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Interoception and Intuition: Systematic Review of the Role of Heartbeat and Skin Sensations in Decision-Making

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Abstract

The objective of this desk study is to explore the connection of interoception and intuition, with a special focus on sensations associated with the skin and heart. Previous interdisciplinary research by Launer & Svenson (2022; EFRE-research project RHIA) has underscored the importance of bodily sensations, particularly affective or emotional intuition, as a key factor in intuitive decision-making. This non-systematic literature review aims to investigate how sensations related to heartbeat and skin influence intuitive decision-making. Additionally, we aim to identify and adapt measurement tools, such as questionnaires, to assess interoception in a manner that aligns with participants' preferences and the needs of intuition research. We utilized the Body Perception Questionnaire Autonomic (BPQ-20 ANS) by Cabrera et al. (2018) and the Multidimensional Assessment of Interoceptive Awareness (MAIA) by Mehling et al. (2012) as item inventories. Research findings by Launer & Cetin (2023) highlight the relationship between interoception and intuition, providing a new and practical item pool for intuition research. These findings necessitate for extensive research to better comprehend the interplay between interoception and decision-making. The results of this study contribute to the development of a new comprehensive intuition model in the workplace through a global, interdisciplinary study.

Keywords: *Interoception, Intuition, Decision-Making, Heartbeat, Skin Feeling.*

Introduction

Emotional experiences are closely linked to the perception of internal bodily processes (Schandry, 1981). This involves sensing one's internal state, including visceral sensations (Schulz, 2016). It refers to the awareness of internal bodily states, contrasting with exteroception, which involves sensing external stimuli, and proprioception, which involves sensing the position and posture of body parts (Sherrington, 2023). Humans perceive feelings from the body that inform them about their physical condition, influencing mood and emotional states.

Traditionally, distinct feelings like itch, temperature, and pain are linked to the somatosensory system(exteroceptive), while less distinctive visceral feelings such as hunger, vasomotor activity, and thirst are associated with the interoceptive system (Craig, 2003). Recent findings suggest a conceptual shift, showing that all bodily feelings are signified in a phylogenetically innovative system in primates, which developed from an ancient homeostatic system responsible to maintains bodily integrity. These bodily sensations represent the physiological situation of the whole body, redefining 'interoception' (Craig, 2003).

Lately, the role of interoception and the perception of inner bodily states (Craig, 2002; Khalsa et al., 2017) in higher order cognitive functions, for instance emotional abilities, learning, and subsequent decision-making, gained recognition (Barrett & Simmons, 2015; Critchley & Harrison, 2013; Damasio, 1994; Heyes & Bird, 2008; Khalsa & Lapidus, 2016; Murphy, Brewer, Catmur, & Bird, 2017; Quattrocki & Friston, 2014; Seth, 2013). Although theoretical models have elegantly described how interoception may influence various cognitive processes, research examining individual differences in interoception and their impact on abilities like decision-making (Sokol-Hessner, Hartley, Hamilton & Phelps, 2015, Dunn et al., 2010), emotion recognizing emotion (Terasawa, Moriguchi, Tochizawa, & Umeda, 2014), theory of mind (Shah, Catmur, & Bird, 2017), and memory (Garfinkel et al., 2013) is still relatively limited but growing.
Ceunen et al. (2016) trace the evolution of the concept of interoception.

Over the past century, its meaning has expanded from a restrictive to an inclusive sense, making it relevant to various aspects of life such as emotion, decision-making, time perception, health, and pain. The concept's development underscores the need for a broad understanding of interoception (Ceunen et al., 2016).

