it as ‘the self-perceived tendency to be internally self-focused and interoceptively cognizant’. It has also been described as a conscious inner representation of the body (Emanuelson, Drew, & Köteles, 2015) and to be a general adaptive tendency central for health related behaviour such as taking in of food (Shields, Mallory, & Simon, 1989; Schmidt, Lerew, & Trakowski, 1997). When compared with interoceptive accuracy, interoceptive sensibility is more influenced by top-down cognitive processes such as memories and expectations (Emanuelson et al., 2015). It does not necessarily involve accurate sensing of the body.

Interoceptive sensibility is a term specifically used by Garfinkel et al. (2015). Another common term used in the research field is self-reported body awareness, which describes the same phenomena as interoceptive sensibility (Emanuelson et al., 2015; Mehling et al., 2009). In this study we will use internal subjective body awareness to describe the self-perceived awareness of internal body processes. This allows it to be clearly separated from the subject’s self-perceived awareness of the appearance of the body and evaluating the body, constructs which will be introduced later.

Internal subjective body awareness is assessed with questionnaires or interviews. It is generally not well known how the construct differs among questionnaires. To respond to this ambiguity Mehling et al. (2009) reviewed twelve body awareness questionnaires and found qualitative differences between them. Out of these questionnaires they identified four key domains with eleven subdomains, which make up the construct of body awareness. These domains were labeled as 1) perceived body sensations, 2) attention quality, 3) attitude, and 4) mind-body integration. As the present study used questionnaires of *body vigilance* (Schmidt, Lerew, & Trakowski, 1997), *body awareness* (Shields, Mallory, & Simon, 1989) and *private body consciousness* (Miller, Murphy, & Buss, 1981) figure 1 presents how key domains as identified by Mehling et al. are emphasized in these three questionnaires.

Table 1. Qualitative differences between questionnaires of *body vigilance*, *body awareness* and *private body consciousness* (adapted from Mehling et al., 2009 with insertions from original papers).

Aspect of internal subjective body awareness	Description
Body vigilance (Schmidt et al., 1997)	Adaptive tendency to be aware of the body (Schmidt, Lerew, & Trakowski, 1997). It is the attentional tendency to focus or ignore body sensations, which can sometimes become exaggerated (Mehling et al., 2009). It has however been found to be elevated among people with panic and anxiety disorder and to be related with anxiety symptoms and a history of panic attacks in nonclinical populations (Schmidt, Lerew, & Trakowski, 1997).
Body awareness (Shields et al., 1989)	Primarily the perception of neutral/ambiguous body sensations (Mehling, 2009). These body sensations are part of regular non-emotive body processes, like physical reactions to weather or food (Shields, Mallory, & Simons, 1989). It is considered to include the prediction of physical reactions like the onset of illness or changes in energy levels (fatigue vs. vitality) (Shields, Mallory, & Simons, 1989).
Private body consciousness (Miller et al., 1981)	Primarily the perception of body sensations of distress, worry, pain and tension (Mehling, 2009). These body sensations refer to regular distress and pain like the sensing of hunger, heartbeat, dry mouth or throat. Further, it is the perception of non-affective body sensations and has been found to be unrelated to illness, social anxiety, hypochondriasis and emotionality (Miller, Murphy, & Buss, 1981).

Mehling et al. (2009) found for example that the questionnaire assessing *body vigilance* (Schmidt, Lerew, & Trakowski, 1997) covered only the sub dimension of ‘intensity’. Mehling et al. classified intensity as a sub dimension of ‘attention quality’. Intensity of attention quality was described as

‘actively paying attention versus ignoring and suppressing perception’. It also reflected the importance of body sensations to the subject.

Mehling et al. (2009) also found that the questionnaire assessing *body awareness* (Shields, Mallory, & Simon, 1989) covered only two subdimensions: 1) ‘neutral/ambiguous sensations’ and 2) ‘sensations of distress and worry, pain and (muscle) tension’. These sub dimensions were classified under the dimension of ‘perceived body sensations’ However, Mehling et al. found that *body awareness* emphasized more perception of neutral sensations and less sensations of discomfort.

Further Mehling et al. (2009) found that the questionnaire assessing *private body consciousness* (Miller, Murphy, & Buss, 1981) covered the same sub dimensions as *body vigilance* and *body awareness*. However, contrarily to the questionnaire focusing on *body awareness* the questionnaire on *private body consciousness* emphasized more the perception of regular distressing sensations than the perception of neutral sensations. Thus Mehling et al. (2009) provided a framework, which helps to understand how different questionnaires of internal subjective body awareness differ from each other qualitatively. This provides information about how the concept is used differently.

Internal subjective body awareness has been considered for a long time to be characteristic of mental distress. For example, people suffering from panic- and other related anxiety disorders have reported higher levels of body vigilance than control groups (Olatunji, Deacon, Abramowitz, & Valentiner, 2007; Schmidt et al., 1997). This enhanced attentional focus on body signals has been suggested to be motivated by the fear of future panic attacks and has been found to diminish after a cognitive-behavioral intervention (Schmidt et al., 1997). However, as noted earlier a variety of interventions aiming at increasing mental health have made use of training in body awareness (Mehling, 2011). Recent developments in the research field have provided some theoretical models how increased sensitivity to the body can benefit health (Farb et al., 2015). There is some empirical evidence to support the assumption that increased internal subjective body awareness benefits well-being. For example, a study by Lustyk, Douglas, Bentley, & Gerrish (2012) found high levels of internal subjective body awareness to relate with lower stress responses among women in a laboratory setting. Further, Martin, Prichard, Hutchinson and Wilson (2013) found yoga exercise to decrease disordered eating through elevated levels of internal body awareness. There are thus different points of view whether increased internal subjective body awareness relates with good health or not. There is not enough empirical evidence to state whether it associates with mental distress or beneficial health.

