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Cultural Influences on Heart Rate Variability as an Indicator of Emotion Regulation Abilities Among Turkish and Iranian Adults

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Abstract:

This thesis investigates the influence of cultural norms on interoception, heart rate variability (HRV), and emotion regulation. The study hypothesized that interoceptive accuracy, bodily awareness, and HRV would correlate positively with emotion regulation abilities and that these relationships would differ across cultural contexts. A mixed-methods approach was employed, integrating physiological measures of HRV with self-reported survey assessing bodily awareness. While self-reported data indicated that Turkish participants demonstrated higher bodily awareness compared to Iranian participants, no significant differences were found in physiological measures of HRV between the two groups. This highlights the nuanced ways in which cultural norms may influence subjective versus physiological aspects of interoception.

Moreover, the study addresses a broader gap in the literature on cross-cultural emotion regulation, particularly in the context of non-Western populations. Findings underscore the necessity of integrating cultural perspectives into studies on emotion regulation to account for the variability in regulatory strategies influenced by cultural norms and practices. This research contributes to expanding the understanding of how culture shapes the interplay between physiological and psychological regulation processes. The findings emphasize the importance of exploring how cultural norms shape emotion regulation and interoceptive processes, contributing to the advancement of cross-cultural psychological research and informing culturally sensitive intervention strategies.

Keywords: Interoception, emotion regulation, cardiac vagal tone, Turkish culture, Iranian culture.

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Introduction

This thesis explores the intersection of culture, interoception, and emotion regulation through the lens of heart rate variability (HRV) and cardiac sensitivity, focusing on Turkish and Iranian emerging adults. The capacity to perceive internal bodily signals—interoception—and its link to emotion regulation has gained attention in psychological and physiological research. However, the impact of cultural norms and practices on these processes remains underexplored, especially in non-Western contexts. This study addresses this gap by examining the relationships between cardiac interoception, HRV, and bodily awareness across two distinct cultures.

The first chapter provides a theoretical foundation by reviewing the concept of interoception, emphasizing its role in emotional and physiological regulation. It discusses key constructs like cardiac sensitivity, interoceptive accuracy, and their implications for mental health. The second chapter delves into HRV as a physiological indicator of autonomic nervous system balance and emotional flexibility. It highlights the relevance of HRV in understanding emotion regulation and its connections to cognitive functioning and overall well-being. The third chapter addresses the cultural dimensions of emotion regulation, focusing on Turkish and Iranian contexts. It explores how cultural norms and values influence emotional processes, with attention to collectivist traditions, religious practices, and gender norms.

The methodology chapter outlines the mixed-methods approach used to investigate these phenomena. This includes objective physiological measures of HRV and cardiac sensitivity, as well as self-report survey assessing bodily awareness. Comparative analyses were conducted to evaluate cultural differences and their implications for psychological health. By integrating physiological data with cultural perspectives, this thesis aims to provide a comprehensive understanding of how interoception and HRV contribute to emotion regulation

within culturally distinct populations. The findings have practical implications for advancing cross-cultural psychological research.

CHAPTER 1

Interoception

1.1 Introduction to Interoception

The capacity to detect changes in body parts is known as interoception. This encompasses internal experiences like thirst, hunger, inhalation, exhalation, heartbeat, and stomach contractions. Interoception plays a vital role in how individuals perceive and interact with their internal bodily states. It can influence emotional and cognitive processes by increasing awareness of one's bodily states. This concept includes both conscious awareness and unconscious processes. Interoception involves the interpretation of signals originating internally within the body (Cameron, 2002). Over time, the understanding of interoception has expanded. Initially, it was synonymous with viscероception; subsequently, it encompassed somatosensory and proprioceptive signals as well (Vaitl, 1996; Ceunen et al., 2016; Berntson et al., 2018). Despite its growing prominence in academic literature, the definition of interoception remains debated. Although the term "interoception" has been increasingly prominent in academic literature from the beginning of the millennium, there is still disagreement over what exactly it means.

In contrast to interoception, body awareness refers to a broader concept. Body awareness refers to the individual's awareness of the movements of his or her own body, including movements, postures, and sensations of various symptoms (such as muscle elongation, pain, temperature). This awareness extends beyond internal bodily signals to include external perceptions of the body. This concept encompasses both internal sensations and external body perceptions. Body awareness is thus an overarching, continuous state of how the body is experienced and how a person responds to changes within it.

The relationship between interoception and emotion regulation is particularly noteworthy. Most modern researchers concur that interoception is the perception of the state of the body (Ceunen et al., 2016). In adults, the ability to process or regulate emotions, along with other aspects of emotional experience, relies significantly on their capacity to recognize their own bodily signals. While many interoceptive processes occur unconsciously, their conscious aspects can be clinically measured. Most interoceptive processes occur outside of consciousness. Consciously experienced aspects are quantified clinically through subjective report, and there are few observable interoceptive signals like heart rate, breathing rate, pupillary dilation, flushing, perspiration, piloerection, and nociceptive reflexes (Khalsa et al., 2018).

A specific aspect of interoception is cardiac sensitivity, which focuses on the detection of heartbeats. Cardiac sensitivity is the individual's ability to detect and recognize their own heartbeat. This ability is a more focused type of interoception that highlights the connection between physiological responses and emotional states. This refers to the feeling of a person's heartbeat speeding up, slowing down, or changing its rhythm. Cardiac sensitivity is a particular type of interoception and primarily focuses on the individual's ability to notice physiological responses to emotional states such as stress and anxiety.

Garfinkel and Critchley (2013) suggested making distinctions among three aspects of interoception: interoceptive sensibility, interoceptive accuracy, and interoceptive awareness. Interoceptive sensibility is the tendency to become aware of interoceptive information and to be internally focused, whereas interoceptive accuracy is a measure of how accurately one can sense the interior state of one's body and interoceptive awareness is the ability to be conscious of how accurately individuals can perceive their internal body signals. Interoceptive accuracy pertains to assessments of internal body signal perception through objective tests, exemplified by the Heartbeat Perception Task (HPT) (Schandry, 1981). Invasive techniques are frequently

required to access the entire spectrum of interoceptive signals, and these techniques frequently cause physiological disruptions and index additional objectively observable characteristics (Khalsa et.al., 2019). However, the use of non-invasive techniques in the context of psychological and neurological assessment has yielded numerous new insights (Critchley et.al., 2004). Most studies measure and evaluate interoceptive awareness in relation to an individual's capacity to sense their own heartbeat. It has been demonstrated that adult heartbeat perception assessments are sufficiently reliable. A deficit in interoceptive accuracy has been linked to various mental health conditions, including eating disorders and depression (Pollatos et al., 2008; Pollatos et al., 2009).

Interestingly, research findings indicate that the connection between these three dimensions of cardiac interoception is weak or nonexistent. These findings indicate that different dimensions of interoception should be evaluated independently of each other. In terms of evaluation and assessment, there is a discrepancy in the literature regarding the concept of interoceptive sensibility. Unfortunately, it remains unclear which questionnaires are suitable for evaluating the dispositional aspect of interoceptive sensibility (Horváth et al., 2021). Garfinkel et al. (2015b) suggest using the Body Awareness Scale from the Body Perception Questionnaire (Porges, 1993). The Body Awareness Questionnaire (BAQ), (Shields et al., 1989) and the Multidimensional Assessment of Interoceptive Awareness (Mehling et al., 2012) have also been employed in previous studies (Meessen et al., 2016; Ferentzi et al., 2019). Interoceptive awareness is expected to predict individuals' ability to regulate emotions. It is hypothesized that higher interoceptive accuracy corresponds with better emotion regulation skills, as individuals can more accurately monitor their physiological states.

1.2 Interoception and Mental Health

Although it has been found that high interoceptive accuracy is associated with both anxiety and better emotion regulation skills, these two conditions are not opposite to each other. The positive relationship between anxiety and high interoceptive accuracy indicates a high sensitivity to bodily signals, and this sensitivity can sometimes increase anxiety. However, this high sensitivity can also help individuals to better identify their emotional states and manage these situations more effectively.

The awareness of physical sensations related to emotions is crucial for emotion regulation and the sense of self. This is a relevant explanation of the importance of the connection between this dimension and mental health. For instance, interoceptive information does not necessarily equate to interoceptive consciousness. Some of this information can penetrate awareness, enabling us to become conscious of it. Mental processes such as attention, interpretation, appraisal, beliefs, memories, conditioning, attitudes, and affect all significantly influence subjective consciousness (Mehling et al., 2009). Signals related to hunger, thirst, breathing, and cardiac signals are all interoceptive. Although visceral sensations were the only ones mentioned when the word interoception was first used (e.g., Fowler, 2003), perception of interoceptive signals is correlated with a higher level of consciousness.

Our capacity for interoception—the ability to detect and comprehend changes in our autonomous nervous system—determines our emotional experiences. It is proposed that individuals can perceive sensations originating within their bodies, enabling them to cultivate an awareness of their emotional and physical states. The term interoceptive awareness seems to have emerged among clinicians who were treating individuals, particularly those with Post Traumatic Stress Disorder (PTSD), who had undergone trauma (Leech et al., 2024). Interoception dysfunction is being increasingly recognized as a significant factor to a variety of mental health illnesses, including anxiety disorders, mood disorders, eating disorders, addiction disorders, and somatic symptom disorder (Khalsa et.al., 2018). Individuals with

PTSD often struggle to focus on their internal sensations because they frequently feel overwhelmed by lingering trauma-related perceptions, emotions, and sensations (Yehuda, 2000). Interventions aimed at promoting emotional control, stress reduction, and general well-being can be informed by an understanding of interoceptive awareness. Enhancing one's comprehension of interoceptive awareness can result in more effective techniques for regulating emotions, which are essential for mental health and overall well-being.

1.3 Clinical and Psychological Implications of Interoception

Interoception has been studied extensively in both clinical and psychophysiological research (Cameron, 2002; James, 1890; Sherrington, 1906). Individuals with higher interoceptive awareness shows higher accuracy in recognizing and understanding the emotional states (Terasawa et al., 2014) and accurate interoceptive awareness plays a crucial role in shaping emotional experiences and cognitive processes (Garfinkel et al., 2013).

Studies show that just being aware of the heartbeat is not enough for emotion regulation skills. According to Pollatos (2007) high interoceptive accuracy is associated with emotional awareness and emotion regulation skills. However, this relationship is based not only on the ability to notice the heartbeat, but also on the ability to associate this awareness with emotional states. According to the theoretical frameworks proposed by Garfinkel et al. (2015a) interoception is not only about being aware of heartbeats but also about processing this awareness accurately and effectively, which is essential for emotion regulation abilities and other psychological outcomes.

Studies in the literature show us the complexity of interoception and how the different components of this concept can be related to both anxiety levels and emotion regulation. The presence of a positive relationship between high interoceptive awareness and anxiety means that individuals are more sensitive to internal body signals like heartbeats, which can increase

anxiety. This indicates the relationship between interoceptive awareness and anxiety levels. Interoceptive sensitivity is connected to anxiety levels and the body's response to physical exertion. It explores how heightened interoceptive awareness may influence individuals' experiences and reactions to anxiety-inducing situations. Interoceptive dysfunction observed also in panic disorder, depression, somatic symptom disorders, anorexia nervosa, and bulimia nervosa (Khalsa et.al., 2016).