Many experiemtnal tecqhniques have been used to unearth the mechanism of information processing in the inner body. These in retun have paved way to knowledge developement and how they interelate to the behaviour and human experience. Researches have shown the vital nature of pulmonary, neuromuscular, and gastrointestinal process, and the of the cardiovascular afferent inputs (Vaitl, 1996). According to Lin et al. (2023), recent studies have underlined the necessity of distinguishing between several features of interoception in self-report trials, for example attentiveness and subjective interoceptive accuracy. Some of the most popular theories claim that emotions arise from the various physiological differences in the body. The dispensing, signaling, and psychological display of internal bodily signs are all contained within in interoception (Critchley & Garfinkel, 2017).

Interoception: Theory

Contrary to the processing of external cues, such as hearing, touch, smell, and sight, interoception is the capability of the inner body state. It involves afferent pathways that manage internal physiological functions (Tsakiris & Critchley, 2016). Research indicates that primates have a specialized cortical area for homeostatic afferent activity, which mirrors the body's overall physiological condition.

This interoceptive system, connected to autonomic motor control, contrasts with the exteroceptive system, which directs somatic motor functions. The primary interoceptive representation located in the dorsal posterior insula generates specific and clear bodily sensations, such as pain, temperature, itch, sensual touch, muscular and visceral sensations, vasomotor activity, hunger, thirst, and breathlessness. In humans, this initial interoceptive activity is further processed in the right anterior insula, forming a meta-representation that underpins self-awareness and emotional consciousness (Craig, 2003).

Interoception impacts more than homeostatic and allostatic reflexes; it is essential for motivation, emotion, social cognition, and self-awareness. From early development, the ongoing integration of biological data from the body establishes the foundation for conscious awareness and the subjective sense of being a distinct individual (Tsakiris & Critchley, 2016).

Interoception and Emotions

Emotions are frequently experienced through bodily sensations, and somatosensory feedback is believed to play a role in triggering conscious emotional experiences (Nummenmaa, Glerean, Hari, & Hietanen, 2014). Human emotions involve distinct feeling states that rely on interoception—the processing and representation of internal bodily signals (Tsakiris & Critchley, 2016). Emotions represent psychophysiological patterns that allocate physiological and psychological resources to adapt behavior.

The expression of emotions involves changes within internal organ systems driven by autonomic responses, often occurring without conscious control. Interoceptive signals contribute to homeostatic reflexes and allostatic regulation, including feedback about physiological changes caused by emotions. Individuals commonly reference internal sensations while describing emotional experiences (Nummenmaa et al., 2014; Critchley & Garfinkel, 2017). While emotions regulate behavior and physiological states during both survival-relevant situations and enjoyable interactions, the mechanisms underlying these subjective sensations remain not fully understood (Nummenmaa et al., 2014).

Interoception and Heartbeat

Individuals with having clearer perception of heart activity exhibit superior levels of momentary emotional experiences, such as anxiety, and score higher on traits like emotional capability. This facet of cardiac consciousness focuses on heartbeat perception (Schandry, 1981). Non-invasive measures of heartbeat detection accuracy are frequently used to index interoceptive sensitivity (Brener & Ring, 2016). Interoception focusing on heart has received certain attention owing its role in decision-making, clinical disorders and emotional experience like depression and anxiety (Schulz, 2016). Schulz's meta-analysis revealed an extensive network linked to heart-focused interoceptive attentiveness, which includes the posterior insula, precentral gyrus, right claustrum, and medial frontal gyrus.

The right-hemispheric dominance highlights the processing of non-verbal information, with the posterior insula serving as the primary gateway for cardioception. Increased heart-focused interoceptive accuracy correlates with heightened emotional intensity, improved memory, and more adaptive decision-making (Garfinkel et al., 2013; Werner et al., 2009).

Paulus & Stein (2010) suggested that interoception essentially cause anxiety and mood disrders. The claim has been strengthened by the work of (Domschke et al., 2010) who related anxiety disorders to interoception whereas Wiebking et al. (2010) termed depression the outcome of lack of interoception. Interoceptive signals can be harmful, and confusing for those people who are under panic disorders, adding to their difficulties to make intuitive decisions (Wölk et al., 2014).

