



Interoception and gender: What aspects should we pay attention to?



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ABSTRACT

Interoception is involved in both somatic and mental disorders with different prevalence between genders; however, gender differences are often neglected. To examine the potential gender differences in interoceptive awareness, we recruited 376 healthy subjects (51% males, aged 17–30 years), to fill in the Multidimensional Assessment of Interoceptive Awareness (MAIA). Of that sample, in a subgroup of 40 subjects (50% males), interoceptive accuracy was assessed by heartbeat counting task (HCT).

The results on interoceptive awareness suggest that females tend to notice bodily sensations more often, better understand relations between bodily sensations and emotional states, worry or experience more emotional distress with sensations of pain or discomfort and see body as less safe. The results of interoceptive accuracy further suggest that females are less efficient in consciously detecting heartbeats. Therefore, gender should be considered when interoceptive evaluation is performed in disorders associated to bodily sensations and to the emotional/mood states.

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1. Introduction

Interoception is a group of senses for perception of physiological state of the body that aids in maintenance of homeostasis, allowing a better connectedness to the world and a better adaptation to the changing environment (Barrett & Simmons, 2015; Critchley & Harrison, 2013; Häfner, 2013). Being related to human self-consciousness (Seth, 2013), decision-making (Dunn et al., 2010), also being a part of popular *mindfulness* practices (Arthington, 2016; Farb, Segal, & Anderson, 2013; Haase et al., 2016), and an important aspect of several mental and physical disorders (Barrett & Simmons, 2015; Ehlers & Breuer, 1996; Flink, Nicholas, Boersma, & Linton, 2009; Pollatos et al., 2008; Verdejo-Garcia, Clark, & Dunn, 2012; Weiss, Sack, Henningsen, & Pollatos, 2014), interoception is deserving increasing amount of attention from the scientific community.

Apart from the well-known involvement of interoception in pain sensitivity (Simons, Elman, & Borsook, 2014), impaired interoception has been proposed as a vulnerability or maintaining factor in anorexia nervosa (Pollatos et al., 2008), depression (Terhaar, Viola, Bär, & Debener, 2012), alexithymia (Herbert & Pollatos, 2012). An important aspect of these conditions is related to the different prevalence rates between genders: anorexia nervosa (Nagl et al., 2016), depression (Ferrari et al., 2013), sensitivity to pain (Bartley & Fillingim, 2013; Weiss et al., 2014) are more prevalent in females, and

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alexithymia – in males (Salminen, Saarijärvi, Ärelä, Toikka, & Kauhanen, 1999). All the above mentioned suggest that gender might be an important confound in interoception-related studies.

The multifaceted view of interoception has emerged in recent years (Garfinkel, Seth, Barrett, Suzuki, & Critchley, 2015; Forkmann et al., 2016; Mehling et al., 2012). It is suggested to distinguish between *interoceptive accuracy* (the objective accuracy to detect bodily sensations (Garfinkel et al., 2015)) and *interoceptive awareness* (a set of a person's beliefs on the aspects of his/her own abilities and tendencies to consciously sense signals originating from the inside of the body (Mehling et al., 2012)). Few decades ago, Franzoi, Kessenich, and Sugrue (1989) concluded that there were no differences between males and females in a subconstruct of *interoceptive awareness* and more recent studies on the subjective aspect of interoception tended to ignore gender as a factor. The assessment with the *Multidimensional Assessment of Interoceptive Awareness* questionnaire (Mehling et al., 2012) was heavily biased towards samples dominated by females: in the original MAIA validation study, the sample consisted of 79% females. Similarly, Chilean MAIA study sample consisted of 77% females (Valenzuela-Moguillansky & Reyes-Reyes, 2015), German – 68% (Bornemann, Herbert, Mehling, & Singer, 2015), Italian – 91% (Calì, Ambrosini, Picconi, Mehling, & Committeri, 2015) and Polish – 100% (Brytek-Matera & Kozieł, 2015). None of these studies compared results between genders. Several studies considering *interoceptive accuracy* reported that males were more accurate while detecting their heartbeats in comparison to females (Ludwick-Rosenthal & Neufeld, 1985; Montoya, Schandry, & Müller, 1993). However, Mussgay, Klinkenberg, and Rüdell (1999) and Pollatos and Schandry (2004) failed to show gender differences in heartbeat counting task (HCT). It would seem, therefore, that further investigations are needed in order to clarify what aspects of interoception are sensitive to gender and what is the relationship between the interoceptive aspects within genders.

This paper reports on the gender differences in a sample of young healthy subjects related to the *interoceptive awareness* (as measured with *Multidimensional Assessment of Interoceptive Awareness* questionnaire) and the *interoceptive accuracy* (as measured with heartbeat counting task).

2. Methods

2.1. Participants

The sample consisted of 376 (51% male) volunteers aged 17–30 years ($M = 21.19$, $SD = 2.31$). The mean age did not differ between genders (Mann-Whitney test, $p = 0.202$). The majority of the participants were university students. The years of their education ranged from 10 to 24 years ($M = 14.9$, $SD = 1.9$). The research was approved by Lithuanian Bioethics Committee and all of the participants gave their informed consents.

After the completion of MAIA, subjects were asked to participate in the psychophysiological experiment. Those who expressed interest and provided contact details were invited to complete heartbeat counting task ($N = 40$). No monetary or course-credit payment was provided. The data of five participants, i.e. two males and three females, were excluded: there were extrasystoles in EKG of 1 participant; 1 participant reported guessing the number of heartbeats; 3 participants detected less than two beats during the tasks. Further analysis was performed on the data of 35 participants (18 males and 17 females). The mean age of the experimental subsample was 24.03 years (no age difference between males and females, Mann-Whitney test, $p = 0.319$). All of the experimental subsample participants met the following criteria: were able to participate in all of the experimental procedures without having a break for smoking, had normal or corrected-to-normal visual acuity and good general health, were not using psychotropic substances or any drugs and slept for 6 or more hours at night before an experiment. Additionally subjects were asked about the signs of chronic fatigue and the experience of strong emotions at the time. The information was collected in the form of self-reported questionnaire.

2.2. MAIA questionnaire

All subjects were volunteers agreeing to fill in a paper version of the Lithuanian version of MAIA questionnaire. The detailed description of MAIA questionnaire is provided in Mehling et al. (2012) and psychometric characteristics of Lithuanian MAIA version are presented in Baranauskas, Grabauskaitė, and Griškova-Bulanova (2016). The MAIA has 32 questions that are grouped into 8 scales aiming at the following aspects: (1) *Noticing* – awareness of uncomfortable, comfortable, and neutral body sensations; (2) *Not-Distracting* – tendency not to ignore or distract oneself from sensations of pain or discomfort; (3) *Not-Worrying* – tendency not to worry or experience emotional distress with sensations of pain or discomfort; (4) *Attention Regulation* – ability to sustain and control attention to body sensations; (5) *Emotional Awareness* – awareness of the connection between body sensations and emotional states; (6) *Self-Regulation* – ability to regulate distress by attention to body sensations; (7) *Body Listening* – active listening to the body for insight; (8) *Trusting* – experience of one's body as safe and trustworthy. The subjects had to evaluate each of statements on a 6-point scale (i.e. from 0 – “Never” to 5 – “Always”) indicating how often each statement could be applied to them generally in their daily life.

2.3. Heartbeat counting task

For the evaluation of interoceptive accuracy, the modified version of Schandry (1981) heartbeat counting task (HCT) was used: participants of the experimental subsample were instructed to focus their attention to the area of the heart and try to

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