The concept of interoception includes conscious awareness of physiological signals and covers more specific components such as body awareness, cardiac sensitivity, and bodily perception. In the literature, self-reports of interoception do not seem to be too close with the actual accuracy of interoception but they indicate what people think about their body signals. Murphy and colleagues (2019) proposed that a person may pay close attention to their internal signals, but this attention does not always result in accurate perception or prediction of these signals. Individuals may claim habitual attentiveness to physical signals, yet nevertheless report difficulties knowing when they are thirsty, hungry, or satiated. Being aware of one's own body's movements and sensations plays a crucial role in our ability to feel, engage with our surroundings, and maintain both our bodily and mental health.

1.4 Cardiac Sensitivity: Understanding Heartbeat Perception

Cardiac sensitivity is a crucial part of total body awareness, and these two concepts are interconnected. Understanding cardiac sensitivity requires grasping its relationship to interoceptive awareness, a broader concept encompassing our ability to perceive internal bodily signals. Most research on interoceptive awareness has primarily concentrated on the perception of heartbeats and individual sensitivity to cardiac signals, often referred to as "cardiac awareness." Cardiac sensitivity refers to a person's ability to detect their own heartbeat and use this information.

1.5 The Role and Impact of Cardiac Sensitivity

Cardiac sensitivity plays a pivotal role in emotion regulation, stress management, and overall well-being. For example, during stress, the body's natural response includes an increase in heart rate; individuals with high cardiac sensitivity can better detect and interpret these changes, allowing for more adaptive responses. This ability is not just an isolated skill but is intertwined with emotional responsiveness and autonomic nervous system reactivity. Interoceptive awareness measured by cardiac awareness is associated with increased sensitivity to emotional responsiveness and cardiovascular autonomic reactivity in various situations that trigger autonomic changes (Herbert et al., 2012). This ability allows for a clearer perception of the heartbeat in situations such as stressful situations or physical activity, which can contribute to the regulation of emotional experiences and behaviors. In addition, having a high cardiac sensitivity can also contribute to improving a person's stress coping skills and improving their emotional well-being. For instance, when a person encounters a stressful situation, their heartbeat usually speeds up. In this case, if a person has a high cardiac sensitivity, he can feel this acceleration more noticeably. In other words, they can more clearly perceive bodily changes related to the rapid heartbeat of the heart in a stressful situation. In this case, a person with high cardiac sensitivity can better understand stress levels and react appropriately. In contrast, poor cardiac sensitivity has been associated with increased anxiety and depression. Individuals who struggle to accurately perceive their heartbeat and other cardiac signals may misinterpret these bodily cues, leading to amplified feelings of panic or emotional numbness.

Cardiac sensitivity is a significant factor in cardiovascular health. Monitoring one's heartbeat accurately can serve as an early warning system for cardiovascular issues, enabling early intervention. People who can monitor their heartbeat properly may detect and treat cardiovascular illnesses earlier in life. Enhancing cardiac sensitivity is also linked to better stress management and overall health outcomes. Huang et al. (2013) examined these processes,

revealing that exercise-induced stress can trigger changes in the body's response to stress and impact cardiovascular function. This highlights the importance of cardiac sensitivity in not only detecting cardiovascular issues early but also improving overall stress response and maintaining cardiovascular health.

1.6 Connection to Other Constructs

The link between cardiac sensitivity and broader constructs such as bodily awareness, emotion regulation, and conscious awareness is vital to understand. This connection is crucial to the processes of conscious awareness and emotional control. Being aware of one's own heart rate is not just about physical awareness but also ties directly into emotional processing and regulation. Recognizing and controlling emotions can be easier by being aware of one's own heart rate. Schandry (1981) suggests that cardiac activity is associated with emotional experience. This suggests that the ability to perceive one's heartbeat is closely linked with the ability to manage emotional responses effectively. Our capacity to comprehend and control our emotional responses is compromised by an erroneous perception and interpretation of autonomic changes (Lischke, 2021). Additionally, several authors have examined the possibility of controlling psychological distress through awareness of bodily sensations (Farb et al., 2015). For instance, a beating heart may indicate anxiety or excitement, enabling the person to respond appropriately.

1.7 Measurement of Cardiac Sensitivity

Accurate measurement of cardiac sensitivity is essential for both research and practical applications in health. Numerous techniques have been developed to assess cardiac sensitivity. Counting one's own heartbeat is one of the most popular techniques. For a certain amount of time, participants are instructed to feel and count their own heartbeats; this number is then compared with an objective measurement. This technique was used by Schandry (1981) to test

cardiac sensitivity. To evaluate cardiac sensitivity, electrocardiography (ECG) and pulse measures are also used. Another technique for assessing cardiac sensitivity is "Heartbeat Detection Task", this method involves asking individuals if the audible alerts they get at specific intervals match their heartbeats. These methods not only assess how accurately individuals can detect their heartbeats but also provide insights into their overall interoceptive accuracy. With the use of this technique, it is possible to evaluate people's accuracy in identifying their heartbeat objectively.

1.8 Physiological and Psychological Factors Influencing Cardiac Sensitivity

Several physiological and psychological factors influence cardiac sensitivity, making it a complex trait. For instance, individuals who have good control over their heart rate may have enhanced abilities in perceiving their heartbeats. This suggests that factors influencing heart rate regulation may contribute to one's ability to accurately perceive their heartbeats. A study by Montgomery, Jones, and Hollandsworth (1984) highlighted the connection between physical fitness, exercise, and cardiac awareness, further supporting the idea that heart rate regulation plays a role in interoception. Additionally, past studies indicate that men tend to perceive their heartbeats more accurately than women (Katkin et al., 1981). However, these sex-based differences disappear when body weight is controlled for. This suggests that body composition, rather than gender, plays a crucial role in cardiac sensitivity. Additional studies (Borg & Linderholm, 1967; Montgomery et al., 1984) have demonstrated the positive impact of increased physical fitness on enhancing cardiac sensitivity. Physical fitness thus emerges as a modifiable factor that can potentially enhance an individual’s ability to perceive their heartbeat accurately. These findings are consistent across various research investigations. Moreover, a comprehensive comparison by St. Pierre, Peirlinck, and Kuhl (2022) revealed that while the male and female hearts respond similarly to healthy and athletic conditions, subtle differences in form and function are observed. These differences, which may arise from

physiological variations or measurement techniques, further underscore the complexity of cardiac sensitivity and its interaction with gender and physiological traits.

1.9 Practical Applications and Clinical Relevance

In summary, high interoceptive accuracy and cardiac awareness can play a role in both individuals experiencing anxiety and developing emotion regulation skills. This highlights the bidirectional relationship between interoception and emotional well-being, where improving one can positively influence the other. This indicates the bidirectional effects of inner awareness and that it can have different consequences depending on its context.

It is extremely important for individuals to have cardiac sensitivity and body awareness in order to recognize their own physiological processes and understand the connections between these processes and emotional experiences. The theoretical and practical implications of cardiac sensitivity extend into various domains, including health psychology, clinical practice, and even everyday stress management strategies. The relationship between these variables has been clarified by taking into account their theoretical foundations, measurement techniques, clinical applications and practical results. Research on body awareness and cardiac sensitivity has an important potential in improving the health and quality of life of individuals. Ongoing research in these areas is a candidate to significantly influence various academic disciplines, such as psychology, neuroscience, and medicine.

1.10 Techniques for Enhancing Cardiac Sensitivity

In light of the benefits of cardiac sensitivity, exploring ways to enhance it becomes crucial. Studies have indicated that self-regulation techniques, such mindfulness meditation, can increase heart rate variability and enhance cardiovascular well-being. Researchers such as Miller et al. 1995) and Mehling (2012) have reported that mindfulness and meditation techniques can enhance an individual's body awareness, which can have a good impact on their

general health and well-being. These practices not only benefit physical health but also foster greater emotional resilience and stress management. In addition to physical health, psychological well-being and emotional balance also depend on body awareness. Individuals with high body awareness are more able to interpret their own body signals and respond according to these signals. This allows for more effective management of conditions such as depression, anxiety, and stress.

1.11 Interoception and Stress Management

Interoceptive awareness is not only crucial for understanding bodily signals but also plays a key role in stress perception and management. Interoceptive awareness affects how effectively individuals are able to regulate stress. Individuals with higher interoceptive awareness may be more capable of recognizing stress signals early and implementing stress management strategies but factors such as personality traits, previous experiences, and baseline physiological sensitivity can affect how interoception interacts with stress. For example, depressed individuals have generally been shown to have lower interoceptive awareness and this contributes to emotion regulation difficulties (Dunn et al. 2007). Thus, enhancing interoceptive awareness could serve as a therapeutic target for improving emotion regulation in individuals with mood disorders. There is a bidirectional relationship between interoception and stress. While interoceptive awareness can affect stress perception and management, stress can also affect interoceptive processes. Chronic stress can impair interoceptive accuracy and lead to difficulties in recognizing and responding to bodily signals (Schulz & Vögele, 2015).

1.12 Cultural and Social Influences on Interoception

The influence of culture on interoceptive awareness underscores the importance of considering social context in research and practice. Research shows that cultural norms and practices significantly affect how individuals perceive and interpret bodily sensations. In some

cultures, explicit expression of bodily sensations is encouraged, while in others it may be suppressed or controlled more. This can also have an effect on interoceptive awareness and emotion regulation. Culturally, the language and concepts that individuals use to express bodily experiences and emotional states are crucial. For instance, some cultures often use bodily sensations to describe their emotional states, while other cultures may emphasize more social situations and external events. This condition can affect how individuals notice their interoceptive perceptions and how they interpret these perceptions.

Convergent evidence from both empirical studies and ethnographic work suggests that individuals from several non-Western cultures may demonstrate higher levels of somatic awareness compared to those from Western cultures. In their seminal work on culture, emotion, and language, Tsai et al. (2004) discuss this phenomenon. Western cultures frequently place more importance on verbal expression and external events than on physical sensations. For example, certain cultures place a strong emphasis on holistic perspectives on health, in which physical sensations are carefully considered as markers of general health. For the purpose of clinical procedures and health interventions, it is essential to comprehend cross-cultural differences in somatic awareness and interoceptive accuracy. According to Ma-Kellams and Blascovich (2016), culturally sensitive methods that take into account the variety of ways that people experience their bodies might improve the efficacy of therapeutic interventions and advance holistic well-being.

CHAPTER 2

Heart Rate Variability

2.1 Introduction to Heart Rate Variability (HRV)

HRV refers to the variation in the time intervals between consecutive heartbeats. It is commonly measured by analyzing the R-R intervals—the time between successive heartbeats—using methods such as electrocardiography (ECG) and photoplethysmography (PPG), which allow for precise, non-invasive monitoring of heart rate fluctuations in real-time (Shaffer & Ginsberg, 2017). HRV has gained increasing recognition as a valuable indicator of ANS flexibility and overall health status. As such, HRV provides crucial insights into the balance and responsiveness of the ANS. A higher HRV generally reflects greater adaptability and parasympathetic (rest-and-digest) dominance, while lower HRV can be indicative of sympathetic (fight-or-flight) dominance, which is linked to stress responses.

Research has demonstrated a significant link between HRV and mental health, particularly its association with anxiety disorders, which tend to exhibit reduced HRV with a small-to-moderate effect size (Chalmers et al., 2014). Furthermore, beyond its association with mental health, HRV has been linked to cognitive functioning and executive processes. It is linked to improved cognitive functions and enhanced focus. Higher HRV indicates greater flexibility and adaptability of the ANS, which may contribute to enhanced executive functions such as cognitive control, attention, and working memory. Executive functions encompass essential mental processes including focus, decision-making, and problem-solving. Previous studies have established a connection between HRV and behaviors related to executive functions (Hansen et al., 2003), highlighting the importance of autonomic regulation in cognitive processes.