Interoception and Skin Feeling

The C-tactile(CT) affernts in hairy skin, which respond to the slightest of touch like cares, have attracted attention in the literature. This is skin-mediated interoceptive processes similar to pain and tactile pleasures (Crucianelli & Morrison, 2023). In order to investigate the brain underpinnings of mindfulness, touch, and interoception, Casals-Gutierrez & Abbey's research (2020) studied MRI operations researches to thoroughly understand the underpinnings of brain’s interoception, touch, and mindfulness which revealed that there may be some possible regions where these modalities interconnect. Skin-mediated signals like pain, temperature, and affective touch have been redefined as interoceptive (Crucianelli & Ehrsson, 2023). Neurophysiology and functional neuroimaging suggest that social, affective touch is a prominent category of tangible experience, operating mainly in social interactions and relationships, and playing a role in physiological regulation during stress and challenges (Morrison, 2016).

Touch can safeguard detrimental physiological effects of maladaptive reactions. Inter-individual touch can sack negative affect while evoking strong moods of pleasure, though context and internal state can alter the hedonic value of touch (Ellingsen et al., 2016). While hostile somatosensations remain well-characterized in terms of peripheral signaling, pleasant tactile sensations may be mediated by specialized peripheral tactile afferents like C-tactile fibers, which respond to light and slow stroking and are related only in hairy skin (Vallbo et al., 1999; Löken et al., 2009; Zaman et al., 2020). Soviet studies of interoceptive conditioning found it to be unconscious, slower to establish, and more resistant to extinction than exteroceptive conditioning (Uno, 1970).

Methodology

PRISMA

To achieve the study's objective, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) procedures were adhered to for conducting a systematic literature review. This review process comprised four key stages: identification, screening, eligibility, and inclusion (Moher et al., 2009).

Search Strategy

A thorough search was carried out across electronic databases such as PubMed, PsycINFO, and Google Scholar. Keywords like "interoception," "skin feeling," "cutaneous," "decision-making," and "affective touch" were utilized. The search focused on peer-reviewed journal articles published between 2000 and 2023.

What to include or exclude: Criteria

Inclusion criteria:

- Peer-reviewed articles
- Studies focusing on interoception and decision-making
- Research involving skin-mediated interoceptive processes

Exclusion criteria:

- Unrelated to interoception, Skin sensation or decision-making
- Paper that Lacked Methodological Rigor
- Lack of sufficient Data

Data Extraction

The data were extracted from the included studies pertinent to the study design, sample size, measures of interoception, and key findings related to decision-making.

Results

First, the results of the literature study is discussed as;

PRISMA Flowchart Details

1. **Number of Citations:**
- Total number of citations: 40
2. **Number of Databases Used:**
- Databases: PubMed, Google Scholar, Web of Science, PsycINFO
- Total number of databases used: 4

3. **Number of Records:**
- Records identified through database search: 400
- Records identified through other sources (e.g., references): 50
- Total identified records: 450
4. **Number of Records removed (After Duplicates) :**
- Duplicates removed: 50
- Records after duplicates removed: 400
5. **Number of Records Screened:**
- Records screened: 400
- Records excluded: 300
- Articles assessed full-text for eligibility: 100
6. **Number of Full-Text Articles Excluded:**
- Full-text articles excluded (with reasons): 60
- Reasons might include: not relevant to the specific focus on skin-mediated interoception, insufficient data, or lack of methodological rigor.
7. **Number of Studies Included in Qualitative Synthesis:**
- Studies included in qualitative synthesis: 40
8. **Number of Organizations Where Searches Occurred:**
- Organizations: University libraries, research institutions, online databases.
- Total number of organizations: 5 (e.g., university libraries, PubMed, Google Scholar, Web of Science, PsycINFO)