Interoceptive accuracy

Interoceptive accuracy is another dimension of interoception as identified by Garfinkel et al. (2015). It describes the ability to solidly discern physical sensations such as cardiac sensations or breath volume from other signals of the body (Garfinkel et al., 2015; Farb et al., 2015; Furman, Waugh, Bhattacharjee, Thompson, & Gotlib, 2013). In other words, interoceptive accuracy is the subject's ability to accurately detect immediate sensations of the body. Interoceptive accuracy has been found to vary among individuals (Critchley, Wiens, Rotshtein, Öhman, & Dolan, 2004; Cameron, 2001). It is usually measured with the perception of heartbeat, as the heartbeat provides a distinct body signal and is easy to discern compared to other bodily signals. There are a couple of heartbeat perception tasks to assess interoceptive accuracy (Schandry, 1981; Brener & Kluvitse, 1988). The heartbeat detection task has been demonstrated as being the most valid method to assess interoceptive accuracy. It is less influenced by independent factors (Cameron, 2001) such as belief and rehearsal (Phillips, 1999). A heartbeat detection task involves the comparison of the heartbeat to an external signal (Brener & Kluvitse, 1988). Heartbeat detection has been found to relate with the perception of other interoceptive signals (Herbert, Muth, Pollatos, & Herbert, 2012). Thus, it is commonly treated as a general measure of interoceptive accuracy.

It has been suggested that interoceptive accuracy contributes to health benefits. For example, there is evidence that subjects with high cardiac awareness perform better in the Iowa Gambling task, (Werner, Jung, Duschek, & Schandry, 2009) suggesting that high interoceptive accuracy relates with better decision making. Further, Paulus and Stein (2010) present that interoceptive dysregulation is characteristic to clinical conditions such as depression and anxiety. According to this suggestion, individuals are less able to tell apart body sensations predicting aversive consequences to the organism from other types of sensations. Thus it seems like interoceptive accuracy associates with adaptive psychological tendencies.

The relation between interoceptive abilities

It has been suggested that interoceptive abilities such as internal subjective body awareness and interoceptive accuracy are independent from each other as some studies have not found any link between them (Ainley & Tsakiris, 2013; Emanuelson, Drew, & Köteles, 2015; Garfinkel et al., 2015).

In line with these findings, there is also evidence that conscious training in awareness of the body seems to increase internal subjective body awareness but not necessarily interoceptive accuracy (Khalsa et al., 2008). Also in the clinical context, it has been suggested that vigilance to the body is independent from interoceptive accuracy among people with panic (Schmidt et al., 1997). However, there is contradicting evidence to backup this hypothesis, as some studies have found people with panic to perform similar to a normal control group in a heartbeat detection task (Yoris et al., 2015; Van der Does, Van Dyck, & Spinhoven, 1997) and other studies have found them to be better (Domschke, Stevens, Pfleiderer, & Gerlach, 2010; Ehlers & Breuer, 1992).

There is also some evidence to support that interoceptive abilities relate with each other. In a study done by Critchley, Wiens, Rotshtein, Öhman and Dolan (2004) both internal subjective body awareness and interoceptive accuracy did relate with grey matter volume in the anterior insular/opercular cortex. This suggests they share a common neural basis. Similarly, Miller et al. (1981) found that people high in internal subjective body awareness reported more changes in the body after hidden caffeine induction. This finding implies that subjects with high internal subjective body awareness were better in detecting interoceptive cues and thus suggests, that different interoceptive abilities do associate positively with each other. In a study done by Mailloux and Brener (2002) somatic amplification, i.e. the tendency to experience normal body sensations as distressing, associated with low interoceptive accuracy. Thus there is evidence that internal subjective body awareness is independent from interoceptive accuracy but also that both relate with each other.

From internal subjective body awareness to a broader view of subjective body awareness

Although the multidimensionality of self-reported body awareness has been pointed out, it is not always considered (Mehling et al., 2009). In addition to internal subjective body awareness, Miller, Murphy and Buss (1981) included public body consciousness, which is the perception of the appearance of the body, and body competence, which is the positive evaluation of the body, into their model of self-reported body awareness.

Although public body consciousness refers to awareness of the body in non-affective states it has been found to relate with increased negative emotionality (Miller, Murphy, & Buss, 1981) and beautification among women (Kelson, Kearney-Cooke, & Lansky, 1990). Further it has been found to predict self-objectification, i.e. treating the body as an object rather than as a feeling subject (Ainley

& Tsakiris, 2013). Body competence as such has not been studied a lot, but Miller et al. (1981) found it to associate with higher self-esteem.

To make a clear distinction between different aspects of self-reported body awareness in this study, the terms external subjective body awareness and evaluative subjective body awareness are introduced. External subjective body awareness describes the focus on the appearance of the body (ref. public body consciousness above). Evaluative subjective body awareness describes the positive evaluation of the body (ref. body competence above). Subjective body awareness in this study is a broad overall term for internal, external and evaluative subjective body awareness.

Generally, external subjective body awareness has often been associated with mental distress. For example, self-objectification, has been found to relate to negative experience of the body among women (McKinley & Hyde, 1996). Further, a disturbed way to relate to the body's appearance is characteristic to clinical disorders such as anorexia nervosa (Käypä, 2016). A distress related external subjective body awareness has also been studied in relation to interoceptive accuracy. For example, objectification theory suggests that people who self-objectify are less accurate in heartbeat perception (Fredrickson & Roberts, 1997). Also in healthy samples, body image dissatisfaction (Emanuelson, Drew, & Köteles, 2015) and self-objectification (Ainley & Tsakiris, 2013) have been found to connect with poor interoceptive accuracy. Further, a diminished sense of interoceptive cues like hunger and satiety has been found to be a feature of anorexia nervosa (Garner, Olmstead, & Polivy, 1983).

Relative to self-objectification and body image dissatisfaction, public body consciousness is a more neutral attitude towards the appearance of the body. It has not yet been studied, whether this kind of external subjective body awareness relates to diminished interoceptive accuracy. To our knowledge evaluative subjective body awareness has not been studied at all in relation to interoceptive accuracy.

Aims of this study

Different dimensions of interoception have been distinguished, such as the subjective dimension and accurate sensing of bodily sensations. However, little is known how these different dimensions of interoception relate with each other. Although there is some evidence that interoceptive accuracy relates with focusing on the appearance of the body, research on interoception has mainly investigated awareness of internal body processes. The multidimensionality of subjective body awareness has rarely been considered. For example, the relation of an evaluative aspect of subjective body awareness

with interoceptive accuracy has not been studied at all. Further, it is not well known how bodily awareness, both on the subjective level as well as on the level of accurate sensing, associate with health benefits. The aim of this study was thus to investigate the following two research questions: 1) Do different aspects of subjective body awareness as measured with questionnaires associate with objectively measured interoceptive accuracy? 2) Do different aspects of subjective body awareness and/or interoceptive accuracy correlate with experienced well-being?