Furthermore, HRV is associated with various cardiovascular functions like blood pressure regulation and heart rate control. It is also influenced by lifestyle factors such as smoking and alcohol consumption, which can reduce HRV and impair the body's ability to respond flexibly to stress. These insights have practical applications in both clinical and everyday settings, where HRV can be a powerful tool for monitoring health. With advancements in technology, HRV can now be easily measured and analyzed in clinical and personal health settings, offering insights into not only physical but also psychological well-being.

2.2 Autonomic Nervous System and HRV

The ANS regulates the body's internal organs and systems automatically, consisting of two main branches: the sympathetic nervous system (SNS) and the parasympathetic nervous system (PNS). The ANS maintains homeostasis by balancing the actions of these systems. This dynamic balance is essential for responding effectively to both internal and external demands.

The SNS is associated with the "fight or flight" response, increasing heart rate, raising blood pressure, and releasing energy to prepare the body for action. In contrast, the PNS promotes relaxation by decreasing heart rate, stimulating digestion, and slowing respiration. Together, these systems work to ensure the body can respond flexibly to environmental stressors, a key aspect of maintaining overall health. When the balance between the SNS and PNS is disrupted, it may lead to reduced psycho-physiological flexibility. This inflexibility can manifest as metabolic issues and poor mitochondrial function, contributing to conditions such as metabolic syndrome, accelerated aging, and cardiovascular disease (Thayer et al., 2012; van de Weijer et al., 2013). In this context, autonomic dysregulation is often associated with broader health implications. Imbalances in the ANS, characterized by higher sympathetic

activity and decreased vagal tone, are linked to an increased risk of cardiac death (Cygankiewicz & Zareba, 2013).

Given the importance of this balance, HRV serves as a significant predictor of cardiovascular health and mortality (Thayer et al., 2010). HRV, as a physiological marker, highlights the adaptability of the ANS. High HRV is associated with the ANS's ability to adapt to various internal and external stress factors. Specifically, increased SNS activity results in reduced HRV, as heartbeats become less variable. Conversely, increased PNS activity leads to higher HRV due to increased variability in heartbeats. These changes illustrate how HRV can reveal the body's capacity to regulate stress and maintain equilibrium. This relationship underscores the importance of HRV as an indicator of the balance and functioning of the ANS.

By providing insights into the balance and responsiveness of the ANS, HRV reflects how well the nervous system regulates heart rate in response to internal and external stimuli. More specifically, vagal tone—a measure of parasympathetic activity—has been found to correlate with both physiological and psychological outcomes. Greater resting vagal tone has been correlated with higher levels of sociability, improved cognitive and emotional competence, and reduced problem behaviors (Calkins & Keane, 2004). Several scholars have proposed that disruptions in the neural regulation of the ANS could serve as markers for behavioral or psychiatric issues. This has led to a deeper exploration of the connection between the ANS and mental health conditions. It has been suggested that dysfunctional mental conditions are linked to excessively high vagal activity (Eppinger & Hess, 1915). Understanding the role of the vagus in integrating feedback systems and regulating different brain structures is key to evaluating the ANS in relation to psychiatric disorders and social behaviors.

In summary, a decreased ability to adapt to environmental stressors may be attributed to reduced autonomic or psycho-physiological flexibility, leading to various health issues. Thus, HRV serves as a window into the delicate interplay of the SNS and PNS, offering valuable insights into cardiovascular and mental health.

2.3 HRV and Emotion Regulation

To understand emotion regulation, it is essential to first define what emotions are. Emotions are biologically based reactions that facilitate adaptive responses to significant opportunities and confrontations (Levenson, 1993). These transient states typically last only minutes rather than hours or days and involve changes across various domains, including subjective experiences, outward expressions, and physiological responses (Lang et al., 1972). Because emotions are closely tied to our physiological responses, their regulation has a direct connection to the ANS. Due to their propensity to function initially outside of conscious awareness, emotions can manifest spontaneously, appearing to arise unexpectedly (Gross & Muñoz, 1995). Given this spontaneous nature, effective emotion regulation becomes a critical skill that enables individuals to navigate their emotional experiences, deciding how to react or express them appropriately in different contexts.

Emotion regulation is defined as the process by which individuals influence which emotion they have, when they have them, and how they experience and express those emotions (Gross, 1998). In other words, emotion regulation is not just about suppressing emotions but actively managing them to ensure they are expressed in socially appropriate ways. It may involve either the regulation of emotions themselves or the broader process of managing emotional responses, as emotions help coordinate reactions to significant environmental events. This concept aligns closely with the study of emotions, where emotions exert control

over thoughts and actions (Gross & Muñoz, 1995). This regulation is vital for psychological well-being, particularly in situations of heightened stress or emotional arousal.

A growing body of research has examined the relationship between emotion regulation and HRV. The intersection of these fields has shed light on the physiological underpinnings of how emotions are controlled. Analysis of HRV has emerged as a reliable indicator of regulated emotional responses (Appelhans & Luecken, 2006). HRV, being a measure of the ANS flexibility, directly reflects how well an individual can manage emotional responses. Over the past decade, empirical evidence has increasingly supported the notion that individuals with higher resting HRV demonstrate better skills in regulating negative emotions. This relationship suggests that resting HRV can serve as an index of emotion regulation ability. Higher HRV levels, therefore, are not just markers of cardiovascular health but also indicators of emotional flexibility. For instance, high HRV is associated with lower social stress (Lischke et al., 2018) and is proposed as a biomarker of adaptive social behavior. As mentioned previously, higher HRV indicates better flexibility in the nervous system and enhanced resilience in coping with challenging life situations. Conversely, low HRV is linked to deficient emotion regulation and mental health issues such as depression and anxiety, underscoring the vital role HRV plays in both emotion regulation and emotional awareness.

Studies indicate that excessive worry and poor emotion regulation skills can adversely affect the ANS, leading to increased reliance on sympathetic control (Knepp et al., 2015). This means that individuals who struggle with emotion regulation are more likely to show signs of autonomic inflexibility, increasing their vulnerability to stress. On the other hand, effective emotion regulation acts as a protective barrier against stress, enhancing overall psychological resilience. This highlights the importance of HRV not only in emotional health but also as a key player in how the body and mind manage stress and emotional responses.

2.4 Aspects of Emotion Regulation

A critical aspect of emotion regulation is emotional awareness, defined as the ability to recognize, label, and be conscious of one's emotional state. This awareness serves as the foundation for any form of emotion regulation, as it enables individuals to consciously manage their emotional reactions. Many models of emotional experience in adults depend significantly on an individual's ability to interpret their own bodily signals (Koch & Pollatos, 2014), making emotional awareness closely linked to interoception. Thus, understanding the relationship between bodily sensations and emotional experiences is key to regulating emotions effectively. Maintaining emotional balance is closely tied to one's awareness of these physiological signals.

Emotional clarity—defined as the ability to clearly categorize and describe one's own emotions—is essential for effective emotion regulation and decision-making. Without this clarity, emotions may be misinterpreted or suppressed, leading to maladaptive responses. This is related to the concept of attention to emotions, reflecting the extent to which individuals value and focus on their emotional experiences (Boden & Thompson, 2017). When individuals pay close attention to their emotions, they are more likely to engage in adaptive regulation strategies, improving their emotional well-being. Research indicates that these processes are interconnected, shaping how emotional experiences relate to bodily sensations. Understanding these connections can provide insights into why some individuals are more adept at emotion regulation than others.

This connection is crucial, as emotion researchers agree on the adaptive role of emotions, positing that they provide critical information about one's environment, influencing priorities, judgments, and behaviors (Schwarz, 1990; Schwarz & Clore, 1983). Emotions not only guide behavior but also inform individuals about their needs, enabling them to make decisions aligned with their well-being. Positive emotions, in particular, have been shown to

improve executive function, cognitive processes, and overall functioning (Ullah & Uddin, 2024). Therefore, fostering positive emotions may enhance both cognitive and emotional functioning, contributing to better emotion regulation. Consequently, the inability to regulate emotions effectively can result in negative outcomes, impacting both mental and physical health.

2.5 Polyvagal Theory and Vagal Tone

The Polyvagal Theory, developed by Stephen Porges in the 1990s, provides a comprehensive framework for understanding the connection between the ANS and brain structures, particularly highlighting the role of the vagus nerve in regulating autonomic responses and influencing behavior and emotion regulation. By bridging the gap between neurobiology and behavior, this theory offers new insights into the ways the brain and body interact to shape emotional and social responses. The vagus nerve, which extends from the medulla oblongata of the brain to various body regions, plays a critical role in brain-body interactions and is essential for controlling vital functions such as emotion regulation, relaxation, and social engagement. Thus, the vagus nerve is crucial not only for physiological regulation but also for adaptive social and emotional behavior. Known as the 10th cranial nerve, the vagus functions as more than just a motor pathway connecting the brainstem to peripheral organs; it forms a complex neural network that facilitates two-way communication between the brain and internal organs. This communication loop allows the vagus nerve to act as a regulatory system, constantly adjusting bodily functions in response to emotional and environmental stimuli. This theory elucidates the influence of different parts of the vagus nerve on the functioning of the ANS (Porges, 2003).

It offers a compelling explanation for various social, emotional, and communicative behaviors, providing a neurobiological model that explains how positive social behaviors

support health and growth. The theory thus links physiological regulation with social engagement, proposing that successful interaction with others can promote both emotional well-being and physical health. The theory emphasizes the development of three distinct subsystems within the ANS, each aligned with different evolutionary stages and adaptive behaviors. By organizing the nervous system into hierarchical circuits, the theory shows how evolution has equipped mammals with flexible behavioral strategies for survival. These subsystems are intricately linked to various functions: the communication subsystem, encompassing facial expressions, vocalizations, and listening; the mobilization subsystem, responsible for fight-or-flight responses and reliant on the sympathetic nervous system; and the immobilization subsystem, which includes behaviors such as feigning death and is based on the unmyelinated vagus shared with many vertebrates. These three systems provide a layered approach to understanding how different neural circuits support varied responses to stress, danger, and social interaction. Together, these stages illustrate a phylogenetic order that highlights a hierarchical response system in mammals, where the most recently evolved neural circuit activates first, demonstrating how these circuits facilitate complex social and physiological responses (Porges, 2001). Thus, Polyvagal Theory presents a dynamic model of behavior, showing how humans shift between states of social engagement, defense, and immobilization based on their neurobiological systems.

2.6 Evolutionary Perspective of Polyvagal Theory

Millions of years of evolutionary processes have profoundly shaped human physiology and behavior, enabling adaptation to a wide range of biological and environmental challenges. Over this long evolutionary timeline, the development of the nervous system has played a critical role in allowing organisms to respond dynamically to their environments. This extended evolutionary trajectory has particularly influenced the neurological systems of mammals. Throughout evolution, mammals have developed complex neurological and behavioral traits

that enhance their capacity to withstand environmental stressors, respond to shifting conditions, and maintain internal homeostasis (Porges, 2001). This system is crucial not only for sustaining physiological equilibrium but also for modulating behavioral and emotional responses.

From an evolutionary perspective, the theory posits that the nervous system has adapted not only to manage survival-based "fight or flight" responses but also to facilitate social engagement and emotion regulation. This dual-function system underscores how evolution has prioritized social bonding and emotional resilience as key to survival in complex environments. This perspective offers a deeper understanding of human behavior and social interaction within an evolutionary context. Through these processes, mammals—including humans—have developed a more sophisticated vagal system that fosters social bonding, promotes feelings of safety, and supports emotion regulation. Polyvagal Theory connects the evolution of the ANS to emotional experiences, facial expressions, vocal communication, and responsive social behaviors (Porges, 2003).

