

EXPLORING THE INTERPLAY BETWEEN ATTACHMENT STYLES AND NEUROCEPTION: INSIGHTS FROM POLYVAGAL THEORY

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ABSTRACT

Neuroception, the unconscious detection of safety or threat, plays a crucial role in shaping attachment patterns and interpersonal functioning. This research aims to investigate the complex relationships between neuroception of psychological safety and attachment styles. Specifically, it seeks to enhance our understanding of how secure, avoidant, and anxious attachment styles relate to neuroceptive patterns. An analytical cross-sectional design was employed, assessing participants at a single point in time. Data was collected from the city of Lahore, Punjab from June 2024 to December 2024. A total of 250 adult participants were selected using a convenience sampling approach. Recruitment was occurred through various channels to ensure a representative sample, including diverse attachment styles, genders, and cultural backgrounds. Eligibility for the study was determined based on pre-established criteria. Participants were assessed using two established scales: the Neuroception of Psychological Safety Scale (NPSS) to measure psychological safety, and the Original Attachment Three-Category Measure to assess attachment styles. Statistical methods, including descriptive statistics and Post hoc (Tukey HSD) were applied to explore the relationships between neuroception and attachment styles. Securely attached individuals reported the highest NPSS scores ($M = 112.48$, $SD = 16.94$), followed by avoidant ($M = 92.51$, $SD = 20.41$) and anxious individuals ($M = 78.75$, $SD = 20.44$). Understanding the interplay between attachment styles and neuroception can inform therapeutic interventions. Polyvagal theory suggests that interventions targeting neuroception can potentially mitigate attachment-related challenges by promoting adaptive autonomic responses and enhancing emotional resilience.

Keywords: psychological safety, attachment styles, polyvagal theory, neuroception.

INTRODUCTION

In the recent past, there has been an increasing focus on the interaction between neuroception of psychological safety and attachment styles developed during childhood. This emerging field is important as it offers insights into the navigation of individuals' social and emotional world, their mental health and social wellbeing (Anda et al., 2006; Dale et al., 2022; Hughes et al., 2017; McLaughlin et al., 2015). Neuroception is a term coined by Stephen Porges (2011) to denote the non-conscious process of assessing threats and safety signals in the environment by the autonomic

nervous system (Porges, 2011). This neuroceptive system is very much related to the creation and the development of psychological safety, factor that affects emotional regulation, stress and mental health (Winhall, 2021).

Attachment styles points out a person's pattern of defense mechanisms. Polyvagal theory explains it as every individual has the inclination to move into fight/flight response, shut-down response or social engagement in situations which individual perceive as threatening. The propensity to adapt the social engagement system could define secure

attachment. In this context polyvagal theory offers a fascinating lens to understand the complicated interplay between our nervous system, our emotions, and our relationships. This theory by Dr Porges (2007) explained that development of attachment styles is grounded on our early experiences of early childhood that how we perceive our environment safe or unsafe (Porges, 2007). This shapes our "neuroception" - our subconscious ability to detect cues of safety or threat (Dana, 2008).

In the developmental stage of infancy, the nervous system, mainly the amygdala, is intensely affected by the surrounding environmental factors, it shapes fear responses of child and attachment patterns which effect further attachment styles in adulthood are much dependable on the interactions with caregivers. Insecure and threatening environments, marked by child abuse on emotional, physical and sexual level, neglect, or chronic stress, scars a child's ability to regulate fear in threatening situation and can lead to long-term effects such as anxiety, depression, and maladaptive coping mechanisms. These early disruptions in attachment and safety can leads to dissociation, complex PTSD, and entrenched survival behaviors, impacting memory, emotional regulation, and social functioning (Holochwost et al., 2020). Social isolation, bullying, or stress due to any discrimination further activate pathological defense mechanisms, leading towards addiction or self-harm as passive coping strategies. In the similar pattern, soldiers who are skilled for fight in high-alert combat conditions mostly face the mental health issues most prevalent one is post-traumatic stress disorder due to unresolved trauma and difficulty during adjustment and transition to back to civilian life (Dale et al., 2009). As mentioned by Deb Dana *"We live in a story that originates in our autonomic state, is sent through autonomic pathways from the body to the brain and is then translated by the brain into beliefs that guide our daily living. The mind narrates what the nervous system knows. Story follows state"* (Dana, 2008 p. 35).