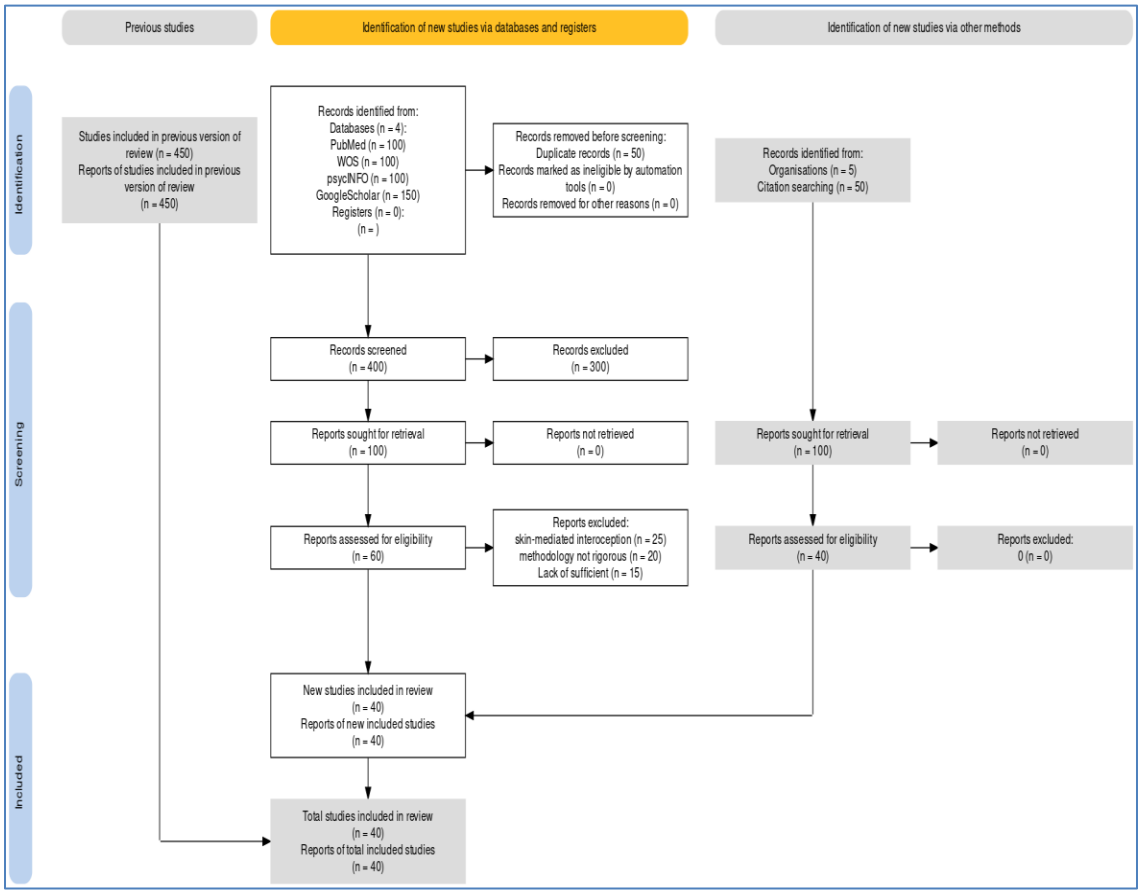

Figure 1: PRISMA Flowchart of study selection process.

Explanation for PRISMA Flowchart

During the identification stage, a total of 450 records were identified over database searching and other registers. Following the Screening phase, 50 duplicates were removed, whereas 400 records were screened based on their titles and abstracts. In the Eligibility stage, a total of 100 full-text papers were evaluated for eligibility, and 60 were excluded for reasons such as irrelevance, lack of methodological rigor, insufficient data. Lastly, during the inclusion stages 40 articles were considered for the qualitative synthesis, establishing the basis of the conceptual paper.