According to the Polyvagal Theory, there are two distinct vagal circuits within the parasympathetic nervous system: the ventral vagal complex (VVC) and the dorsal vagal complex (DVC). These circuits represent the evolutionary layering of the nervous system, where different neural responses have emerged to support increasingly complex forms of behavior. These circuits, along with the sympathetic nervous system, shape individuals' subjective experiences of body awareness by modulating signals originating from the body. Thus, the vagal system serves as a bridge between physiological states and subjective emotional experiences. The vagal system, particularly the VVC, enables mammals to navigate their social environments by appropriately responding to both opportunities for connection and perceived threats. A higher vagal tone, indicating increased activity of the vagus nerve, is associated with better emotion regulation, enhanced social interactions, and improved

adaptability to stress. The VVC originates from the nucleus ambiguus in the medulla oblongata, forming connections to the heart and lungs, and is associated with social engagement and relaxation. This vagal circuit helps individuals regulate their emotional and physiological states during social interactions. Its effectiveness is facilitated through interactions with brain regions linked to emotional processing, such as the amygdala. This nerve branch aids individuals in forming safe social connections and is linked to higher vagal tone (Porges, 2007).

Conversely, the dorsal vagal complex (DVC) begins in the medulla oblongata and is connected to survival responses, forming the neuroanatomical basis for "freezing" behaviors. The DVC plays a critical role in more primitive, defensive behaviors, illustrating the hierarchical nature of the vagal system. The DVC's function is supported by its interactions with regions like the limbic system and the hypothalamus. These connections ensure that the DVC can initiate rapid defensive responses during perceived threats, even in the absence of conscious awareness. Thus, within the framework of Polyvagal Theory, the neuroanatomical structures of vagal circuits play a central role in regulating emotional and social behaviors. These vagal circuits are crucial for understanding vagal tone, a concept central to the Polyvagal Theory. Vagal tone refers to the influence of the vagus nerve on heart rate regulation. By measuring vagal tone, researchers gain insight into the balance between social engagement and survival responses in the ANS.

2.7 Vagal Tone and HRV

The concept of vagal tone is central to the Polyvagal Theory. Vagal tone specifically refers to the activity of the vagus nerve, which can be quantified through HRV. This measurement provides valuable insights into the balance between the sympathetic and parasympathetic nervous systems and serves as an indicator of autonomic flexibility. In the past decade, cardiac vagal tone has been increasingly recognized as a psychophysiological

indicator of various dimensions of behavioral functioning, as well as emotion regulation and specific aspects of psychological adaptation in both children and adults (Beauchaine, 2001). This emphasis on vagal tone highlights its significance in understanding how physiological processes relate to psychological states. It is a physiological parameter that measures the influence of the vagus nerve on the heart and is regarded as a key indicator of parasympathetic nervous system activity. In essence, HRV is primarily mediated by the interplay between sympathetic and vagal activity (Levy, 1990; Saul, 1990). Cardiac vagal tone has been suggested as an innovative measure for assessing stress levels and susceptibility to stress in mammals (Porges, 1995).

Understanding these relationships helps to clarify the role of vagal influences in emotional and physiological responses. Specifically, vagal influences are the dominant factors in regulating heart rate from beat to beat, making them crucial for emotion regulation. High vagal tone is linked to greater sensitivity in heart rate control and overall HRV (Stein et al., 1994). Research on adolescents and adults has consistently found that atypical vagal tone is associated with anxiety (Thayer et al., 1996) and depression (Carney et al., 1995). This connection underscores the importance of vagal tone in mental health outcomes, emphasizing the need to consider physiological factors in psychological assessments.

Resting vagal tone, which indicates increased parasympathetic activity, refers to the influence of the vagus nerve on heart rate regulation during rest. Increased resting vagal tone typically results in higher HRV, as the vagus nerve's influence promotes greater variability in heartbeat intervals. High vagal tone fosters better flexibility and control in heart rate regulation, enhancing the body's ability to adapt efficiently to changes and manage stress more effectively. Moreover, this adaptability is linked to overall psychological well-being and social connectedness, reinforcing the interconnection between physiology and mental health. Conversely, low vagal control indicates that the negative feedback mechanisms in the body,

which respond to stress or stimuli, are not functioning adequately (Friedman, 2007). This dysfunction weakens the individual's capacity to adapt flexibly and efficiently to environmental changes. A low vagal tone can lead to a more rigid and less controllable heart rate, thereby reducing overall physiological adaptability. Understanding these dynamics is essential for developing interventions aimed at improving both emotion regulation and physiological resilience.

2.8 Practical Implications of HRV in Emotional and Cognitive Health

Mindfulness meditation practices have gained considerable recognition as effective interventions for managing stress, pain, and anxiety-related disorders. These techniques emphasize maintaining awareness and attentiveness to the present moment, thereby offering significant benefits to both mental and physical well-being. Research has demonstrated that specific respiratory rates during meditation can influence heart rate and HRV, which is a key marker for emotional and physiological health (Song & Lehrer, 2003). Consequently, HRV serves as a well-known indicator of ANS flexibility and emotion regulation, highlighting the importance of these interventions in enhancing parasympathetic activity.

For instance, a study by Peng et al. (1999) revealed that certain meditation techniques induce exaggerated oscillations in heart rate, suggesting a unique cardiovascular response during meditation. This response is crucial for understanding how mindfulness practices can facilitate better emotion regulation. By reducing ruminative thought patterns and alleviating symptoms of anxiety and mood disorders, mindfulness meditation enhances individuals' emotion regulation capacities. Moreover, mindfulness has been linked to neural and physiological improvements, such as increased immune activity and reduced amygdala reactivity to emotional stimuli (Krygier et al., 2013). These findings underscore the positive

impact of meditation on emotional well-being, emphasizing the role of HRV as a biomarker in this context.

Additionally, studies have shown that certain yoga-based relaxation techniques and inward-focused meditation can enhance HRV by stimulating parasympathetic activity (Sarang & Telles, 2006; Wu & Lo, 2008). Therefore, integrating mindfulness practices like meditation and yoga into daily routines may positively influence HRV, further contributing to psychological health and emotional resilience. With advancements in information and communication technologies, the monitoring of HRV and biofeedback during relaxation responses will become increasingly feasible (Nakao, 2019). This capability to track HRV in real-time will further solidify the role of mindfulness interventions in promoting emotional and physiological well-being. As the field progresses, incorporating technology into these practices may provide valuable insights into individual responses and enhance the effectiveness of stress management techniques.

CHAPTER 3

Culture

3.1 Introduction to Culture

In American cultural studies, Swingewood (1998) describes culture as a conversation between the past and the present, created by people, and as a space of memory that both existed in the past and endures today. This perspective underscores the continuity of cultural narratives over time. Culture is constantly changing and developing, shaped by factors such as globalization, migration, and technological progress. These dynamics illustrate how culture is not static but evolves in response to external influences. It consists of symbolic beliefs, practices, and institutions that are used to shape the meanings of social situations and to guide social interactions (Adams & Markus, 2001; Kitayama et al., 1997).

Culture is one of the basic elements that determine the identity of a society and regulate the relationships between individuals. As such, it plays a critical role in forming societal structures. It includes both material (concrete) and spiritual (abstract) elements. This distinction highlights the comprehensive nature of culture. The material aspects of culture consist of physical objects such as works of art, clothes, and architectural structures, while spiritual culture encompasses abstract elements like language, beliefs, norms, and traditions.

The purpose of this chapter is to provide a comprehensive overview of culture, specifically by defining cultural concepts and exploring the distinct elements of Iranian and Turkish cultures. Through a comparative analysis, this chapter aims to highlight the similarities and differences between these two rich cultures in the context of cultural values. Additionally, it seeks to examine how these cultural components influence emotion regulation practices within each context. By integrating these aspects, this chapter will contribute to a deeper understanding of the interplay between culture and emotional processes.

3.2 Cultural Values in Turkish and Iranian Culture

Throughout history, Turkey has acted as a crossroads between the East and the West, and its social and cultural fabric continues to reflect this role (Sunar & Fişek, 2005). This unique position has fostered a diverse cultural landscape. The roots of Turkish civilization trace back to the nomadic tribes of Central Asia, and Turkish culture has evolved under the influence of various civilizations, including the Ottoman Empire, Islamic culture, and Western interactions. All of these interactions have profoundly influenced Turkish art, cuisine, and social customs. In parallel, these diverse influences have shaped the collective identity and social structure of Turkish society, where collectivism and strong family ties play a crucial role. Family structure, hospitality, holidays, and other traditions are integral to the culture. The primary language spoken in Turkey is Turkish, which has undergone significant evolution since the early Ottoman period and continues to reflect the nation's diverse cultural influences. Following the fall of the Ottoman Empire after World War I, Turkey transitioned into a republic in 1923 under the leadership of Mustafa Kemal Atatürk. Today, Turkey operates as a secular republic with a democratic political system, where the president holds substantial executive power, reflecting both modernity and a rich cultural heritage.

Similarly, Iran's history, deeply rooted in ancient Persia, has influenced its cultural and political development. Iran, known for its rich cultural heritage, has a history that dates back to ancient Persia, one of the world's oldest continuous civilizations. The Persian people, known for their contributions to art, philosophy, and science, have played a vital role in shaping human thought and culture. The Persian Empire, renowned for its achievements in art, architecture, and governance, significantly shaped the region's cultural landscape. Today, Persian (Farsi) is the official language, reflecting the country's deep linguistic roots. Iran is an Islamic Republic, where the political structure combines elements of theocracy and democracy, with the Supreme Leader holding significant authority over state matters. The emergence of Iran as an "Islamic

Republic" following the 1979 Revolution has led to a range of regional and global consequences. Key political events of the past few decades include the establishment of a new constitution, a comprehensive restructuring of both civil and military bureaucracy, and the introduction of an unusual foreign policy discourse (Sarikaya, 2012). This unique governance model influences various aspects of Iranian society, including cultural expression and social norms.

Despite differences in political structures, Turkey and Iran share a long history of interaction and cultural exchange. Turkish and Iranian tribes have lived in close proximity to one another from ancient times up to the present day. This closeness and neighborliness have led to the establishment of extensive relationships, resulting in deep-rooted interactions that have influenced all areas of life. The presence of Turkish people in Iran dates back significantly further than the well-known Oguz migrations. Recent research has established that over a thousand years of Iranian history corresponds closely with that of the Turks. It is acknowledged that the longest-lasting states in this region were largely Turkic in origin.

These historical interactions have influenced the cultural and linguistic landscapes of both countries, interactions between Turks and Persians have led to substantial linguistic and cultural exchanges between Turkish and Persian, affecting not only vocabulary but also syntactic structures (Boylu, 2014). The lexicon of a language reflects the traditions, beliefs, and worldviews of its speakers, indicating that changes in a community's way of life directly influence its language and vocabulary.

Islam plays a crucial role in shaping social norms and values in both cultures, guiding aspects of daily life, ethical considerations, and communal practices. However, these countries also exhibit significant differences, particularly in terms of their forms of governance. Turkey operates as a secular republic, where the government separates religious influence from state

affairs. In contrast, Iran is an Islamic Republic, where religious authorities play a significant role in governance and law-making, impacting cultural expression and societal norms. This divergence is key to understanding the distinct paths these two nations have taken despite their shared historical and cultural ties.