Relevant literature regarding frame work of attachment theory mostly highlighted the role of individual differences in development of social bonds and attachments. Although there is deficiency of literature relevant to the neurobiological underpinnings of attachment orientations and their well-established impact on a range of social and affective behaviours, but on the

bright side we see the emerging literature in the area of neuroscience that has further investigated into the neurobiological underpinnings of attachment styles (Verticka & Vuilleumier, 2012). Brain imaging studies have identified specific neural circuits and patterns of activation associated with secure, anxious, and avoidant attachment styles. Understanding the neural basis of these attachment styles provides a bridge between the psychological and physiological aspects of interpersonal relationships. Mikulincer and Shaver's (2016) provides an inclusive overview of attachment theory and exploration of early developed attachment styles and their impact on interpersonal dynamics and emotional regulation throughout the lifespan. Further they emphasized that secure attachment fosters emotional regulation, a sense of safety, and effective social engagement, whereas insecure attachment styles are linked to heightened stress and maladaptive coping. These psychological dynamics comparable to the polyvagal theory, which explains how neurophysiological states of safety or threat influence emotional and relational functioning (Mikulincer & Shaver, 2016). Additionally investigation by Siegel (2012) assimilates the neuroscientific perspectives with the attachment theory, highlighting the deep impact of early attachment styles on brain development (Siegel, 2012). Furthermore this research work offers understandings into the complex connections between neurobiology, attachment, and psychological well-being of an individual in later life. Allan Schore's (2001) work underlines the critical role of early attachment experiences in shaping the developing brain (Schore, 2001).

Based on the fundamental work of Bowlby and Ainsworth, pioneers in the research work on attachment theories, contemporary researchers have explored how attachment styles influence an individual's sense of psychological safety in various contexts. Individuals with securely attached style incline to perceive the greater safety and indulge in open communication as they have well-regulated autonomic nervous system that can readily engage in social interaction with others. On the contrary individuals with insecure attachment styles incline to have disrupted and maladaptive neuroception, which make the world around them unsafe and threatening which further reinforce insecure attachment styles and reason for difficulties in social engagements. Based on this literature it is

hypothesized for this current research project that individuals with secure attachment styles will demonstrate more adaptive neuroception patterns, associating with better emotional regulation and social engagement. In contrast, insecure attachment styles may show dysregulated neuroception linked to heightened threat responses and emotional dysregulation.

In a nutshell we can say that this study seeks to explore this predictive connection between the attachment styles and psychological safety in collectivistic culture of Pakistan as mostly literature is relevant to individualistic cultures. Furthermore by clear conceptualization of this relationship among attachment patterns, neuroception, and the autonomic nervous system, polyvagal theory offers insights into how to promote emotional healing and secure attachment through practices that regulate the vagus nerve and nervous system (Wagner, 2015).

METHODOLOGY

Participants

The study was analytical cross-sectional and grounded on data from Lahore, Punjab. The sample size was constructed on the proclamation made by Kline (2013) which specified that the proportion of the sample must be at least 3:1 for the number of the items of the scale (Kline, 2013). The sample was selected through the convenience non-probability sampling technique as the data was collected through google forms. The sample was comprised of 250 participants. Inclusion criteria was general population belongs to the city of Lahore with the minimal education level intermediate and above and age range from 20 to 55 years. Those participants not residents of Lahore and with the education level less than intermediate were excluded from the sample. Participants who were less than 20 and more than 55 years were excluded from sample.

Measurements

i. Demographic questionnaire

The first part of form was consisted of informed consent, further comprised demographic details in first segment.

ii. Neuroception of Psychological Safety Scale (NPSS)

The (NPSS) is a 29-item tool designed to evaluate an individual's sense of safety. Items will be scored

by likert scale by marking 1 for strongly disagree to 5 for strongly agree. It is comprised of three sub-scales: Social Engagement (14 items) assesses the perception about environment as non-threatening and safe for social engagement; Compassion (7 items) assesses the passion to form social connections, demonstrate care and empathy, and have a sincere desire to help others around., and last subscale is of Bodily Sensations (8 items) evaluates that how much individual has calm internal bodily sensations, described by a sense of relaxation all over body, a stable heartbeat and breath, and a stable stomach. The NPSS showed good internal reliability with Cronbach's α of 0.95 overall, and sub-scale α of 0.94 for social engagement, 0.90 for compassion, and 0.93 for bodily sensations. This scale on the whole offers a standardized evaluation of psychological safety, based on the principles of the Polyvagal theory. Higher scores shows greater levels of psychological safety (Morton et al., 2022).

iii. Original Attachment Three Category Measure

This is the first measure of adult attachment developed by Hazen and Sahaver (1987). It is a 3-item questionnaire designed to measure one's attachment style. The three attachment styles are Avoidant, Anxious/Ambivalent, and Secure. In scoring score of 1 for secure, 2 for anxious/ambivalent, and 3 for avoidant. This tool showed good internal reliability with cronbach alpha of 0.98 (Hazan & Shaver, 1987).

