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Reactions to Uncertainty: Exploring the Interplay Between Intolerance of Uncertainty, Attachment Styles, and Psychological Symptoms

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Abstract

This study investigated the interplay between Intolerance of Uncertainty (IU), attachment styles, and mental health, using network analysis on a community sample of 1121 individuals (450 men, 654 women, 17 unreported gender), aged 20-76 years ($M = 36.8$; $SD = 12.4$). Participants completed various instruments, including the Intolerance of Uncertainty Inventory, Experiences in Close Relationships-Revised, Attachment Style Questionnaire, State Adult Attachment Measure, and the 27-item Symptoms Checklist. Findings revealed a complex network with a central cluster of maladaptive IU beliefs. Attachment styles significantly shaped responses to uncertainty, especially doubt, threat overestimation, and reassurance seeking, while avoidant attachment linked to uncertainty control and avoidance of uncertainty, symptoms of mistrust and social phobia. Secure attachment offered a protective indirect influence. Central nodes in the network, like Worry, Reassurance Seeking, and Doubt, connect closely to core IU beliefs and depressive symptoms, suggesting them as potential intervention targets. Addressing these maladaptive reactions to uncertainty, particularly in individuals with insecure attachment, could mitigate the co-occurrence of IU beliefs and attachment styles, enhancing coping mechanisms in daily life. This research enriches the understanding of the dynamics between attachment styles, IU, and mental health.

Key words: Intolerance of Uncertainty, Attachment Styles, Mental Health, Network Analysis, Affective Reactions to Uncertainty

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Introduction

While some individuals possess a remarkable ability to manage uncertainty, others have a strong aversion to it. This tendency has been named Intolerance of Uncertainty (IU), a personality trait that makes people apt to perceive even the slightest possibility of a negative future event as unacceptable and threatening (Carleton et al., 2007). Initially, IU was thought to determine the onset and maintenance of pathological *worry* in Generalized Anxiety Disorder (Dugas et al., 1998). More recently, IU has been recognized as a transdiagnostic factor that extends beyond worry, determining a wide range of reactions to uncertainty in the context of complex, generalized stressors (Shihata et al., 2016).

A possible consequence of IU is *avoidance* (Dickson et al., 2012), which consists in refraining from or escaping anxiety-provoking uncertain situations. However, the inflexible use of behaviors aimed at avoiding uncertainty can hinder its emotional appraisal, reinforcing uncertainty aversion and desire for certainty and predictability (Hayes et al., 2004; Sankar et al., 2017). Individuals high on IU often try to exert control over uncertainty, aiming to prevent negative outcomes (Helbig-Lang & Petermann, 2010; Sookman & Pinard, 2002). Similarly, *seeking reassurance*, such as soliciting information from others or reliable sources, is a maladaptive consequence of IU that may temporarily alleviate anxiety. Yet, reassurance seeking can lead to new dysfunctional appraisals, contributing to the persistence of anxiety over time (Kobori & Salkovskis, 2013). Individuals with elevated levels of IU are biased towards potentially negative events, leading them to *overestimate threats*. This tendency has been linked to the severity of obsessive compulsive disorder, anxiety, and depression symptoms (Miranda et al., 2008; Moritz & Jelinek, 2009). Last, individuals high on IU experience chronic *doubt*, reflecting lack of certainty and confidence. This can be an IU-related reaction to uncertainty and a hallmark feature of OCD (Nikodijevic et al., 2015).

Exploring IU through the Lens of Attachment Theory

The understanding of IU's impact on mental health opens the door to examining foundational theories that might underpin these phenomena. Among these, attachment theory stands out as a prominent framework. This theory, with its emphasis on *perceived predictability* of support from attachment figures in times of need, offers a lens through which the development of IU can be understood in the context of need for secure emotional bonds. Regarding adult attachment, Mikulincer et al. (2003) maintained that perceived predictability in attachment relationships can influence coping strategies in the face of uncertainty. Secure individuals view themselves as deserving of others' care and are comfortable with intimacy, displaying a high tolerance for uncertainty and employing effective emotional regulation strategies for personal growth (Shaver et al., 2016). Conversely, individuals with insecure attachment, shaped by experiences of unpredictability or emotional unavailability from attachment figures, perceive uncertainty as threatening and adopt maladaptive emotional regulation strategies to manage distress (Campbell et al., 2005; Main, 1990). Anxiously attached individuals are particularly sensitive to uncertainty, *hyperactivating* their attachment behaviors to seek support from others, upon

whom they heavily rely on (Mikulincer et al., 2003). Avoidant individuals prioritize self-sufficiency, using *deactivating* strategies to minimize negative emotions associated with potential rejection or unavailability from others (Main, 1990).