MATERIAL AND METHODS

This study was part of a larger research project ‘Body awareness, brain and exercise’ (Kehotietoisuus, aivot ja liikunta), which started in fall 2015 as part of a collaboration between the Department of Psychology and the Faculty of Sports and Health Sciences at the University of Jyväskylä. The aim of this project was to investigate the relations between interoception, body awareness, personality and exercise as well as to look for group differences in brain functioning using Magnetoencephalography (MEG). As this thesis focused on the relation between subjective body awareness, interoception and well-being only data from self-report assessment methods (body awareness and well-being) and behavioral measures (interoceptive accuracy) were included.

Subjects

Forty subjects were recruited through the University’s e-mail list, face-to-face contact, social media and flyers. As one aim of the research project was to look for the relation between exercise and interoception, subjects were recruited according to their athletic background. The ideal was to find 20 subjects who engage in moderately hard exercise four times a week (athletic group) and 20 subjects who exercise only once per week (non-athletic group). As there were not enough signups for the study, eight subjects who fell in between these two groups were also included. Body mass, age and gender are known to influence performance in the interoceptive task and metal in the body can disturb MEG measurements. This is why inclusion criteria for participating in this study were age between 18 and 35, normal Body Mass Index (not over 25) and no metal in the body. Subjects received a movie ticket at the end of the study as a reward for their participation. Three subjects were excluded

from the study, as one subject had too high BMI and two measurements had technical disturbances. In total 13 male and 24 female (n=37) participants were included in this study, with a mean age of 24.

Procedures

During measurements subjects performed first a heartbeat detection task, which was conducted by two researchers. Afterwards subjects filled out a battery of questionnaires, which included subjective body awareness and well-being measures. Prior to measurements, participants signed a written informed consent. The ethical committee at the University of Jyväskylä approved the procedures of the study.

Subjective body awareness measures

Subjective body awareness was assessed with three different questionnaires, which were translated from their original language into Finnish. Each of them is presented separately in the following.

The Body Vigilance Scale (BVS) was developed by Schmidt, Lerew and Trakowski (1997) to assess 'attentional focus to internal body sensations'. The scale consists of four items. The first three items assess the subject's degree of attention to body sensations (*'I am the kind of person who pays close attention to internal bodily sensations'*), belief of sensitivity to body sensations (*'I am very sensitive to changes in my internal bodily sensations'*) and the time spent per day to focus on bodily process (*'On average, how much time do you spend each day 'scanning' your body for sensations?'*). The fourth item assesses how much one pays attention to 15 sensations. These 15 sensations are the physical symptoms characteristic to panic attacks as presented in the DSM-IV (Schmidt, Lerew, Trakowski, 1997). Subjects respond on a 10-point Likert scale to each item. The Cronbach's alfa coefficient for the Body Vigilance Scale was 0.613.

The Body Awareness Questionnaire (BAQ) was developed by Shields, Mallory and Simons (1989) and consists of eighteen items, which measure the subject's 'attentiveness to normal, non-emotive body processes'. Based on a factor analysis, these items have been grouped into four different categories: 1) detecting changes in the body, 2) prediction of bodily reactions, 3) sleep-wake cycle and 4) prediction of the onset of illness (Shields, Mallory, & Simons, 1989). However, these categories are not pointed out in the questionnaire. Subjects respond on a 7-point Likert scale how well each item describes them (1= not at all true for me; 7= very true for me). The internal consistency of the scale in this study was high (Cronbach's Alfa coefficient = 0.841).

The Body Consciousness Questionnaire (BCQ) was developed by Miller, Murphy and Buss (1981) to measure 'private and public aspects of the body in neutral (nonaffective) states'. The scale consists of three different subscales: 1) private body consciousness, 2) public body consciousness and 3) body competence. Private body consciousness is assessed with five items, which focus on attentiveness to different body responses (tension, dry mouth and throat, heartbeat, hunger contraction in the stomach, changes in body temperature). Public body consciousness is assessed with six items, which focus on attentiveness and importance of appearance of the body (hands, skin, facial features, hair, body posture). Body competence is an evaluative subscale with four items assessing the subject's positive attitude towards the body (strength, agility, speed and coordination). For each of the subscales subjects respond on a 4-point Likert scale how well each item describes them (0= very untypical; 4= very typical). In this study two items were excluded from the analyses, as they correlated poorly with subscales (correlation of item "*I'm very aware of changes in my body temperature*" with private body consciousness = 0.036; correlation of item "*I'm concerned about my posture*" with public body consciousness=-0.049). After item exclusion Cronbach's alfa coefficients were 0.597 for private body consciousness, 0.597 for public body consciousness and 0.822 for body competence.

Measurement of interoceptive accuracy

Interoceptive accuracy was measured with a heartbeat detection task. The heartbeat detection task is a widely used instrument in the study of interoception (Garfinkel, Seth, Barrett, Suzuki, Critchley, 2015). In this study, the heartbeat detection task was conducted according to Critchley, Wiens, Rotshtein, Öhman and Dolan (2004), although note trials were not included. In the heartbeat detection

task, the subject is asked to detect whether an audible signal reflects her heartbeat or not. The level of the subject's sensitivity to her heartbeat reflects interoceptive accuracy. The interoceptive accuracy variable is formed out of the subject's self-reported answers to whether the audible signals were in synchrony or desynchrony with her heartbeat. To echo the subject's heartbeat, an amplifying speaker was connected with three sensors with the subject's upper body. The amplifying speaker played a beep sound that was either in accordance or in a 500 ms delay of the subject's heartbeat. Beep sounds were played in 16 trials, out of which half echoed the subject's heartbeat and half occurred in delay. Synchronous and desynchronous trials were played in a random order. The task took about 10 minutes. Prior to measurements, the subject was informed about the procedure and length of the task. If it seemed, that the instruction was unclear to the subject, the research conductor elaborated to prevent any misunderstanding. Subjects were also asked to breathe normally, to sit in a relaxed position and to have their gaze rest on a checkpoint in front of them. Subjects were advised not to talk during measurement and not to ask questions before or after the task is over. It is known that physical changes of speech might interfere with the measurement. Between each trial there was an approximately ten seconds pause. During the pause the subject responded on an answer sheet, whether the beep sounds were in synchrony with their heartbeat or not. The beginning of each trial was verbally communicated to help the subject in orienting to the next trial. After 16 trials were played, subjects were asked to rate on a scale from 1-5 how confident they felt about their responses (1= I was not confident at all, guessed, 5= I was very confident, I knew all of the answers). Subjects were also asked an open-ended question regarding comments related to the task (i.e. any kind of disturbances; if something was easy). Before starting the measurement, between one and three test trials were run. The task took 10-15 minutes as in some sessions the task was restarted due to technical disturbances in the device, misunderstandings' about the task, or interruption by the subject's speech.