Procedure

The sample was collected from the city of Lahore. The demographic form, NPSS and Original Attachment three category measure were administered. The approximate time for the completion of both questionnaires was about ten minutes.

Ethical considerations: Informed consent was obtained from participants on the individual level during data collection. Participants were debriefing regarding objectives of research and confidentiality issues. Ethical permission for the use of measurement tools was obtained before data collection.

Scoring and Statistical Analysis

Data was analysed using Statistical Package for Social sciences (SPSS, version 25.0). The descriptive statistics was used for capturing the descriptive characteristics of demographic characteristics of sample. Normality of the distribution of the scores will be tested using Shapiro-Wilk. Further Post Hoc (Tukey's HSD) analysis was applied to assess the predictive relationships between neuroception and attachment styles with the confidence level of 95 %.

RESULTS

The Analysis of Variance was conducted to analyse the difference in level of neuroception of psychological safety in individuals having three attachment styles; avoidant, secure and anxious.

The findings of entire data indicate significant difference in the mean values of these three attachment styles on the scores of NPSS and its subscales of Social Engagement, Compassion & Bodily Sensations as shown in Table 1. To enrich our understanding of these results, data was further analysed by the Post Hoc analysis (Tukey's HSD shown in Table 2) to see the differences among these attachment styles on the variable of neuroception of psychological safety. The findings revealed that there was significant difference in the mean scores of NPSS total scores in all attachment styles but only on the subscale of social engagement the difference between means of avoidant attachment style and anxious attachment styles was not statistically significant.

Table 1

Descriptive Statistics of Attachment Styles on the Variable of NPSS and its Subscales

Variable	Avoidant M (SD)	Secure M (SD)	Anxious M (SD)
Social engagement	40.67 (10.41)	52.69 (8.46)	36 (9.76)
Compassion	26.16 (6.86)	29.77 (4.43)	21.25 (7.32)
Bodily Sensations	25.67 (7.96)	30.02 (6.40)	21.50 (8.95)
NPSS	92.51 (20.41)	112.48 (16.94)	78.75 20.44)

Note. NPSS = Neuroception of Psychological Safety Scale. Higher scores indicate higher perceived safety.

In social engagement, secure attachment style reported the highest mean score ($M = 52.69$, $SD = 8.46$), indicating greater social engagement compared to Avoidant ($M = 40.67$, $SD = 10.41$) and anxious attachment styles ($M = 36$, $SD = 9.76$). Anxious attachment style reported the lowest mean score. In compassion, secure attachment style also showed the highest mean score ($M = 29.77$, $SD = 4.43$), followed by avoidant ($M = 26.16$, $SD = 6.86$) and anxious ($M = 21.25$, $SD = 7.32$). Anxious attachment style scored significantly lower in compassion. In Bodily Sensations, secure

attachment scored the highest ($M = 30.02$, $SD = 6.40$), while avoidant ($M = 25.67$, $SD = 7.96$) and anxious ($M = 21.50$, $SD = 8.95$) showed lower scores. In NPSS Total Score, secure attachment style had the highest total NPSS score ($M = 112.48$, $SD = 16.94$), indicating higher positive self-perceptions and social functioning. Avoidant scored moderately ($M = 92.51$, $SD = 20.41$), and Anxious scored the lowest ($M = 78.75$, $SD = 20.44$). These findings are also illustrated in clustered bar in Figure 1.