Few studies addressed the relations between attachment and IU. Wright et al. (2017) found that attachment anxiety and avoidance were positively associated with IU and worry in a community sample. The same study also showed that attachment anxiety predicted worry through its impact on IU, highlighting the importance of considering attachment in understanding and treating IU and worry. Similarly, Clark et al. (2020) showed that attachment anxiety predicted reassurance seeking and that both IU and worry were significant serial-multiple mediators in the relationship between attachment anxiety and reassurance seeking. Both studies focused on how attachment anxiety was related to worry and reassurance seeking. While worry and reassurance seeking are critical aspects of how individuals cope with uncertainty, the literature suggests a wider array of consequences. These aspects have not been the focus of earlier studies (Clark et al., 2020; Wright et al., 2017) but are crucial for a more comprehensive understanding of how people react to uncertainty. Moreover, investigating attachment security could offer new perspectives on how attachment may influence the experience of uncertainty.

The Attachment and IU Network

The current study aims to explore attachment styles and IU-related reactions to uncertainty through network analysis, seeking to identify key variables and their interconnections. In general, we hypothesize that both anxious and avoidant attachments intensify IU beliefs and their maladaptive consequences. This is attributed to anxious attachment heightening perception of threats and avoidant attachment enhancing mistrust and sensitivity to uncertain scenarios. Conversely, secure attachment is expected to correlate with lower IU levels, offering resilience against uncertainty distress.

Methods

Participants

The sample was based on convenience and consisted of 1121 individuals (450 men, 654 women, and 17 individuals who did not declare their gender) who completed a series of self-report measures as part of a larger, IRB-approved study (Deliberation #23.7.2014). Part of the data were used in other related publications (Lauriola et al., 2018; Trentini et al., 2015). Participants ages ranged from 20 to 76 years ($M = 36.8$; $SD = 12.4$). Regarding education, the sample included elementary school (142; 12.7%), junior high school (496; 44.2%), and senior high school (476; 42.5%), with seven participants not disclosing education (7; 0.6%). In the study, the fourth author trained eighty-nine undergraduate psychology students to recruit participants and administer questionnaires consistently. These students, from an advanced clinical assessment

class, gathered data from their acquaintances, excluding other psychology students and close family members. The administration occurred in quiet, comfortable home settings. Participants were briefed about the study's voluntary nature, their right to withdraw, and the confidentiality of their responses. Verbal consent was obtained prior to data collection.

Instruments

Intolerance of Uncertainty Inventory (IUI). The IUI is a 45-item, two-part inventory designed to evaluate an individual's excessive inclination to perceive life's uncertainties as unacceptable (IUI-A), along with various maladaptive reactions that may emerge from this excessive inclination (IUI-B) (Lauriola et al., 2018). Participants' responses were collected using a 5-point Likert scale (1-5). The IUI-A yields a total IU beliefs score (Cronbach's $\alpha = 0.92$ in the present study). The IUI-B subscale yields six total scores for Avoidance, Doubt, Overestimation of Threat, Worry, Control of Uncertainty, and Reassurance Seeking. In the current study, Cronbach's alpha coefficients were 0.79, 0.86, 0.92, 0.89, 0.87, and 0.83, respectively.

Experiences in Close Relationships-Revised (ECR-R). The ECR-R assesses adult attachment anxiety and avoidance (Busonera et al., 2014). It comprised 36 items, split evenly across the above-mentioned dimensions, each rated on a 7-point Likert scale (1-7). High scores on the anxiety subscale (Cronbach's $\alpha = 0.87$) indicated a strong desire for closeness and fear of abandonment. Conversely, high scores on the avoidance subscale (Cronbach's $\alpha = 0.92$) suggested discomfort with intimacy and difficulty in emotional sharing with a partner.

Attachment Style Questionnaire (ASQ). The ASQ provides a nuanced assessment of attachment anxiety and avoidance along with secure attachment (Fossati et al., 2003). It consisted of 40 items, grouped into Confidence, Need for Approval, Preoccupation with Relationships, Discomfort with Closeness, and Relationships as Secondary. Respondents rated each item on a 6-point Likert scale (1-6). In the current study, Cronbach's α coefficients were 0.68, 0.76, 0.76, 0.72 and 0.73, respectively.