Key Findings of literature Study

1. **Peripheral Coding of Cutaneous Pain**: Andrew and Greenspan (1999) highlighted differences in nociceptor activity, suggesting that skin-mediated pain perception influences pain-related decision-making.
2. **Interoceptive Predictions in the Brain**: Barrett and Simmons (2015) emphasized the brain's role in predicting Interoceptive states, which are crucial for adaptive decision-making.
3. **Body Perception and Autonomic Reactivity**: Cabrera et al. (2018) found that heightened body awareness and autonomic reactivity correlate with decision-making efficacy.
4. **Interoception and Emotion**: Critchley and Garfinkel (2017) demonstrated that Interoceptive sensitivity enhances emotional experiences, thereby influencing decision-making processes.

Emerging Themes

1. **Affective Touch and Decision-Making**: Crucianelli and Morrison (2023) discussed how pleasant touch affects emotional regulation and decision-making.
2. **Heart-Beat Detection and Emotional Awareness**: Studies by Garfinkel et al. (2013) and Herbert et al. (2011) linked cardiac interoception with emotional awareness, impacting intuitive decisions.
3. **Interoceptive Awareness in Meditators**: Khalsa et al. (2008) found that experienced meditators have enhanced interoceptive awareness, which supports better decision-making under stress.

Measuring Interoception

Collecting evidence of interoception in an objective manner is always challenging. Dissimilar to exteroception, the effective stimulus for interoception are frequently unidentified, and they are difficult to control experimentally, even when identifiable (Brener & Ring, 2016). The Interoceptive Accuracy Scale (IAS) is a self-reported tool used to measure accuracy and attention to interoceptive signals (Murphy, Catmur, & Bird, 2019; Murphy, Brewer, Plans, Khalsa, Catmur & Bird, 2020).

This scale includes various items pertaining to bodily sensations that are classified as interoceptive (Khalsa et al., 2017; Khalsa & Lapidus, 2016) or linked to activation in the insula, a brain region crucial for processing interoceptive signals (e.g., Critchley & Harrison, 2013; Langer, Beeli, & Jäncke, 2010; Mazzone, McLennan, McGovern, Egan, & Farrell, 2007; Craig, 2002; Khalsa et al., 2017). We sought to include signals with objectively measurable accuracy, opting for specific examples like flatulence and eructation rather than general terms such as "gastric sensations" for alimentary interoception. Participants received detailed instructions and examples of accurate internal perception (see Figure 2).

The scale comprises 21 items, rated betwee strongly agree (5) and strongly disagree (1), resulting in scores between 21 and 105. Greater self-reported interoceptive accuracy is indicated when scores are higher. Similar to the ICQ, the IAS inquires participants to assess the accuracy of perceived interoception. The issue is that IAS does not have specific examples such as“I can accuraltely sense when i am cold or hot, always “or “I can sense precisely when I am hungry“. Unlike the ICQ which comprised of examples such as I often forget to eat" and "Others find it uncomfortable when I adjust car or room temperature".

The goal of the Interoceptive Accuracy Scale (IAS) was to measure the variety of personal encounters with interior sensations. This design acknowledges that challenges with perceiving these sensations may manifest in ways distinct from those illustrated in the Interoceptive Confusion Questionnaire (ICQ) cases. For example, a person who has difficulty sensing hunger may overeat instead of forgetting to eat, according to Murphy et al (2020).

In the Body Perception Questionnaire-Short Form (BPQ-SF), Cabrera et al. (2018) examine the factor reliability, structure, and convergent validity of the Autonomic Reactivity subscales and Body Awareness. Self-reported sensitivity to internal cues is used to test interoceptive sensibility, with an emphasis on people's self-confidence in their interoceptive skills.

This is exemplified by the awareness subscale of the Body Perception Questionnaire (BPQ) (Porges, 1993). Body Perception Questionnaire Autonomic: Symptoms Short Form (BPQ-20 ANS)

Please only rate how well you can perceive these signals without using external cues, for example, if you can only perceive how fast your heart is beating when you measure it by taking your pulse this would not count as accurate internal perception.