3.3 Cultural Identity Through Art and Aesthetics

To truly understand a culture, exploring its art and the perspectives it holds towards artistic expression is essential. Art reflects the values, emotions, and social dynamics of a society, offering a window into how people connect with their surroundings and each other. Through various forms—whether visual, musical, or literary—art captures the essence of a culture's identity, making it a vital aspect of cultural understanding and appreciation. The concept of art is shaped by the traditions and norms of each culture. Artistic expression reflects not only individual creativity but also the collective values and beliefs of a community. In this way, traditions, social expectations, and cultural norms influence how art is created, perceived, and appreciated. Art serves as a lens through which a society's values, lifestyle, and social structures are expressed. Whether through literary works, visual arts like painting and sculpture, or auditory arts like music, art evokes beauty, pleasure, and emotional resonance, leaving a positive impact on sensory experiences. The ability to convey emotions or ideas through artistic techniques makes art unique, reflecting the core of cultural identity (Soysaldı, 2018; Mülayim, 1994). Art is not static; it evolves alongside cultural shifts, adapting to changing societal standards while preserving its deep connection to heritage.

Both Turkey and Iran have rich artistic traditions that reflect their social norms, beliefs, and historical legacies. Art in both countries transcends mere aesthetic expression, offering insight into the past and present cultural identity of societies. The fusion of traditional and modern forms in art paves the way for new cultural identities in both Turkey and Iran. In

Turkey, Ottoman architecture, Turkish music, and carpet weaving reflect cultural heritage and social identity, illustrating the region's vast cultural interactions and historical exchanges (Levendoğlu, 2005). These art forms serve as cultural bridges, showing how art adapts and evolves in response to both internal traditions and external influences. The most advanced phases of Turkish art coincided with periods of enhanced wealth and scientific progress, highlighting the link between scientific achievement and artistic expression (Soysaldı, 2018). In Iran, miniature painting, poetry, and music subtly convey deep emotions and social meanings. Traditional Iranian cuisine and tea ceremonies further integrate sensory experiences with emotional and social connections (Richter, 2005).

3.4 Individualism and Collectivism

Collectivism and individualism present contrasting frameworks for understanding emotion regulation. These opposing perspectives shape how emotions are perceived and expressed in different cultures. While individualism is characterized by emotional independence from groups, organizations, and collective entities, collectivism involves emotional reliance on family, kinship networks, organizational structures, and the broader social system. This emotional reliance creates distinct patterns of interaction, where in collectivist cultures, the strong connection between the individual and the collective often diminishes personal privacy, while trust in group decisions and control becomes more pronounced (Guess, 2004).

Hofstede (1980), through his extensive research on cultural dimensions, similarly argued that individualistic societies prioritize personal goals and autonomy, whereas collectivist societies emphasize group harmony and interdependence. In collectivist cultures, individuals are expected to align their behaviors with group norms and expectations, often prioritizing group welfare over personal aspirations. Hofstede's framework highlights the

central role of group affiliation in shaping both emotion regulation and interpersonal relationships in collectivist settings. Markus and Kitayama (1991) built upon this framework by introducing the concept of "independent" and "interdependent" self-construals. In individualistic cultures, individuals tend to see themselves as autonomous agents, distinct from others. In contrast, collectivist cultures promote an interdependent self-concept, where personal identity is closely linked to relationships and group affiliations. This interdependent view leads individuals in collectivist societies to regulate their emotions in ways that promote group cohesion and prevent conflict.

Hui and Triandis (1986) identified five categories to explore individualism and collectivism:

1) Social responsibility and duty

2) Sharing of material resources

3) Sharing of non-material resources

4) Collective goals and group success

5) Group cohesion and interdependence

These categories provide a framework for understanding the nuanced differences between individualistic and collectivist societies. Hui and Triandis emphasized that individualism is marked by emotional independence from groups and other collective forms, while collectivism manifests as emotional reliance on family, kinship structures, and increasingly the social system. This emotional dependence highlights the relational dynamics prevalent in collectivist cultures. As a result, the intensity of the relationship between the individual and the collective often reduces personal privacy, while belief in group decisions and collective control becomes more significant (Darwish et al., 2003).

3.5 Cultural Collectivism in Turkey and Iran: A Comparative Perspective

Based on these definitions and findings from studies on similar cultures, it is accurate to describe Turkish culture as largely reflecting a collectivist pattern (Goregenli, 1995). In such a context, individual behavior is often shaped by a sense of duty and responsibility towards the community, emphasizing the importance of maintaining social harmony and collective well-being. Iranian culture also exhibits strong collectivist traits, particularly in its emphasis on family and in-group connections (Saboori et al., 2015). This focus on family creates a social framework where deep emotional ties shape interpersonal relationships and decision-making processes.

While both Turkish and Iranian cultures share these strong collectivist traits, there are important cultural nuances that distinguish their expressions of collectivism. For example, in Iranian society, loyalty to the family is not only a social expectation but also a moral imperative, shaping both values and behavior (Yeganeh & Su, 2007). This deep sense of familial loyalty often leads to collective decision-making that prioritizes family interests over individual desires. Collectivism in both cultures extends beyond the nuclear family to larger kinship structures and social networks. In Turkish culture, maintaining multi-generational family support networks is considered essential for ensuring social stability and personal security (Kagitcibasi, 1997). These cultural distinctions underscore the complexity of collectivism as a concept, which manifests differently depending on social, historical, and familial contexts.

3.6 Cultural Scripts and Emotion Regulation

Cultural variations in emotion regulation are shaped by unique cultural scripts regarding emotion and self (Cole & Tamang, 1998; Cole et al., 2006). These scripts guide individuals on how to manage emotions, with norms, beliefs, and values influencing strategies. Cultural differences impact emotional well-being (Kwon et al., 2013), leading to different

emotional outcomes across backgrounds. Additionally, emotions are expressed and regulated differently across cultures (Matsumoto et al., 2006), reflecting diverse approaches to coping with distress (Arens & Balkir, 2013). Emerging research highlights the importance of understanding cultural influences on emotion regulation (Tull & Aldao, 2015). Furthermore, conflict resolution strategies differ based on cultural values, with collectivist cultures favoring collaboration and individualist cultures leaning toward assertiveness (Kamil Kozan & Ergin, 1999). Emotional intelligence also plays a crucial role in adapting these strategies effectively (Gunkel et al., 2016).

3.7 Emotion Regulation in Turkish and Iranian Culture

Emotion regulation strategies in Turkey are influenced by social expectations, religious beliefs, and cultural traditions, shaping emotional expression in various contexts. The collectivist nature of Turkish culture emphasizes family bonds, social networks, and community involvement, with group loyalty and interpersonal relationships highly valued (Ataca, 2009). Maintaining interpersonal peace and fulfilling social obligations are paramount. Positive emotions like joy are openly expressed, while negative emotions such as anger and sadness are controlled to preserve group harmony and family reputation. Physical touch and intimacy reinforce emotional connections within social groups.

In Iranian culture, family ties and emotional commitment are highly valued, with strong group integration shaping interpersonal dynamics. Family structure, hospitality, and cultural practices like Nowruz and religious rituals play significant roles in emotional exchanges. Religious rituals and social norms, influenced by Islamic values, dictate appropriate emotional behavior. This integration creates an implicit group control that fosters indirect communication and limits individual expression. Family members and close friends hold high expectations of one another, including performing favors. Emotional expression in Iran tends to be more

conservative, shaped by deep-rooted cultural traditions. Social politeness, indirect communication, and respect for authority are integral to Iranian social interactions (Javidan & Dastmalchian, 2003). For example, Ta'arof, a code of extreme politeness, exemplifies the indirect way of communication and conflict avoidance that is prevalent in Iranian culture. This cultural context encourages emotion regulation strategies that emphasize emotional suppression and the indirect expression of emotions. Incorporating these cultural norms, Iranians regulate their emotions in a way that prioritizes the collective over individual expression.

Emotion regulation in Turkey and Iran is significantly shaped by religious and cultural values. Despite the similarities, it is crucial to recognize the distinct historical and cultural contexts. In both countries, Islamic teachings play a crucial role in guiding emotional behavior, with an emphasis on self-control, patience, and moderation. Additionally, the similarities between Turkish and Iranian cultures highlight shared foundations regarding emotion regulation, particularly in the emphasis on family and community values.

3.8 The Role of Islam in Shaping Emotion Regulation

Islam plays a significant role in shaping emotion regulation in both Turkey and Iran, guiding emotional expression and social behavior through religious values. In Turkey, Islamic teachings promote patience, forgiveness, and the control of negative emotions, aligning with cultural values like self-control and moderation. Emotion regulation is often achieved through prayer, religious reflection, and participation in rituals, which can foster emotional balance. Concepts such as "shame" or "sin" may restrict certain emotional expressions, reinforcing the importance of emotional control within social contexts (Goregenli, 1995).

Similarly, in Iran, Islam profoundly influences emotional and social behaviors, particularly after the 1979 revolution, which integrated religious rules into public life, shaping

social norms and behaviors (Maryam, 2022). Islamic values promote emotional balance, emphasizing patience, tolerance, and inner peace. Self-restraint is highly valued, with anger and resentment being emotions to be controlled, while gratitude and compassion are encouraged. Gratitude, in particular, is a prevalent emotion in Islam and has been linked to positive well-being and psychological health (McCullough et al., 2002; Emmons & Crumpler, 2000; Watkins et al., 2003).

Both Turkish and Iranian cultures utilize emotion regulation strategies such as suppression and cognitive reappraisal, often influenced by religious teachings. In Turkey, religious coping strategies like prayer and seeking social support are common (Ahmadi et al., 2019). Likewise, in Iran, religious coping mechanisms such as prayer, Quran recitation, and guidance from religious leaders help individuals manage emotional distress. These practices contribute to emotional stability, resilience, and a sense of inner peace, underscoring the significant role of religion in emotion regulation (Vishkin et al., 2014). In both societies, maintaining group harmony and fulfilling social responsibilities are highly valued, with religion playing a central role in shaping emotional behavior and regulation strategies.

3.9 Gender Norms and Emotion Regulation

Men and women may differ in emotion regulation strategies due to biological differences and socialization processes (Kwon et al., 2013). These differences are further influenced by cultural expectations. The socialization process and gender norms play a significant role in shaping emotion regulation strategies, as they establish societal expectations for how individuals of different genders should express and manage their emotions. Gender norms in Turkey and Iran play a crucial role in shaping emotion regulation strategies. By examining these norms, we can better understand the broader implications for emotional health.

In both cultures, traditional expectations dictate emotional behaviors based on gender, impacting how individuals experience and express their emotions. While Turkey shows some modernization in urban areas, with shifts toward more egalitarian practices, Iran continues to adhere to strict traditional and religious norms. These differences in cultural contexts result in varying emotional landscapes. In Turkey, traditional gender roles glorify masculinity, associating it with strength and competence, while femininity is often linked to passivity and fragility (Sakallı & Kuzlak, 2018). This cultural framework leads to expectations that men should be emotionally restrained, while women are encouraged to express emotions compassionately but within socially acceptable limits.

These gender expectations create a strict moral framework that governs behavior, particularly regarding honor. In Turkish culture, the concept of honor, or "namus," is predominantly upheld by men, who are responsible for the sexual conduct of women (Meeker, 1976). This focus on honor creates significant constraints on women's freedoms. This honor code creates a system where women's behavior is tightly regulated, and any perceived breach of this code results in a loss of honor for their male protectors (Zaccharia & Senthamarai, 2023). Consequently, the implications of this code extend beyond individual behavior, affecting familial and societal relationships. This system is more about social reputation than individual morality, and while it is framed as protective, it significantly restricts women's freedoms and reinforces traditional gender roles.