Well-being measures

Well-being was measured with two individual items and one questionnaire. They all assess the subject's satisfaction. The questionnaire was translated from the original language into Finnish.

Individual items assessed satisfaction with oneself 1) '*how satisfied are you with yourself?*', and satisfaction with life 2) '*how satisfied are you with your life?*'. These items were drawn from the

questionnaire assessing satisfaction with life (Kokko & Shehadeh, 2014). Subjects answered each question on a 10-point Likert Scale (1= very dissatisfied; 10= very satisfied).

The Satisfaction with Life questionnaire was developed by Diener, Emmons, Larsen and Griffin (1985) to measure global life satisfaction. This 5-item instrument includes statements like ‘*in most ways my life is close to my ideal*’, ‘*the conditions of my life are excellent*’, and ‘*so far I have gotten the important things that I want in my life*’. Subjects rate each item on a 7- point Likert Scale on how much one agrees with the statement (1=strongly disagree; 7 =strongly agree). The Cronbach’s alfa coefficient for the scale was 0.774.

Statistical analysis

The statistical analysis was carried out using IBM SPSS statistics 22. For each questionnaire a total score was calculated according to the instructions provided by original papers. As there was missing data in the Body Consciousness Questionnaire, a summed aggregated mean score was calculated for each of the three subscales. Reliability of the questionnaires was tested with Cronbach’s alfa model. Before starting analyses, one outlier in the private body consciousness variable was moved from 0,75 to 1,25 and another outlier in the satisfaction with life variable from 12 to 16 to the end of the distribution so that they go along with normal distribution. All other variables did follow normal distribution so parametric tests could be used.

To test whether background variables such as BMI, age, gender and exercise level related with interoceptive accuracy Pearson’s correlation coefficients were calculated.

Afterwards the analysis of the relation between different aspects of subjective body awareness and interoceptive accuracy (research question 1) was started. First Pearson’s correlation coefficients were calculated for the relation between all five variables of subjective body awareness and interoceptive accuracy. At the next level Multivariate linear regression analysis was used to further analyze if subjective body awareness relates with interoceptive accuracy. All variables of subjective body awareness were put as independent variables and interoceptive accuracy as dependent variable into the model. Those independent variables, which did not have a significant effect on interoceptive accuracy were excluded from the model in order of highest p-value to the lowest. In the end the analysis was done only with those independent variables with a significant effect ($p > 0.05$).

The relation between subjective body awareness and well-being was investigated with the same procedure as in research question 1. After having calculated Pearson's correlation coefficients a Multivariate linear regression analysis was done for each variable of well-being. Variables of subjective body awareness were put as independent variables in the model and each variable of well-being as dependent variable. Insignificant independent variables were excluded from the model. To investigate the relation between interoceptive accuracy and wellbeing, Pearson's correlation coefficients were calculated between interoceptive accuracy and each variable of well-being.

RESULTS

The relation between background variables and interoceptive accuracy

BMI, age, gender and exercise level did not relate significantly with interoceptive accuracy (see table 2). This means, that performance during the heartbeat detection task was not significantly influenced by these factors. Therefore, background variables were not included in Multivariate regression analysis.

Table 2. Pearson's correlation coefficients between background variables, subjective body awareness, interoceptive accuracy and well-being

	Age	BMI	Gender	EL	IA	BA	BV	PrBC	PubBC	BC	GLS	SL	SS
Age	1												
BMI	.117	1											
Gender	-.336*	-.335*	1										
EL	-.237	.199	.150	1									
IA	.010	.087	.189	.289	1								
BA	-.275	.040	.204	.349*	-.116	1							
BV	-.259	.081	.218	.206	.378*	.437**	1						
PrBC	-.107	-.146	.089	-.014	.102	.297	.465	1					
PubBC	-.355*	-.122	.519**	.239	.113	0.455**	.372*	.430**	1				
BC	-.029	.379*	-.255	.589**	.120	0.279	.189	.011	-.005	1			
SC	-.361*	-.111	.053	.026	-.121	.033	-.104	-.191	-.147	.204	1		
SL	-.114	-.019	.047	-.179	-.216	-.090	-.268	-.509**	-.345*	.052	.630**	1	
SS	-.325*	-.047	.110	.162	-.265	.050	-.143	-.349*	-.238	.292	.555**	.644**	1

Note: *p > .05; ** p > .01.

EL= Exercise level; IA= interoceptive accuracy; BA = body awareness; BV= body vigilance; PrBC= private body consciousness; PuBC= public body consciousness; BC= body competence; GLS= global life satisfaction; SL= satisfaction with life; SS= satisfaction with self

Subjective body awareness and interoceptive accuracy

Among variables of subjective body awareness, only the Pearson's correlation coefficient between body vigilance and interoceptive accuracy was significant (see table 2). Results of the Multivariate linear regression analysis supported the significant relation between body vigilance and interoceptive accuracy (see table 3). Body vigilance related positively with interoceptive accuracy, meaning that subjects with high body vigilance detected more accurately their heartbeat.

Regression analysis revealed also a relation between body awareness and interoceptive accuracy (see table 3). However, in contrast to the relation between body vigilance and interoceptive accuracy, body awareness and interoceptive accuracy related inversely with each other. In other words, subjects with high body awareness were less accurate in heartbeat detection. The link between body vigilance and interoceptive accuracy was stronger than the link between body awareness and interoceptive accuracy.

The relation between private body consciousness, public body consciousness and body competence with interoceptive accuracy was statistically not significant (see table 2).