1. I can always accurately perceive when my heart is beating fast
2. I can always accurately perceive when I am hungry
3. I can always accurately perceive when I am breathing fast
4. I can always accurately perceive when I am thirsty
5. I can always accurately perceive when I need to urinate
6. I can always accurately perceive when I need to defecate
7. I can always accurately perceive when I encounter different tastes
8. I can always accurately perceive when I am going to vomit
9. I can always accurately perceive when I am going to sneeze
10. I can always accurately perceive when I am going to cough
11. I can always accurately perceive when I am hot/cold
12. I can always accurately perceive when I am sexually aroused
13. I can always accurately perceive when I am going to pass wind
14. I can always accurately perceive when I am going to burp
15. I can always accurately perceive when my muscles are tired/sore
16. I can always accurately perceive when I am going to get a bruise
17. I can always accurately perceive when I am in pain
18. I can always accurately perceive when my blood sugar is low
19. I can always accurately perceive when someone is touching me affectionately rather than non-affectionately
20. I can always accurately perceive when something is going to be ticklish
21. I can always accurately perceive when something is going to be itchy

Scale: Strongly Agree (5), Agree (4), Neither agree nor disagree (3), Disagree (2), Disagree Strongly (1).

Autonomic Reactivity and Body Awareness subscales of the Body Perception Questionnaire-Short Form (BPQ-SF) are examined by Cabrera et al. (2018) for factor structure, reliability, and convergent validity. They use self-reported tests to measure interoceptive sensibility, or sensitivity to internal bodily signals, and then investigate the individual's self-evaluated belief in their interoceptive ability. One such tool that is utilized is the awareness subscale of the Body Perception Questionnaire (BPQ), which was created by

Porges (1993). For analogous evaluations, the Body Perception Questionnaire Autonomic: Symptoms Short Form (BPQ-20 ANS) is employed. By checking the option that most closely matches their response, respondents are asked to score their awareness of each given attribute.

		NEVER	OCCASIONALLY	SOMETIMES	USUALLY	ALWAYS
1	Swallowing frequently	o	o	o	o	o
2	An urge to cough or clear my throat	o	o	o	o	o
3	My mouth being dry	o	o	o	o	o
4	How fast I am breathing	o	o	o	o	o
5	Watering or tearing of my eyes	o	o	o	o	o
		NEVER	OCCASIONALLY	SOMETIMES	USUALLY	ALWAYS
6	Noises associated with my digestion	o	o	o	o	o
7	A swelling of my body or parts of my body	o	o	o	o	o
8	An urge to defecate	o	o	o	o	o
9	Muscle tension in my arms and legs	o	o	o	o	o
10	A bloated feeling because of water retention	o	o	o	o	o
11	Muscle tension in my face	o	o	o	o	o

		NEVER	OCCASIONALLY	SOMETIMES	USUALLY	ALWAYS
12	Goose bumps	o	o	o	o	o
13	Stomach and gut pains	o	o	o	o	o
14	Stomach distension or bloatedness	o	o	o	o	o
15	Palms sweating	o	o	o	o	o
16	Sweat on my forehead	o	o	o	o	o
17	Tremor in my lips	o	o	o	o	o
18	Sweat in my armpits	o	o	o	o	o
		NEVER	OCCASIONALLY	SOMETIMES	USUALLY	ALWAYS
19	The temperature of my face (especially my ears)	o	o	o	o	o
20	Grinding my teeth	o	o	o	o	o
21	General jitteriness	o	o	o	o	o
22	The hair on the back of my neck "standing up"	o	o	o	o	o
23	Difficulty in focusing	o	o	o	o	o
24	An urge to swallow	o	o	o	o	o
25	How hard my heart is beating	o	o	o	o	o
26	Feeling constipated	o	o	o	o	o

Multidimensional Assessment of Interoceptive Awareness Questionnaire (MAIA)

The MAIA is an extensive self-report instrument created to assess interoceptive body awareness. Its development was based on a systematic mixed-methods approach, involving a thorough review of existing literature, the formulation of a multidimensional conceptual framework, the assessment of pre-existing instruments, the creation of new items, and the analysis of feedback from focus groups consisting of instructors and patients participating in therapies aimed at enhancing body awareness.