Emotion regulation strategies in Turkey can have both positive and negative mental health implications. Maintaining social harmony may foster emotional stability; however, the suppression of negative emotions, particularly among men, can lead to psychological distress or internalizing disorders such as depression or anxiety. This underscores the need for a nuanced understanding of emotional expression within the cultural context. Research by Fisek (1991) indicates that interpersonal closeness and personal boundaries vary by demographic

factors, with contemporary educated Turkish families showing more equal and supportive dynamics compared to traditional counterparts (Fisek, 1993; Kagitcibasi, 1986).

Iranian culture is similarly shaped by traditional gender roles, which influence emotion regulation. These roles are deeply embedded within the cultural fabric, with men expected to avoid vulnerability and women encouraged to be emotionally expressive, albeit modestly. However, the Iranian context is complicated by systemic inequalities that are reinforced by the theocratic regime, which further impact these gender norms. Women face challenges such as legal restrictions and cultural expectations that limit their freedoms, requiring permission for travel and facing strict dress codes (Rafique & Butt, 2020). Societal norms dictate that men often express anger overtly, while women are socialized to suppress anger or express it in less confrontational ways (Evers et al., 2011). This results in differing emotion regulation strategies, with men potentially favoring suppression and women engaging in communal regulation through social support.

Despite the similarities in traditional gender norms, the societal contexts of Turkey and Iran reveal important differences in the experience of these roles. Both cultures dictate that men should exhibit emotional restraint and avoid vulnerability, while women are allowed more emotional expressiveness within accepted limits. This distinction highlights how cultural and religious influences shape the parameters of emotional expression. In summary, understanding the nuances of gender norms in Turkey and Iran is essential for grasping the broader implications for emotion regulation and societal dynamics. As these cultures evolve, further research is needed to explore how emerging trends may influence traditional norms and emotional expression.

CHAPTER 4

Method

4.1. The project

The aim of this study was to examine the relationship between HRV, cardiac sensitivity and body awareness across two cultural groups, Turkish and Iranian participants. By analyzing HRV as a physiological marker and including self-report data, this study sought to assess how effectively individuals from each cultural group regulate their emotions and to explore the influence of cultural context on these abilities. Moreover, our study aims to shed light on intercultural emotion regulation skills, addressing gaps in the literature, particularly in the comparison between Turkish and Iranian cultures, thereby contributing to this field.

4.2 Research questions and hypotheses

The present study aimed at assessing the relationships between cardiac interoception, bodily awareness and HRV also investigating whether these factors differed across cultures.

Specifically, we aimed at answering to the following research questions.

1) Is cardiac interoception, defined as participants' ability to perceive their own heartbeats, correlated with self-reported bodily awareness?

Hypothesis 1: We hypothesize that there is a positive correlation between participants' ability to accurately perceive their heartbeats (cardiac interoception) and their self-reported bodily awareness.

Previous studies support a link between cardiac interoception and bodily awareness. Mehling et al. (2012) found that individuals with higher interoceptive accuracy (the ability to sense their heartbeat) tend to report greater bodily awareness. This relationship suggests that those more

attuned to their internal bodily signals are also more conscious of their body's overall state, making this hypothesis well-founded in the literature.

2) Is interoception (both objective and self-reported) correlated with physiological regulation as indexed by cardiac vagal tone at rest?

Hypothesis 2: We expect both objective and self-reported interoception to be positively correlated with physiological regulation, as indicated by cardiac vagal tone at rest.

The connection between interoception and physiological regulation, particularly through the cardiac vagal tone, is supported by research on the parasympathetic nervous system (Thayer & Lane, 2000). Cardiac vagal tone reflects the body's ability to regulate autonomic processes, and it has been linked to interoceptive awareness.

3) Do Turkish and Iranian participants differ in their interoception (both objective and self-reported) and physiological regulation as indexed by cardiac vagal tone at rest?

Hypothesis 3: We expect Turkish and Iranian participants to differ in both objective and self-reported interoception, as well as in physiological regulation, as indicated by cardiac vagal tone at rest.

Cultural differences in emotion regulation and bodily awareness have been documented in psychological research (Matsumoto et al., 2008). Given that interoception and physiological regulation can be influenced by cultural factors, it is reasonable to hypothesize that Turkish and Iranian participants will show differences in both interoception and cardiac vagal tone. These differences may reflect varying cultural norms related to emotional and bodily awareness.

4) Does heart rate variability and cardiac sensitivity influence body awareness? Is there a cultural effect?

Hypothesis 4: We hypothesize that heart rate variability and cardiac sensitivity are positively correlated with body awareness, and that this relationship may be influenced by cultural factors.

Research has shown that heart rate variability and cardiac sensitivity play important roles in regulating physiological and emotional states, which are closely linked to body awareness. According to Mehling et al. (2009), people who have a high level of bodily awareness also have a high level of cardiac sensitivity. Furthermore, cultural factors may influence the relationship between cardiac sensitivity and body awareness, as different cultures emphasize varying degrees of emotional expression and bodily awareness, which can shape how individuals perceive and regulate their internal bodily states (Matsumoto et al., 2008).

4.3 Participants

A total of 104 participants were involved in the study, comprising 60 Turkish individuals and 44 Iranian individuals. All participants were over 18 years of age, with an age range from 19 to 37 years (M = [26.16], SD = [4.14]). Participants were all volunteers and were not compensated for their participation. Prior to engaging in the study, all participants signed an informed consent form to indicate their willingness to participate.

The sample included 38 Turkish females (38.5%) and 22 Turkish males (21.2%), alongside 22 Iranian females (21.2%) and 22 Iranian males (21.2%). In terms of educational levels, the participants varied, with the majority being master students. All participants completed the study by filling out online questionnaires, ensuring a diverse representation of individuals without any history of cardiovascular or severe psychiatric disorders.

4.4 Procedure

Before participating in the study, participants received an informative email detailing the study process, which included two phases: online data collection and a laboratory assessment focused on measuring heart rates. Participants were fully voluntary in their participation and did not receive any compensation or incentives for their involvement. Before beginning the study, participants signed a consent form to confirm their understanding and agreement to the study procedures. Prior to arriving at the lab, participants were requested to complete an online survey using their computer, tablet, or smartphone. They were informed that the survey would take approximately 20 to 30 minutes to complete, and it was emphasized that their device should be charged or plugged in for this duration. The survey aimed to assess several aspects, including emotion regulation, the relationship of these skills to social behavior, family and friendship dynamics, stress management, and the role of the environment in the development of emotional competencies by comparing results from different countries to achieve a multicultural perspective. Participants were instructed to respond to the survey using a Likert scale to indicate their level of agreement with various statements. In preparation for their visit to the laboratory, participants were reminded of important guidelines to follow, such as refraining from consuming coffee, eating, or smoking for at least two hours prior to their arrival. Additionally, they were advised to wear a comfortable shirt to facilitate the application of monitoring devices. Participants were also asked to indicate if they were taking any special medications or had been diagnosed with any heart conditions.

A reminder email was sent to participants a day before their lab appointment, they were reminded to get sufficient sleep, and to avoid any substances or activities that might impact heart rate variability measurements. Upon their arrival, participants were instructed to meet in front of the main entrance of the Psychology Building (PSICO 1) and were encouraged to notify the research team upon their arrival. The research team asked participants if they had followed the guidelines, specifically inquiring about their caffeine intake, hours of sleep from the

previous night, recent food intake, and any medications taken. The research team expressed gratitude for their participation.

In order to gain insights into participants' interoceptive awareness, both objective data and self-reported interoceptive data were collected. Participants completed a Body Awareness Questionnaire prior to their laboratory visit, followed by the cardiac sensitivity task, which aimed to compare participants' real heartbeats with their perceived heartbeats. Participants came to the laboratory for the cardiac sensitivity task and the resting heart rate variability measurement. The heartbeat perception task was conducted first, and then participants completed a 5-minute resting period while watching a relaxing video accompanied by soothing music, allowing for the assessment of their resting heart rate variability. To minimize distractions during the heart rate variability measurements, participants were asked to silence their phones. There were always two members of the research team present in the laboratory during the assessments: one person was seated at the computer to initiate the tasks and take notes, while the other person informed the participant in their native languages before each task. To account for variations in the cardiovascular system, participants' weight and height were measured to calculate their BMI. This final assessment contributed to a broader understanding of body awareness, as it allowed for the exploration of how physiological factors relate to emotion regulation and overall well-being. Throughout the study, the research team remained available to address any questions or concerns that participants might have had.

4.5 Measures

Cardiac sensitivity

The heartbeat perception task is designed to assess individuals' abilities to perceive their own heartbeats, providing valuable insights into cardiac sensitivity. This objective assessment of interoception requires participants to silently count their heartbeats over specified time

intervals, employing a mental heartbeat-counting paradigm developed by Schandry (1981). During the task, the actual number of heartbeats is recorded using the Kubios Software system. Participants' accuracy is determined by calculating the difference between their reported counts and the actual heartbeats, thereby distinguishing between interoceptive accuracy—defined as the ability to accurately perceive internal bodily sensations—and interoceptive sensibility, which refers to the subjective awareness of these sensations.

In the heartbeat perception assessment, participants are instructed to engage in a tracking task. Upon hearing the prompt "start," they silently count each heartbeat they perceive until they hear "stop." To minimize distractions, they are advised to remain still, keeping their feet on the ground and their hands comfortably positioned in front of them. Following an explanation of the task, the study is conducted in a randomized order for each participant, with rest intervals between trials. Participants are instructed to count only the heartbeats they actually feel, reporting a count of zero if they perceive none. This task is repeated six times, utilizing randomized time windows of 25, 30, 35, 40, 45, and 50 seconds. Through this methodology, the heartbeat perception task aims to yield comprehensive data on interoceptive accuracy, contributing to a deeper understanding of the relationship between physiological awareness and emotion regulation.

Body awareness

The Body Perception Questionnaire (BPQ; Porges, 1993) is a validated self-report measure designed to assess individuals' subjective perceptions of bodily function and reactivity in organs influenced by ANS. Encompassing dimensions such as body awareness, autonomic reactivity, stress responses, and health history, the original BPQ consists of 122 items aimed at capturing ANS-mediated stress response patterns (Cabrera et al., 2018).

The BPQ has been widely applied in neural, behavioral, and clinical research worldwide, demonstrating adaptability and reliability across various cultural and linguistic contexts. Reflecting its versatility, the questionnaire has been translated into multiple languages and used in diverse populations, making it a valuable tool for international research. In this study, we used the short-form version, BPQ-20 ANS, developed by Porges to facilitate assessment. This 20-item version specifically targets autonomic reactivity and uses a 5-point ordinal scale (from "never" to "always") to measure the frequency of ANS-related symptoms. Participants completed a version of the Body Perception Questionnaire (BPQ-20 ANS) that was translated and back-translated by native Turkish and Iranian speakers fluent in English. The item wording in the back translation demonstrated a strong convergence with the original English-language version, which suggests a high degree of fidelity in the translation process. This meticulous approach ensured that participants could engage with the questionnaire in their native languages, thereby enhancing the accuracy and reliability of their responses.

Heart rate variability

To investigate heart rate variability a strap with the polar H10 attached was positioned around the torso of the participant so that the sensor would be in contact with the skin of the participant. (Figure 1). The sensor codifies the cardiac tone in real time transmitting it to a dedicated computer (ProComp Infiniti, Thought Technology; Montreal, Canada) through a multimodal monitoring system. The ECG signal is processed at 12-bit from analog to digital and converted with a sampling rate of 256 volts per second. During the heart rate variability task, participants were asked to watch a video for 5 minutes while sitting in a comfortable position, accompanied by relaxing music and a landscape on the screen. Participants were provided with headphones and watched the video on the screen while listening to music played at a moderate volume. Participants were instructed not to move much during these 5 minutes,

to sit quietly, and to relax. During this session, 5 minutes of electrocardiogram (ECG) data were collected while participants watched the relaxing video.