Table 3. Multivariate Linear Regression: Correlates of significant variables of subjective body awareness with interoceptive accuracy and well-being

	Standardized b coefficient	Adjusted R-square
Model 1		
Dependent variable: Interoceptive accuracy		.196
Independent variable:		
Body vigilance	.530 **	
Body awareness	-.347*	
Model 2		
Dependent variable: Satisfaction with life		.238
Independent variable:		
Private Body Consciousness	-.509**	

Note: *p > .05; **p > .01

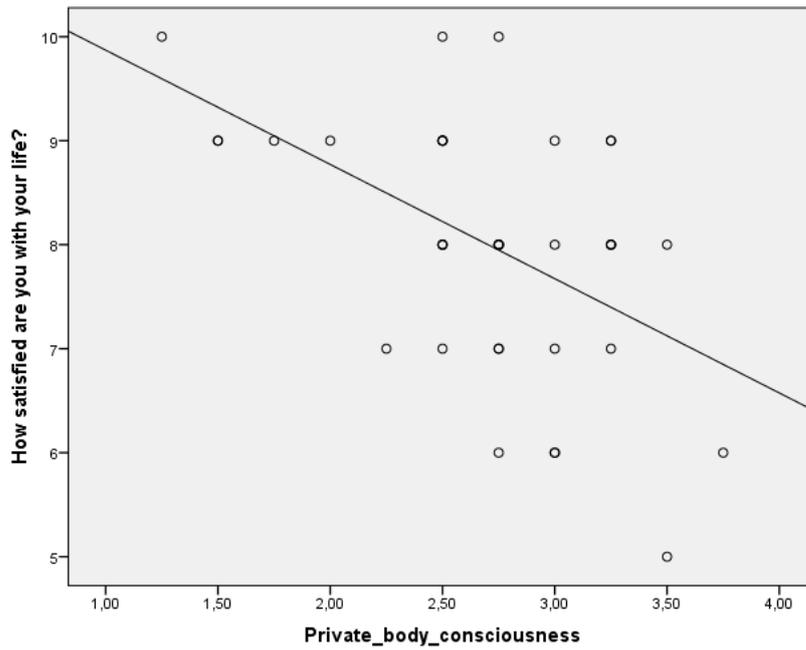
Model 1: The effect of body vigilance and body awareness on interoceptive accuracy after the exclusion of insignificant subjective body awareness variables and background variables.

Model 2: The effect of private body consciousness on satisfaction with life after the exclusion of insignificant subjective body awareness variables.

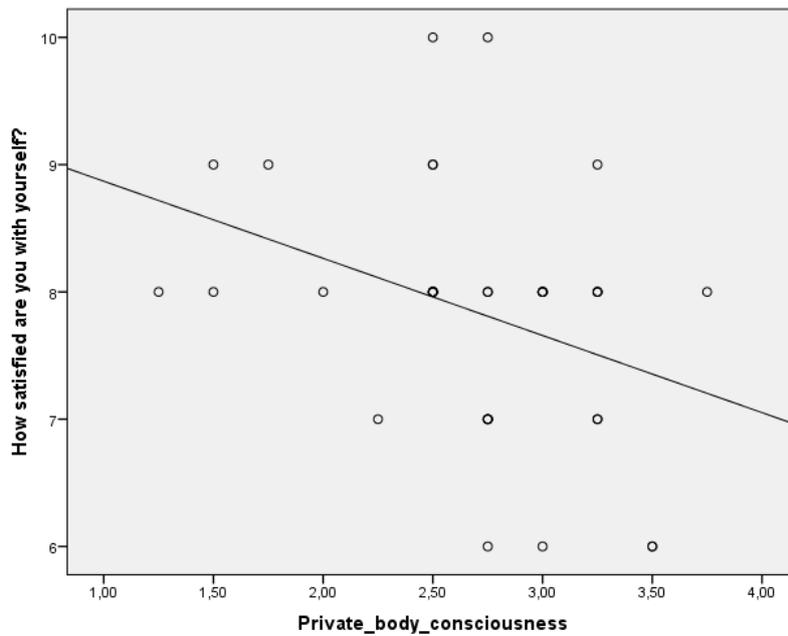
Subjective body awareness and well-being

Among variables of subjective body awareness, private body consciousness was the only variable, which related to both satisfaction with life and satisfaction with self (see table 2). The relation between private body consciousness and satisfaction with life and satisfaction with self was negative, meaning that subjects with high private body consciousness were less satisfied with their life and themselves. Private body consciousness associated stronger with satisfaction with life than with satisfaction with self. Multivariate linear regression analysis supported the statistically significant relation between private body consciousness and satisfaction with life (see table 3). Significant correlations between private body consciousness and satisfaction with life and satisfaction with self are visualized with the help of scatterplots in scatterplot 1 and 2.

Scatterplot 1. Correlation between Private body consciousness and satisfaction with life



Scatterplot 2. Correlation between Private body consciousness and satisfaction with self



Pearson's correlation coefficient revealed a relation between public body consciousness and satisfaction with life. This relation was negative, meaning that subjects high in public body consciousness were less satisfied with their life (see table 2). The relation between public body consciousness and satisfaction with life was however weaker than between private body consciousness and satisfaction with life and it was not supported in regression analysis.

Body vigilance, body awareness and body competence did not relate with variables of well-being. None of the subjective body awareness variables related with global life satisfaction (see table 2).

Interoceptive accuracy and well-being

Interoceptive accuracy did not relate with satisfaction with life, satisfaction with self or global life satisfaction (see table 2). Thus, the subjects' ability to accurately detect their heartbeat did not link with well-being.

DISCUSSION

The aim of this study was first to investigate the relation between different aspects of subjective body awareness and interoceptive accuracy by considering the multidimensionality of subjective body awareness. In addition, the focus was on the relation of different aspects of subjective body awareness and interoceptive accuracy with well-being.

Subjective body awareness included 1) internal subjective body awareness (body vigilance, body awareness and private body consciousness), 2) external subjective body awareness (public body consciousness) and 3) evaluative subjective body awareness (body competence). Well-being was studied by measuring satisfaction with life, satisfaction with self and global life satisfaction.

The main findings of this study can be summarized as follows: Two aspects of subjective body awareness related with interoceptive accuracy. High body vigilance associated positively and body awareness negatively with poor interoceptive accuracy. Further, two other aspects of subjective body awareness associated with aspects of well-being. High private body consciousness related with low satisfaction with life and low satisfaction with self. High public body consciousness related with low

satisfaction with life. No relation was found between public body consciousness and satisfaction with self.