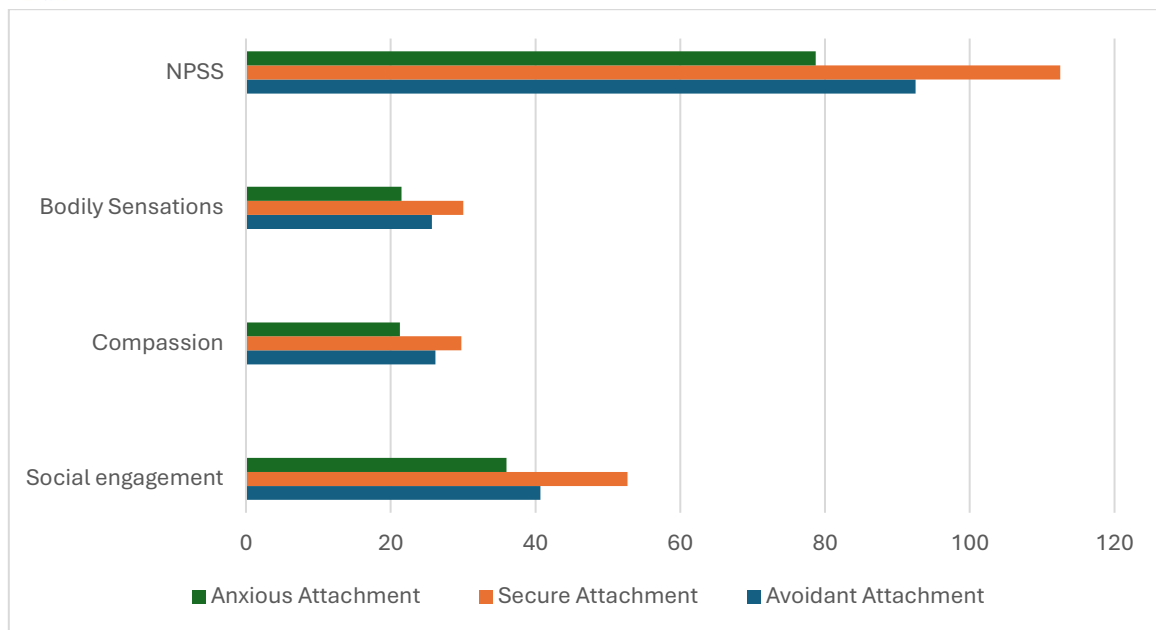


Figure1. Mean scores of Neuroception of Psychological Safety Scale (NPSS) and its sub-scales across attachment styles

Table 2

Tukey's HSD Post Hoc Comparisons among Attachment Styles for NPSS and Its Subscales

Variable	Attachment Styles	Mean difference	SE	p
Social engagement	Avoidant -Secure	12.02	1.35	.000
	Avoidant -Anxious	4.67	2.15	.078
	Secure- Anxious	16.69	2.15	.000
Compassion	Avoidant -Secure	3.61	.84	.000
	Avoidant- Anxious	4.91	1.34	.001
	Secure & Anxious	8.52	1.34	.000
Bodily Sensations	Avoidant -Secure	4.34	1.05	.000
	Avoidant - Anxious	4.17	1.67	.000
	Secure - Anxious	8.52	1.67	.000
NPSS	Avoidant - Secure	19.97	2.68	.000
	Avoidant- Anxious	13.76	4.28	.004
	Secure - Anxious	33.73	4.28	.000

Note. *p* values are based on Tukey's HSD post hoc test. *p* < .05 indicates significant differences.

In social engagement, significant differences were observed between avoidant & secure ($p < .001$) and Secure & Anxious ($p < .001$). No significant difference between avoidant & anxious ($p = .078$). In compassion subscale, all pairwise comparisons showed significant differences as avoidant & secure ($p < .001$), avoidant & anxious ($p = .001$) and secure & anxious ($p < .001$). Secure individuals displayed significantly greater compassion compared to avoidant and anxious individuals. In the area of Bodily sensations, significant

differences were found in all pairwise comparisons: avoidant & secure ($p < .001$), avoidant & anxious ($p < .001$), and secure & anxious ($p < .001$). Secure individuals reported better awareness or integration of bodily sensations. In NPSS all comparisons were significant; Avoidant & Secure ($p < .001$), avoidant & anxious ($p = .004$) and secure & anxious ($p < .001$). Secure attachment style consistently had significantly higher NPSS scores than both avoidant and anxious styles.

Secure attachment style consistently scored higher on all subscales and the total NPSS score, suggesting better social engagement, compassion, and bodily awareness. Anxious attachment style consistently had the lowest scores, indicating challenges in these areas. The significant differences among attachment styles, especially with secure attachment outperforming both avoidant and anxious styles, highlight the positive role of secure attachment in self-perceptions and social functioning.

DISCUSSIONS

The present study designed to investigate the differences in neuroception of psychological safety (NPSS) and its subscales—Social Engagement, Compassion, and Bodily Sensations—across individuals exhibiting varied attachment styles: avoidant, secure, and anxious. The results revealed significant differences among these attachment styles in NPSS and its subscales, elevating our comprehension of the pervasive impact of attachment dispositions influence perceptions of psychological safety.