Subsequently, the intervals between each heartbeat are calculated, which is the difference in milliseconds between the R waves, using the software Kubios-HRV Analysis 2.2 (The Biomedical Signal Analysis Group, Department of Applied Physics, University of Kuopio, Finland). Furthermore, the mean frequencies of the at rest heart rate (HR) and the squared roots of the differences between the intervals (rMSSD) were calculated. These represent an index sensitive to the measurements of the cardiac vagal tone since they directly reflect the parasympathetic activity carried out by the vagal nerve. To do this a computer codifying system was used, the FlexComp InfinitiTM (Thought Technology Ltd, Montreal, Canada), approved by the "U.S. Food and Drug Administration" (FDA).

4.6 Data analysis plan

Data were fist observed by running a series of descriptive statistics for each study variable.Subsequently the following specific analyses were performed to answer the four research questions.

1) To assess if cardiac sensitivity, that is participants' ability to feel their actual heart beats, was associated with self-reported bodily awareness a set of correlation was performed.

2) To assess if cardiac sensitivity and self-reported body awareness was associated with physiological regulation as indexed by cardiac vagal tone at rest a number of correlations was performed.

3) To assess if Turkish and Iranian participants reported different cardiac sensitivity and self reported body awareness as well as in cardiac vagal tone at rest a number of analyses of variance were performed while controlling for age and gender.

4) To assess if cardiac vagal tone and cardiac sensitivity directly or indirectly influenced body awareness and whether there was a cultural differences a regression model was performed while controlling for age and gender and including cardiac sensitivity, cardic vagal tone and culture as predictors.

CHAPTER 5

Results

5.1 Cardiac sensitivity and bodily awareness

To assess if cardiac sensitivity, defined as participants' ability to feel their actual heartbeats, was associated with self-reported bodily awareness, a Pearson correlation was performed.

As shown in Figure 5.1, the two variables are not correlated (**r** = -.06). The figure below shows that both variables have a normal distribution, yet they are not associated.

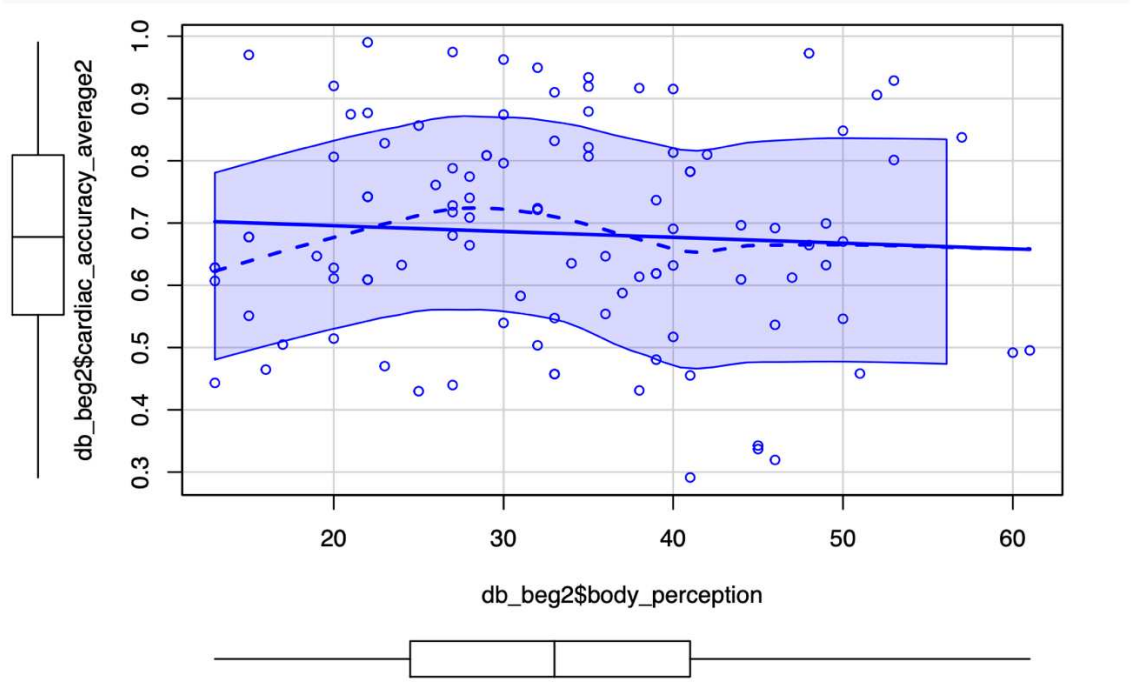

Figure 5.1: correlation between cardiac sensitivity, bodily awareness and data distribution

Despite the normal distribution of both variables, as visualized in Figure 5.1, there was no evident pattern suggesting a relationship between participants' self-reported bodily awareness and their ability to sense their heartbeats. This finding suggests that individuals who

are more sensitive to their cardiac signals may not necessarily be more aware of their overall bodily sensations and vice versa.

5.2 Cardiac sensitivity, bodily awareness and cardiac vagal tone

To assess if cardiac sensitivity and self-reported body awareness were associated with physiological regulation as indexed by cardiac vagal tone at rest, two correlations were performed.

As shown in Figure 5.2, bodily perception and cardiac vagal tone are not significantly correlated (**r** = -.10). Additionally, cardiac vagal tone is skewed towards the lower part of the scale, with the majority of participants exhibiting medium to low rMSSD.

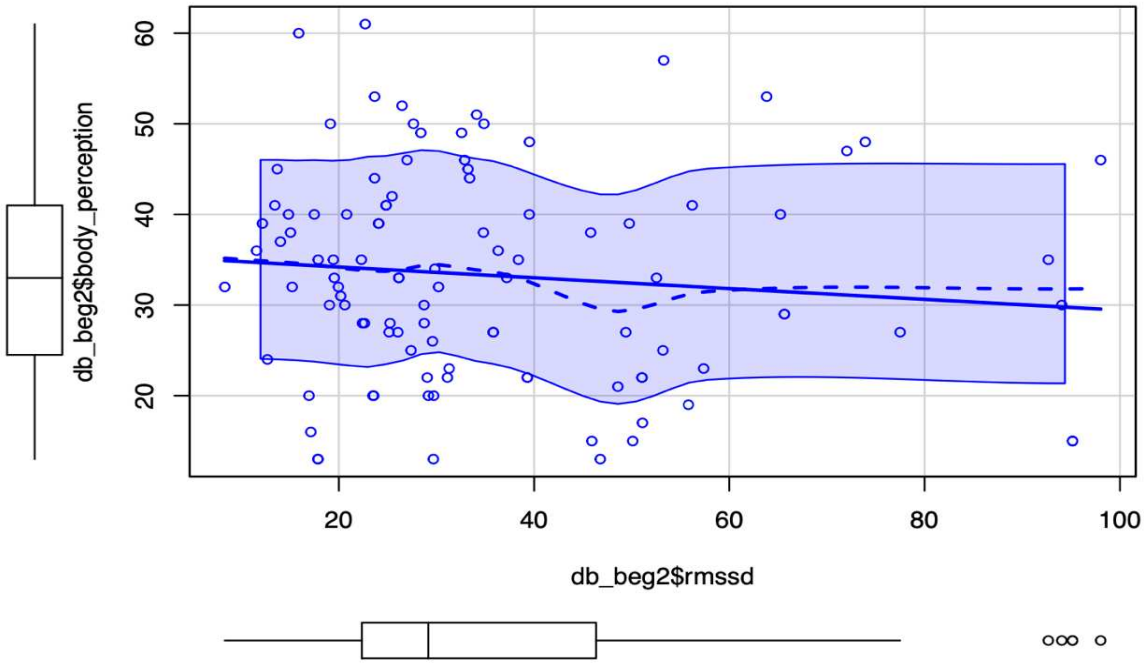

Figure 5.2: correlation between bodily perception, cardiac vagal tone and data distribution

As shown in Figure 5.3, cardiac sensitivity and cardiac vagal tone are positively and significantly associated (**r** = .22, **p** < .05). This indicates that as cardiac sensitivity increases, a greater cardiac vagal tone at rest is observed and vice versa.

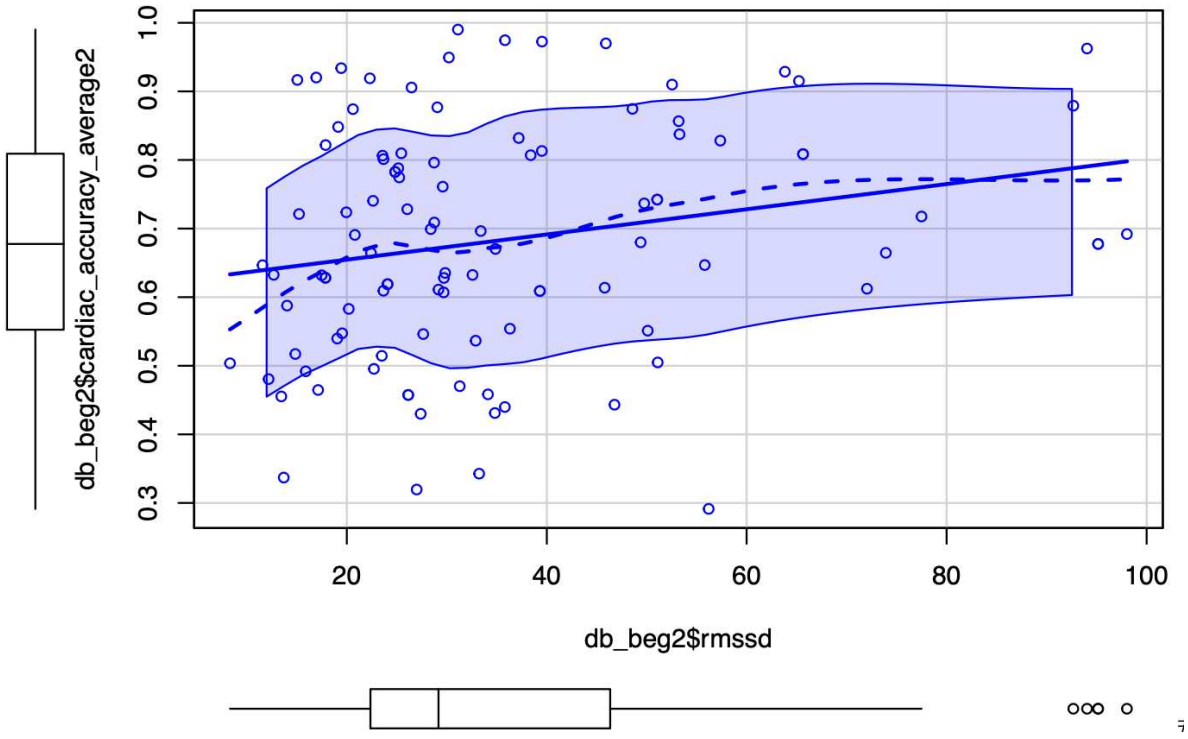

Figure 5.3: correlation between cardiac sensitivity, cardiac vagal tone and data distribution

5.3 Cultural differences in cardiac sensitivity, bodily awareness and cardiac vagal tone

To assess whether cardiac sensitivity, bodily awareness, and cardiac vagal tone (indexed by rMSSD at rest) differed between Turkish and Iranian participants, multiple linear regression analyses were conducted, controlling for age and gender.