Body vigilance and body awareness did not relate with any aspect of well-being. Private and-public body competence did not relate with interoceptive accuracy. Thus, those aspects of subjective body awareness that related with interoceptive accuracy did not associate with well-being and vice versa. Further, body competence did neither relate with interoceptive accuracy nor with aspects of well-being. Among aspects of well-being global life satisfaction did not relate with aspects of subjective body awareness nor with interoceptive accuracy. Finally, interoceptive accuracy was not related to any aspect of well-being.

Thus aspects of subjective body awareness differed in if and how they related with interoceptive accuracy and well-being. Specifically aspects of internal subjective body awareness differed in how they related with interoceptive accuracy. In the following the significant relation between body vigilance and body awareness with interoceptive accuracy will be first discussed. Secondly the lack of relation between external subjective body awareness and interoceptive accuracy is discussed. Afterwards the relation between private- and public body consciousness with aspects of well-being is discussed. The discussion ends with considering limitations of this study and by pointing out implications for future research.

The relation between interoceptive abilities – body vigilance, body awareness and interoceptive accuracy

The results of this study suggest, that some interoceptive abilities do relate with each other. Among variables of internal subjective body awareness, high body vigilance, the attentional tendency to actively focus on body sensations (Mehling et al., 2009; Schmidt et al., 1997), and low body awareness, the perception of neutral, non-emotive body sensations and prediction of bodily reactions (Mehling et al., 2009; Shields, Mallory, & Simon, 1989), associated with good interoceptive accuracy. However, private body consciousness, the primary perception of regular distress and pain (Mehling et al., 2009; Miller, Murphy, & Buss, 1981) was independent of interoceptive accuracy. Thus, these results partially contradict previous studies, which have suggested that internal subjective body awareness is independent from interoceptive accuracy (Ainley & Tsakiris, 2013; Emanuelsen, Drew, & Köteles, 2015; Garfinkel et al., 2015). However, based on a study by Critchley, Wiens, Rotshtein, Öhman and Dolan (2004) there is preliminary evidence that internal subjective body

awareness shares a common neural basis with interoceptive accuracy. Interestingly, Miller, Murphy and Buss (1981) found private body consciousness and interoceptive accuracy to associate with each other, as people with high private body consciousness were better in detecting interoceptive cues after caffeine induction. As private body consciousness was not related with interoceptive accuracy in this study no direct support was found for the results by Miller et al. However, in line with Critchley et al. and Miller et al. the results of this study suggest that internal subjective body awareness does link with the individual's ability to sense immediate body processes. In other words, the results of this study indicate that interoceptive abilities do relate with each other.

Specifically the results of this study suggest that a self-perceived active focus on body sensations links with accurate detection of immediate body sensations as body vigilance associated positively with interoceptive accuracy. Body vigilance is commonly seen to be characteristic of people suffering from panic and anxiety (Schmidt, Lerew, & Trakowski, 1997; Olatunji, Deacon, Abramowitz, & Valentiner, 2007). Schmidt, Lerew and Trakowski (1997) suggest that body vigilance and interoceptive accuracy are independent from each other among people with panic and anxiety disorder. Yet, there is contradicting evidence, if people with panic and anxiety are better in interoceptive accuracy or not. Some studies suggest, that people suffering from panic and anxiety disorder perform better than a control group in a heartbeat perception tasks (Domschke, Stevens, Pfleiderer, & Gerlach, 2010) but other studies suggest they perform similarly (Yoris et al., 2015; Van der Does, Van Dyck, & Spinhoven, 1997). As our study was done among people without panic and anxiety, our results provide information about how body vigilance and interoceptive accuracy associate with each other among healthy subjects. The positive relation between body vigilance and interoceptive accuracy in our study suggests that people who are vigilant of their body without a clinical condition are more accurate in detecting interoceptive cues.

As actively focusing on the body, i.e. body vigilance, related with better interoceptive accuracy, it would have been probable that people who report to perceive and predict multiple processes within their body are also better in accurately sensing immediate body sensations. However, the negative relation between body awareness and interoceptive accuracy in the present study suggests quite the opposite. It suggests that people who perceive themselves to be aware of and predict various body processes are less accurate in sensing their heartbeat. Earlier evidence for a negative relation between internal subjective body awareness and interoceptive accuracy comes from a study done by Mailloux & Brener (2002). In their study somatosensory amplification, i.e. the tendency to experience normal sensations as distressing, associated negatively with heartbeat detection. If healthy body awareness associates negatively with interoceptive accuracy has not yet been studied and thus the results of our study are original. It has however been pointed out by some authors that the heartbeat detection task

is not necessarily a sufficient measure of interoceptive accuracy as it leaves out awareness of other physiological processes in the body (Mailloux & Brener, 2002; Garfinkel et al., 2015). Thus, the negative link between body awareness and interoceptive accuracy does not necessarily imply that people high in body awareness are less interoceptively accurate. They might well detect interoceptive cues other than the heartbeat. It is also possible that the negative relation between body awareness and interoceptive accuracy tells about how subjective reports of body awareness can differ from objective measures of sensing the body.

Body vigilance and body awareness had an opposite relation with interoceptive accuracy and private body consciousness was unrelated to it. This implies that aspects of internal subjective body awareness do qualitatively differ from each other, which has been proposed by Mehling et al. (2009). Further, the opposite relation of body vigilance and body awareness with interoceptive accuracy suggests that aspects of internal subjective body awareness differ in how they relate with interoceptive accuracy. There is little previous empirical evidence about under which kinds of conditions aspects of internal subjective body awareness have an opposite relation with interoceptive accuracy. Fairclough and Goodwin (2007) found that two dimensions of a self-report scale assessing internal subjective body awareness had an opposite relation with interoceptive accuracy. However, also in their study, this result was unexpected and Fairclough and Goodwin did not provide interpretations about the origins of the result.