The findings align with existing literature suggesting that attachment styles play a crucial role in shaping individuals' neuroception, the subconscious detection of safety or threat (Porges, 2011). Securely attached individuals reported the highest NPSS scores ($M = 112.48$, $SD = 16.94$), followed by avoidant ($M = 92.51$, $SD = 20.41$) and anxious individuals ($M = 78.75$, $SD = 20.44$). These results underscore the protective role of secure attachment in fostering a stronger sense of psychological safety, likely due to positive self-other schemas and effective emotion regulation strategies (Mikulincer & Shaver, 2016). The well-regulated vagus nerve facilitates smooth conversion between various emotional states, allowing for what polyvagal theory refers to as "neuroception," the unconscious scanning of your environment for safety or threat. Individual with anxious attachment style often have a nervous system that tends towards the "fight or flight" state. The vagus nerve, which usually helps in regulating emotions, might not be performing its role effectively for you. Consequently, your nervous system is more likely to propel you into states of hyper vigilance or hyper arousal. In avoidant style vagus nerve's social engagement function is under-activated, the individual is more inclined to withdraw and limit

emotional output, a kind of self-preservation. Those with avoidant attachment often retreat emotionally as a way to safeguard themselves. This can be linked to an underactive social connection mechanism, resulting in separation from emotions and a heavy reliance on themselves. As a result, they often find emotional communication difficult, and finding balance with others can trigger relationship tension.

Social engagement, a critical component of psychological safety, varied significantly across attachment styles, except for the avoidant-anxious comparison ($p = .078$). Securely attached individuals reported the highest social engagement scores ($M = 52.69$, $SD = 8.46$), indicating their ability to form and maintain supportive interpersonal connections (Gillath et al., 2005). In contrast, anxious and avoidant individuals exhibited lower scores, reflecting difficulties in trust and communication (Bartholomew & Horowitz, 1991). In relationships, Individuals with anxious attachment styles exhibit pronounced emotional responsiveness, frequently perceiving ambiguous circumstances as unfavorable and threatening. On the other hand the dorsal vagal pathway, which is related with states of freeze and detachment endorses emotional detachment as a form of self-protection as defense in avoidant style. The non-significant difference between anxious and avoidant styles in findings may suggest commonality in underlying difficulties, including hyper activation in anxious style or deactivation in avoidant style.

The significant differences in compassion scores across all attachment styles ($p < .05$) underline the influence of attachment alignment on empathy and caregiving behaviors. Securely attached individuals scored highest ($M = 29.77$, $SD = 4.43$), consistent with studies indicating that secure attachment nurtures compassionate responses to others' needs (Shaver et al., 2010). Conversely, avoidant and anxious individuals demonstrated significantly reduced compassionate profiles, a finding consistent with their propensity for emotional dysregulation and self-preoccupation in stressful situations, as previously documented (Mikulincer et al., 2005).

The bodily sensations subscale also revealed significant differences among all attachment styles. Secure individuals reported the highest scores ($M = 30.02$, $SD = 6.40$), suggesting greater attunement to internal states of safety (Siegel, 2010). Avoidant

and anxious individuals exhibited lower scores, potentially reflecting alexithymia or heightened physiological arousal associated with insecure attachment (Fonagy et al., 2002).

The implications of these findings are profound for therapeutic interventions aimed at cultivating psychological safety. Enhancing behaviors indicative of secure attachment, potentially through emotion-focused therapy or attachment-based interventions, may enhance neuroception and overall well-being (Johnson, 2019). Moreover, the absence of significant difference in aspect of social engagement between avoidant and anxious styles necessitates further investigation into potential shared mechanisms influencing relational dynamics.

Limitations and Recommendations

Although this current study delivers valuable insights in this phenomenon, it also have some limitations. Firstly, its cross-sectional design bounds causal inferences, while the reliance on self-reported data may yield biased results. It is suggested that future research projects could employ longitudinal designs and incorporate physiological measures, such as vagal tone, to substantially augment understanding of neuroception and attachment.

Conclusion

In conclusion, the study underscores the profound influence of attachment styles on neuroception of psychological safety and its subscales. Secure attachment promotes a stronger sense of safety, social engagement, and compassion, whereas avoidant and anxious styles pose unique challenges. These findings contribute to the growing body of literature on attachment and psychological safety, paving the way for targeted interventions to enhance the individual well-being. In essence, this investigation establishes a significant relationship between adult attachment styles and neuroceptive perceptions of psychological safety, underscoring the importance of secure attachment in fostering a propitious environment for social interaction and compassionate relationships. Conversely, avoidant and anxious styles pose unique challenges. The results of this study contribute to a growing body of research literature on the interaction of attachment and psychological safety, further

facilitating the development of targeted interventions to enhance the individual well-being.

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