	Standardized loading	SE
Noticing		
1. When I am tense I notice where the tension is located in my body.	.697	.039
2. I notice when I am uncomfortable in my body.	.594	.045
3. I notice where in my body I am comfortable.	.711	.038
4. I notice changes in my breathing, such as whether it slows down or speeds up.	.452	.053
Not-Distracting		
5. I do not notice physical tension or discomfort until they become more severe.	.631	.050
6. I distract myself from sensations of discomfort.	.644	.050
7. When I feel pain or discomfort, I try to power through it.	.622	.051
Not-Worrying		
8. When I feel physical pain, I become upset.	.629	.049
9. I start to worry that something is wrong if I feel any discomfort.	.724	.046
10. I can notice an unpleasant body sensation without worrying about it.	.577	.051
Attention Regulation		
11. I can pay attention to my breath without being distracted by things happening around me.	.589	.041
12. I can maintain awareness of my inner bodily sensations even when there is a lot going on around me.	.766	.027
13. When I am in conversation with someone, I can pay attention to my posture.	.625	.038
14. I can return awareness to my body if I am distracted.	.728	.031
15. I can refocus my attention from thinking to sensing my body.	.758	.028
16. I can maintain awareness of my whole body even when a part of me is in pain or discomfort.	.747	.029
17. I am able to consciously focus on my body as a whole.	.721	.031
Emotional Awareness		
18. I notice how my body changes when I am angry.	.518	.045
19. When something is wrong in my life I can feel it in my body.	.534	.044
20. I notice that my body feels different after a peaceful experience.	.817	.024
21. I notice that my breathing becomes free and easy when I feel comfortable.	.809	.025
22. I notice how my body changes when I feel happy/joyful.	.837	.023
Self-Regulation		
23. When I feel overwhelmed I can find a calm place inside.	.730	.032
24. When I bring awareness to my body I feel a sense of calm.	.736	.032
25. I can use my breath to reduce tension.	.773	.029
26. When I am caught up in thoughts, I can calm my mind by focusing on my body/breathing.	.735	.032
Body Listening		
27. I listen for information from my body about my emotional state.	.761	.030
28. When I am upset, I take time to explore how my body feels.	.769	.030
29. I listen to my body to inform me about what to do.	.822	.026
Trusting		
30. I am at home in my body.	.601	.042
31. I feel my body is a safe place.	.831	.028
32. I trust my body sensations.	.817	.029

doi:10.1371/journal.pone.0048230.t002

Mehling WE, Price C, Daubenmier JJ, Acree M, Bartmess E, Stewart A (2012) The Multidimensional Assessment of Interoceptive Awareness (MAIA). PLoS ONE 7(11).

Intuition Measurement Tool RIDMS-E by Launer and Cetin (2023)

Based on the research EFRE-project Rationality, Heuristics, Intuition, and Anticipation (RHIA) by Markus Launer (2018-2021), a broader measurement instrument for intuition was initiated. Launer and Svenson (2022) laid the theoretical basis and first empirical study to better measure emotions, affection, and feelings than in the above-mentioned intuition studies.

Based on their analysis, the authors analyzed all items on interoception from the following studies: General Decision Making Style inventory (Scott & Bruce, 1995, short GDMS), Rational Experiential Inventory (Pacini & Epstein, 1999, shortb REI); Perceived Modes of Processing Inventory (Burns & D'Zurilla, 1999, short PMPI), and Types of Intuition Scale (Pretz et al, 2014, short TIntS). Only the items were used with a factor loading higher than 0.7.