External subjective body awareness and interoceptive accuracy

Public body consciousness and interoceptive accuracy did not relate with each other in the present study. This contradicts previous studies, which have found that focus on the appearance of the body, such as self-objectification (Ainley & Tsakiris, 2013) and body image dissatisfaction (Emanuelson et al., 2015) link with less interoceptive accuracy. Although public body consciousness is related to factors of unfavorable health (Miller, Murphy, & Buss, 1981; Kelson, Kearney-Cooke, & Lansky, 1990; Ainley & Tsakiris, 2013), it describes a more neutral focus on the appearance of the body than self-objectification or body image dissatisfaction (Miller et al., 1981). It thus seems, that the way one focuses on the appearance of the body might contribute to the relation between external subjective body awareness and interoceptive accuracy.

Subjective body awareness and well-being

Among aspects of subjective body awareness, private- and public body consciousness were the only aspects, which related significantly with well-being. Increased private body consciousness associated with diminished satisfaction with life and satisfaction with self. Increased public body consciousness related negatively with satisfaction with life. Interestingly, both private- and public body consciousness assess awareness of the body in non-affective states, i.e. they do not by themselves include detection of affect related body processes (Miller, Murphy, & Buss, 1981). Whilst reflecting rather a neutral perception of the body, the results of this study however suggest that private- public body consciousness still do associate with diminished well-being.

Mehling et al. (2009) found that relative to other aspects of internal subjective body awareness, private body consciousness reflected perception of body sensations of distress, worry, pain and tension. However, these sensations referred to normal levels of distress and pain. Further, private body consciousness has been found to be unrelated to illness, social anxiety, hypochondriasis and negative emotionality (Miller et al., 1981). From this perspective, the negative relation of private body consciousness with satisfaction with life and satisfaction with self in the present study is surprising.

As mentioned earlier, public body consciousness has been found to relate to increased negative emotionality (Miller, Murphy, & Buss, 1981), beautification among women (Kelson, Kearney-Cooke, & Lansky, 1990) and to predict self-objectification (Ainley & Tsakiris, 2013). Thus, the results of the present study support previous findings in that a focus on the body's appearance relates with a diminished sense of well-being.

Limitations of this study

Body vigilance has previously been found to associate with a history of panic and anxiety (Olatunji et al., 2007; Schmidt et al., 1997) and to be predicted by anxiety sensitivity (Zvolensky & Forsyth, 2002) even among subjects without a clinical condition. Subjects in our research project filled out questionnaires assessing emotion intensity and emotion regulation but they were not included in the present study. Given that body vigilance has been associated with panic and anxiety in previous studies, there is a possibility that in the present study high body vigilance could also tell about

elevated levels of panic or anxiety among subjects. There are some studies suggesting, that subjects with panic and anxiety are more accurate in detecting their heartbeat (Domschke, Stevens, Pfleiderer, & Gerlach, 2010; for cs. see Yoris et al., 2015). It is thus possible that the positive relation between body vigilance and interoceptive accuracy was mediated by a third factor, i.e. negative emotionality such as panic or anxiety. However, body vigilance was unrelated to measures of well-being in this study, thus making it improbable that subjects did have major conflicts in their state of well-being.

Some authors have pointed out the need to assess interoceptive accuracy with other measures along with heartbeat detection task (Mailloux & Brener, 2002; Garfinkel et al., 2015). The heartbeat detection task leaves out the sensing of other interoceptive cues. An additional measurement of interoceptive accuracy could have added significance to the results.

Conclusions and future directions

The present study suggests that some aspects of subjective body awareness relate with interoceptive accuracy, specifically aspects of internal subjective body awareness. However, aspects of internal subjective body awareness differed in if and how they related with interoceptive accuracy. Though the study done by Mehling et al. (2009) helped to bring some clarification to the construct of the subject's self-reported body awareness, i.e. internal subjective body awareness, it is not well known which conditions support these different levels of internal subjective body awareness. For example, what does support people to actively focus on body sensations, such as in body vigilance versus perceiving and predicting various body sensations, such as in body awareness? By bringing more clarification to the nature and difference between aspects of internal subjective body awareness, more thorough investigation would be possible on their relation with interoceptive accuracy.

External subjective body awareness did not associate with interoceptive accuracy in the present study. However, external subjective body awareness has been found in previous studies to relate with interoceptive accuracy (Emanuelson, Drew, & Köteles, 2015; Ainley & Tsakiris, 2013). It would thus be interesting to investigate further what supports the relation between external subjective body awareness and interoceptive accuracy and under which kind of circumstances they are independent. For example, does negative or positive affect have a mediating effect between external subjective body awareness and interoceptive accuracy?

Our study did not allow for interpretations of causality between aspects of subjective body awareness and interoceptive accuracy. It would thus merit further study, how and what kind of

subjective body awareness supports the ability to accurately detect body sensations? Or inversely, does the ability to accurately detect body sensations contribute to the subject's self-perceived awareness of the body?

Recent developments in the research field have started to formulate models to investigate how awareness of the body contributes to well-being (Farb et al., 2015). Body psychotherapies and other body-focused interventions aiming to increase well-being have suggested for a long time that increased body awareness is beneficial for health (Mehling et al., 2011). Our study did not support this notion, as most aspects of subjective body awareness as well as interoceptive accuracy were independent of well-being. Our study suggests rathermore that subjective body awareness associates with disfavorable health, as two aspects of subjective body awareness related negatively with well-being. In the future, it would thus be interesting to investigate in more detail how well-being can be supported by awareness of the body.

Shedding some light on the questions presented in this chapter would allow for constructing a more coherent picture of awareness of the body among humans. Additionally, they could support the understanding of how this awareness of the body is linked to well-being.

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APPENDIX 1

Finnish translation of the Body Vigilance Scale (Schmidt, Lerew, & Trakowski, 1997)

Kehotarkkaavaisuusasteikko

Tämän testin tarkoitus on arvioida kuinka herkästi tiedostat kehosi sisäisiä tunteita, kuten sydämentykytystä tai huimausta. Täytä kysely sen mukaisesti miltä sinusta on tuntunut viimeksi **kuluneen viikon** aikana.