For body perception, the analysis revealed a significant effect of country, with Turkish participants reporting significantly higher body perception scores compared to Iranian participants (**B**= 9.69, **SE** = 2.12, **t**(101) = 4.58, **p** < .001).

For cardiac accuracy, no significant differences were found between Turkish and Iranian participants. The regression analysis showed that the country variable was not a significant predictor of cardiac accuracy (**B** = -0.01, **SE** = 0.03, **t**(101) = -0.36, **p** = .718).

Finally, for cardiac vagal tone, as indexed by rMSSD, the analysis revealed no significant effect of country. Turkish participants did not differ significantly from Iranian participants in rMSSD values (**B** = -2.16, **SE** = 4.08, **t**(101) = -0.53, **p** = .599).

These findings indicate that while Turkish participants showed significantly higher body perception scores compared to Iranian participants, no cultural differences were observed in cardiac accuracy or cardiac vagal tone at rest.

5.4 Effects on bodily awareness of cardiac sensitivity and cardiac vagal tone

To assess whether cardiac vagal tone and cardiac sensitivity directly or indirectly influenced body awareness, and to evaluate potential cultural differences, a multiple linear regression analysis was conducted.

Age and gender were included as control variables, while cardiac sensitivity (indexed by cardiac accuracy), cardiac vagal tone (indexed by rMSSD), and cultural group (Turkey vs. Iran) were entered as predictors. The results are detailed below.

The regression model revealed that the intercept was significant (B=37.76, t=3.49, p=.001), indicating that baseline body awareness scores, independent of the predictors, were significantly different from zero. Cardiac sensitivity did not have a statistically significant

effect on body awareness (**B**=−12.34, **t**=−0.88, **p**=.377), suggesting that participants' ability to perceive their heartbeat was not strongly associated with self-reported bodily awareness.

Similarly, cardiac vagal tone was not a significant predictor (**B**=−0.26, **t**=−0.94, **p**=.349). Despite the sample showing mostly low-to-medium rMSSD values, this physiological measure did not explain variability in body awareness.

In contrast, cultural group (Turkey vs. Iran) was a significant predictor (**B**=9.42, **t**=4.33, **p**<.001). Turkish participants reported higher levels of body awareness compared to participants from other cultural backgrounds. This aligns with earlier findings, suggesting that cultural differences may shape self-reported body awareness.

Gender did not emerge as a significant predictor (**B**=0.12, **t**=0.05, **p**=.954), indicating no notable differences in body awareness between male and female participants.

Finally, the interaction term between cardiac sensitivity and cardiac vagal tone was also non-significant (**B**=0.29, **t**=0.80, **p**=.423). This indicates that the combined effects of cardiac sensitivity and vagal tone do not meaningfully predict body awareness.

Table 1: Regression Results for Predicting Body Awareness Using Cardiac Sensitivity, Cardiac Vagal Tone, and Demographics

	B	***ES***	***t***	***p***
Intercept	37.76	10.80	3.49	.001***
Cardiac accuracy average	-12.34	13.91	-0.88	.377
Rmssd	-0.26	0.27	-0.94	.349
Country(Turkey)	9.42	2.17	4.33	<0.001***
Gender	0.12	2.24	0.05	.954
Cardiac accuracy average X rmmsd	0.29	0.36	0.80	.423

These results highlight cultural differences as the most significant predictor of body awareness, with Turkish participants reporting higher self-perception scores. Physiological measures, such as cardiac vagal tone and cardiac sensitivity, did not demonstrate significant direct or interactive effects on body awareness. Gender differences were also negligible. These findings underscore the importance of cultural context when studying body awareness and suggest that physiological markers may play a limited role in self-reported bodily perception in this sample.

CHAPTER 6

Discussion

The study aims to explore emotion regulation abilities within a cross-cultural framework by comparing Turkish and Iranian participants, emphasizing the influence of cultural context on emotional and physiological processes. By integrating HRV data with self-reported measures, the study combines objective physiological metrics with subjective perceptions, enabling a nuanced understanding of how individuals regulate emotions across different cultural environments.

This research focuses on key constructs such as interoception, cardiac sensitivity, and body awareness, examining how these elements are reflected in both physiological responses and self-reported emotional experiences. A distinctive aspect of this study is its effort to investigate the intersection of cultural and individual differences in physiological regulation during emotional processes, providing a comprehensive perspective that extends beyond the limitations of single-method approaches.

Furthermore, the research addresses a critical gap in the scientific literature regarding cross-cultural comparisons of emotion regulation. The findings aim to contribute to the theoretical development of intercultural emotion regulation and to enhance practical applications in diverse psychological and physiological contexts. By providing a detailed analysis of the cultural dynamics influencing emotional and physiological integration, this study aspires to enrich the scientific understanding of cross-cultural psychological dynamics and foster new insights in the field of cultural psychology and emotion regulation.

6.1 Research Questions and Detailed Findings

1. Is cardiac interoception, defined as participants' ability to perceive their own heartbeats, correlated with self-reported bodily awareness?

The analysis revealed no significant correlation between cardiac interoception, measured through heartbeat detection tasks, and self-reported bodily awareness. This suggests that individuals' objective ability to perceive their heartbeats does not necessarily align with their subjective awareness of their bodies. While previous research, such as Mehling et al. (2012), proposed a connection between these constructs, the current findings imply that objective physiological interoception and subjective bodily awareness may function as distinct processes. This distinction could be influenced by psychological or cultural factors not captured in the measures used. Therefore, the results do not support Hypothesis 1, which predicted a positive correlation between cardiac interoception and self-reported bodily awareness.

2. Is interoception (both objective and self-reported) correlated with physiological regulation as indexed by cardiac vagal tone at rest?

The study found no significant relationship between either form of interoception (objective or self-reported) and cardiac vagal tone, measured as rMSSD. This indicates that the capacity to detect heartbeats or self-reported bodily awareness does not necessarily predict physiological regulation as reflected by vagal tone. Cardiac vagal tone, a marker of parasympathetic activity, is often linked with autonomic regulation; however, its lack of correlation with interoception in this study suggests that other factors, such as emotional or contextual influences, may play a more significant role in the interplay between physiological and psychological aspects of bodily awareness. As a result, the findings do not support Hypothesis 2, which posited a positive correlation between interoception (both objective and self-reported) and cardiac vagal tone.

3. Do Turkish and Iranian participants differ in their interoception (both objective and self-reported) and physiological regulation as indexed by cardiac vagal tone at rest?

Cultural comparisons revealed that while Turkish participants reported significantly higher self-reported bodily awareness scores, there were no differences between Turkish and Iranian participants in terms of objective interoception accuracy or cardiac vagal tone. These results highlight the influence of cultural norms and values on self-reported measures, as Turkish participants may have been more attuned to expressing or recognizing bodily sensations. However, the absence of differences in physiological and objective measures could point to shared cultural or regional factors influencing bodily regulation, reducing variability across these two populations. Thus, the findings partially support Hypothesis 3, which anticipated differences in interoception and cardiac vagal tone, as differences were found only in self-reported bodily awareness.

4. Does heart rate variability and cardiac sensitivity influence body awareness? Is there a cultural effect?

Neither heart rate variability (rMSSD) nor cardiac sensitivity showed a significant influence on body awareness in this study. Additionally, no significant cultural effects or interactions were identified. These results suggest that body awareness, as measured in this context, might be driven more by cognitive or emotional factors than by direct physiological inputs such as vagal tone or cardiac sensitivity. The findings also imply that physiological contributions to body awareness are not strongly mediated by culture in these populations. Consequently, the findings do not support Hypothesis 4, which posited that heart rate variability or cardiac sensitivity would significantly influence body awareness and that cultural effects would emerge.

6.2 Limitations

While this study provides valuable insights into the relationship between interoception, physiological regulation, and cultural differences, there are several factors that must be taken into account when interpreting the findings. These limitations involve both methodological aspects of the study as well as broader contextual factors, such as the political and cultural influences on the participants. Understanding these limitations will allow for a more nuanced interpretation of the results and offer guidance for future research on these topics. Below, we outline several key considerations that may have impacted the study's outcomes.

Sample Size

A primary limitation of this study is the sample size, which included a total of 104 participants, comprising 60 Turkish and 44 Iranian individuals. While the sample provides valuable insights into cultural differences in body awareness, the relatively small size may limit the generalizability of the findings. Future studies with larger and more diverse samples are recommended to validate these results and explore potential differences in other variables, such as cardiac vagal tone and objective interoception accuracy, where no significant differences were observed in the present study.

Cultural Context and Political Influence on Iranian Literature

One important factor that must be considered when interpreting the findings of this study is the cultural and political context in which the Iranian participants are embedded. Due to strict government regulations, Iranian researchers are often required to obtain government approval before publishing research. This restriction creates a limited and sometimes biased pool of literature, as research topics and their treatment may be influenced by the political climate. Consequently, the articles that are published in Iran may reflect not only cultural

values but also government perspectives, potentially limiting the objectivity of publications. This cultural-political interplay might influence the results observed in this study, particularly in terms of self-reported bodily awareness, where cultural factors play a significant role in how participants perceive and express their experiences.

Lab Setting and Physiological Measurements

An additional limitation of this study is that the measurements were taken in a controlled laboratory environment, which might not accurately reflect participants' natural physiological responses. Due to the lab setting, participants might have experienced some level of stress or discomfort, which could influence their heart rate and other physiological measures. This factor is especially relevant in the context of heart rate variability (HRV) measurements, as participants may not have been fully relaxed. Research indicates that environmental stressors can interfere with the accuracy of physiological data (Kohler et al., 2009), and the lab environment might have led to artificially higher heart rates, potentially impacting the relationship between heart rate and emotion regulation.

Sample Characteristics and Generalizability

The sample of this study consisted largely of psychology students, which poses certain limitations regarding the generalizability of the results. The lack of variation in educational background among participants could mean that the findings are more reflective of individuals with a specific level of academic achievement and cognitive orientation. In addition, the sample size was relatively small, further limiting the ability to generalize these findings to larger populations. A more diverse and larger sample would be needed to draw broader conclusions about the relationship between interoception, emotion regulation, and culture.

Cultural Differences in Participants' Living Environment

A significant factor influencing the findings is the location of the participants. While the participants in this study were of Turkish and Iranian descent, they currently reside in Italy. Living in a European context with a different cultural background may have shaped how these individuals perceive and regulate their emotions. Adapting to life in Italy, they may be influenced by Western norms and values, which could lead to differences in emotional expression, regulation, and bodily awareness compared to individuals living in Turkey or Iran. Therefore, the participants in this study may not fully reflect the typical emotional and cultural characteristics of Turkish or Iranian populations, as they are likely influenced by a mixture of cultures and the experience of migration.

Gender Differences and Measurement Duration

The lack of significant differences between men and women in this study may be attributed to the brief measurement duration. The heart rate and physiological regulation measurements were taken for a short period (5 minutes), which may not have been sufficient to capture gender-based differences in emotion regulation. Future studies could extend the measurement duration to allow for a more comprehensive assessment of gender-related differences.

Similarity Between Turkish and Iranian Cultures

Another important consideration is the cultural similarity between Turkish and Iranian populations. These two cultures share many historical, religious, and social similarities, which could explain why no significant cultural differences were found in this study. Given that both cultures are rooted in similar traditions and values, it is possible that the lack of significant differences in emotion regulation and interoception is a result of this cultural proximity. Additionally, the relatively similar age range of the participants could have contributed to the lack of diversity in responses, as individuals within the same age cohort may share more

common physiological and psychological characteristics. Future studies comparing more distantly related cultures could provide more insight into how cultural differences influence emotion regulation and interoception.

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