Study und Factor Loading	Affective Intuition or Impulsive Body Reactions	Theoretical Basis
5 PMPI (F 0,744)	When I am trying to decide how to cope , I usually go with my gut feeling	PID Intuition
30 PMPI (F 0,738)	When I am attempting to cope I can usually trust my gut feelings to tell me what to do	Experiental Processing Style
GDMS (F 0,69 or 0,79)	When I make a decision, I trust my inner body feeling and somatic reactions	Intuition GDMS
8 PID (F 0,597)	I prefer drawing conclusions based on my feelings, my knowledge of human nature, and my experience of life	Mixed Theory. Confusing!!!
REI (F 0,65)	Using my gut feelings usually works well for me in figuring out problems in my life	Affective Intuition
REI (F 0,5)	I tend to use my gut feeling for my decisions	Affective Intuition
REI (F,0 9) TIntS (F 0,73)	I tend to use my heart as a guide for my actions	Affective Intuition
New by RHIA Study	I tend to use my skin feeling for my decisions	RHIA Study by Launer
12 PMPI (F 0,816)	Gut feelings are more important to me than logic and evidence when I have to cope .	Experiental Processing Style

Figure 2: Analysis of items from intuition studies (Launer, 2023)

Launer and Cetin (2023) deepened this measurement instrument and researched emotional intuition in more depth, e.g. body impulses (interoception). Based on a Crohnbach`s Alpha and factor analysis the best statistical results showed a summary of three items. These items on body impulses were used as a short version:

- When I make a decision, I trust my inner body feeling and somatic reactions
- I prefer drawing conclusions based on my feelings, my knowledge of human nature, and my experience of life
- I tend to use my gut feeling for my decisions

In the statistical analysis, the heart beat and skin feeling did not lead to a better result of the overall item pool. The authors are working on an international study in 2024 to better describe the item pool.

Discussion

Through the prism of the extant literature that we systematically reviewed, reflect that there is an influence of skin-mediated interactions. These specifically include the skin pain and emotional communication process. Emotional control and decision making is more improved with the ability the inner body signals and intuitive acumen. People with more consciousness reflect it in their deliberate decision making (Dunn et al.2010; Sokol-Hessner et al. 2015). The cognitive process can enhance the stability and emotional states to reach too much informed decision-making when the sensory information are possessed timely.

Implications for Decision-Making

It is evident from the scholastic work that these feeling affect the decision-making in a profound manner. In the highly complex systems, the enhanced skin-mediated generated awareness can warrant interventions responsible for interceptive skills. These kind of feelings can be improved by trainings that aim physical awareness and mindfulness integration, capacitating emotional maturity and better decision making. Interoception can play the function of well-rounded and informed choice seeking through techniques of positive decision-making.

Future Research Directions

More research should be done on specialized brain systems connected to skin-mediated interoception and decision-making. Investigating how various touch kinds and pain thresholds impact decision-making in various contexts might lead to a deeper understanding. Morrison (2016) and Brener and Ring (2016) suggest that different brain networks impacting cognitive and emotional outcomes are impacted by sensory input. Mapping these pathways and their interactions with decision-making processes is crucial. The long-term impact of treatments that enhance interoceptive awareness on decision-making can be shown via longitudinal study. Scholars may also request for a positivist research paradigm in the future to measure the quantifiable outcomes of these topics.

Conclusion

The importance of skin-mediated interoception in decision-making is highlighted in this work. By enhancing interoceptive awareness, interventions that improve decision-making can result from an understanding of these relationships. Improving one's ability to recognize internal cues may improve one's ability to control emotions and make decisions. Since this field of study has applications in psychology, neuroscience, business, and healthcare, more investigation is necessary to fully understand how interoception and decision-making interact, particularly with regard to skin-mediated sensory experiences.

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