1. Olen sen tyyppinen ihminen, joka huomioi tarkkaavaisesti kehon sisäisiä tunteita.

0	1	2	3	4	5	6	7	8	9	10
Ei lainkaan					Hieman					Täysin
kuin minä					kuin minä					kuin minä

2. Olen hyvin herkkä muutoksille kehoni sisäisten tunteiden suhteen.

0	1	2	3	4	5	6	7	8	9	10
Ei lainkaan					Hieman					Täysin
kuin minä					kuin minä					kuin minä

3. Kuinka paljon aikaa käytät keskimäärin päivässä tarkkailemalla kehosi sisäisiä tunteita (kuten esim. hikoilu, sydämentykytys, huimaus)

0	1	2	3	4	5	6	7	8	9	10
Ei lainkaan					Hieman					Täysin
kuin minä					kuin minä					kuin minä

4. Arvioi alla olevaa asteikkoa käyttäen, kuinka paljon kiinnität huomiota seuraaviin tunteisiin

0	1	2	3	4	5	6	7	8	9	10
Ei yhtään		Hieman			Kohtuul- lisesti			Huomat- tavasti		Erittäin paljon

1. Sydämentykytys
2. Kipu / epämiellyttävä tunne rintakehässä
3. Turtumus
4. Kihelmöinti
5. Hengästyneisyys / tukahtuneisuus
6. Pyörrytys
7. Näköaistin muutokset
8. Epätodellisuuden tunne
9. Itsestä irtautuneisuuden tunne
10. Huimaus

11. Kuuma aalto
12. Hikiset/nihkeät kädet
13. Vatsavaivat
14. Pahoinvointi
15. Tukehtuminen / kurkun ahtaus

APPENDIX 2

Finnish translation of the Body Awareness Questionnaire (Shields, Mallory, & Simon, 1989)

Kehotietoisuuskysely

Ohjeet:

Alla on lista väittämiä, jotka koskevat herkkyyttäsi normaaleita, ei-emotionaalisia kehon prosesseja kohtaan. Valitse jokaisen väittämän kohdalla numero 1-7, joka parhaiten kuvaa väittämän paikkansapitävyyttä sinun kohdallasi ja kirjoita se väittämän oikealla puolella olevaan laatikkoon.

Ei kuvaa minua lainkaan					Kuvaa minua erittäin hyvin	
1	2	3	4	5	6	7

- | | |
|--|--------------------------|
| 1. Huomaan eroja siinä kuinka kehoni reagoi erilaisiin ruokiin. | <input type="checkbox"/> |
| 2. Kun kolhin itseäni, pystyn aina arvioimaan saanko mustelman vai en. | <input type="checkbox"/> |
| 3. Tiedän aina milloin olen rehkinyt niin paljon, että olen seuraavana päivänä kipeänä. | <input type="checkbox"/> |
| 4. Olen aina tietoinen muutoksista energiatasossani kun syön tiettyjä ruokia. | <input type="checkbox"/> |
| 5. Tiedän etukäteen kun minulle on tulossa flunssa. | <input type="checkbox"/> |
| 6. Tiedän milloin minulla on kuumetta ilman, että mittaan lämpöäni. | <input type="checkbox"/> |
| 7. Osaan erottaa toisistaan nälästä johtuvan ja unenpuutteesta johtuvan väsymyksen. | <input type="checkbox"/> |
| 8. Pystyn ennustamaan tarkasti mihin aikaan päivästä unenpuute alkaa vaivata minua. | <input type="checkbox"/> |
| 9. Olen tietoinen tietyistä syklistä energiatasossani päivän mittaan. | <input type="checkbox"/> |
| 10. * <i>En</i> huomaa vuodenajan rytmiä ja kiertoa kehoni toiminnoissa. | <input type="checkbox"/> |
| 11. Tiedän heti herättyäni kuinka paljon energiaa minulla on päivän aikana. | <input type="checkbox"/> |
| 12. Mennessäni nukkumaan osaan arvioida kuinka hyvin nukun sinä yönä. | <input type="checkbox"/> |
| 13. Huomaan kehossani selkeitä reaktioita kun olen väsynyt. | <input type="checkbox"/> |
| 14. Huomaan kehossani tiettyjä reaktioita sään vaihteluihin. | <input type="checkbox"/> |
| 15. Osaan ennakoida kuinka paljon tarvitsen unta yön aikana herätäkseni virkeänä. | <input type="checkbox"/> |
| 16. Kun liikuntatottumukseni muuttuvat, osaan ennakoida hyvin tarkasti kuinka se vaikuttaa energiatasooni. | <input type="checkbox"/> |
| 17. Vaikuttaa siltä että minulle on olemassa "paras" aika mennä nukkumaan. | <input type="checkbox"/> |
| 18. Huomaan kehossani erityisiä reaktioita kun olen hyvin nälkäinen. | <input type="checkbox"/> |

APPENDIX 3

Finnish translation of the Body Consciousness Questionnaire (Miller, Murphy, & Buss, 1981)

Kehotietoisuuskyselylomake (BCQ)

Vastaa alla oleviin käyttämällä alla olevaa asteikko ja ympyröimällä se numero, joka parhaiten kuvaa sinua.

- (0) erittäin epäominaista
- (1) epäominaista
- (2) neutraalia
- (3) ominaista
- (4) erittäin ominaista

1. Kun olen muiden seurassa, haluan että käteni ovat puhtaat ja näyttävät hyvältä.

0 1 2 3 4

2. Olen melko vahva kokoisekseni.

0 1 2 3 4

3. Olen herkkä kehoni sisäisille jännitteille.

0 1 2 3 4

4. Huomaan heti kun suuni tai kurkkuni kuivuu.

0 1 2 3 4

5. Tunnen usein sydämeni sykkeen.

0 1 2 3 4

6. Olen melko ketterä liikkumaan verrattuna useimpiin ihmisiin.

0 1 2 3 4

7. Minulle on tärkeää, että ihoni näyttää hyvältä... esimerkiksi, että siinä ei ole epäpuhtauksia.

0 1 2 3 4

8. Aistin nopeasti nälän kurnimisen vatsassani.

0 1 2 3 4

9. Pystyn liikkumaan nopeasti.

0 1 2 3 4

10. Olen hyvin tietoinen parhaista ja huonoimmista kasvojeni piirteistä.

0 1 2 3 4

11. Haluan huolehtia siitä, että hiukseni ovat hyvin.

0 1 2 3 4

12. Olen hyvin tietoinen muutoksista kehoni lämpötilassa

0 1 2 3 4

13. Ajattelen paljon ruumiinrakennettani.

0 1 2 3 4

14. Minulla on parempi koordinaatiokyky kuin useimmilla ihmisillä.

0 1 2 3 4

15. Olen huolissani kehoni ryhdikkyudesta.

0 1 2 3 4