State Adult Attachment Measure (SAAM). The SAAM was developed to capture temporary fluctuations due to significant life events and contextual factors (Trentini et al., 2015). It consisted of 21 items that form three adult attachment state scores: security, anxiety, and avoidance. The response format was Likert type with seven steps (1-7). Cronbach's α coefficients were 0.85, 0.84 and 0.81, respectively.

Symptoms Checklist-27 (SCL-27). The SCL-27 (Hardt & Gerbershagen, 2001), is a screening tool to assess six aspects of psychological distress, such as depressive, dysthymic, vegetative, agoraphobic, and mistrust symptoms. Participants rated the experience of each symptom over the past week using a 5-point Likert scale (0-4). In the present study, Cronbach's coefficients were 0.66, 0.72, 0.81, 0.70, 0.77, and 0.72, respectively.

Statistical Analysis

Missing values. Total scores were calculated for each of the study variables. Because we encountered missing values for 75 participants (6.69%), we conducted a missing value analysis

to support the validity of imputation methods. The result of the Little's MCAR test ($\chi^2 = 1348.95$, $df = 1359$, $p = .572$) indicated a completely random pattern. This finding validated the use of multivariate imputation by chained equations using the 'mice' package for R.

Assumptions checks. The Shapiro–Wilks test yielded statistically significant results for all variables (all p -s < .001), indicating deviations from normality. However, the data showed only a slight asymmetry (*Skewness range* = ± 1) for all IU and attachment scores, except for SAAM security ($Sk = 1.04$). The psychological symptoms displayed moderate asymmetry: Vegetative ($Sk = 2.03$, $K = 5.06$), Social Phobia ($Sk = 1.99$, $K = 4.90$), Mistrust ($Sk = 1.33$, $K = 2.26$), Dysthymic ($Sk = 1.11$, $K = 1.36$), Depressive ($Sk = 1.65$, $K = 3.22$), and Agoraphobic ($Sk = 2.94$, $K = 10.44$). To approximate normality, these variables underwent square root transformation. Following the transformation, symptom scores exhibited improved skewness and kurtosis, with only Agoraphobic ones remaining slightly skewed ($Sk = 1.14$) (Supplementary Materials, Table S1).

Network Analysis. We used the 'bootnet' and 'qgraph' packages for R to estimate and visualize the network structure encompassing the study variables. Specifically, we implemented the EBIC-Glasso algorithm to obtain a network model that is parsimonious and effective in illustrating the structure of the data (Epskamp et al., 2012). This method produces a network wherein the connections (edges) between variables (nodes) represent partial correlations. The relative importance of the network's nodes was evaluated using centrality indices. Strength centrality reflects the intensity of the relationships of a focal node within the network, expressed in terms of the absolute value sum of edge weights. Betweenness centrality measures a node's intermediary role and its significance in terms of interconnectivity. Closeness centrality, which considers the average distance of a node from all others, reflects a node's dependence, or influence, relative to other nodes in the network.

The reliability of the edges and nodes' centrality indices were corroborated following Epskamp et al. (2018). This entailed the use of non-parametric bootstrapping with 5,000 resamplings to assess the 95% confidence intervals (CIs) of edge weights. Notably, the presence of non-zero edges in the network already indicates their inherent significance. Therefore, CIs are to be interpreted as reliability measures. The stability of centrality indices was assessed using the correlation stability coefficient (CS-coefficient) derived from case-dropping bootstrapping with 5,000 resamplings. According to Epskamp et al. (2018) the CS-coefficient is obtained by comparing the centrality indices of the original network with those of a network recalculated using a subset of the cases, typically 70%. To ensure the robustness of the network, the CS-coefficient should exceed 0.25 and, ideally, 0.50.

Results

With 23 nodes and 141/253 nonzero edges, the density of the network was 55.7%. Figure 1 showed a complex interaction of constructs, with maladaptive consequences of IU being

closely interconnected, forming a central cluster, in which we observed a strong association between IU beliefs and Worry. Other strong associations emerged between Control and Avoidance as well as among Doubt, Overestimation of Threat, and Reassurance Seeking. The Attachment cluster also showed significant interconnectivity. On the one hand, ASQ Need for Approval, ASQ Preoccupation with Relationships, ECR-R Anxiety, and SAAM Anxiety formed a subgroup representing hyperactivating strategies, characteristic of anxious attachment. Notably, this group was the most proximal to the maladaptive consequences of IU, especially Doubt, Overestimation of Threat, and Reassurance Seeking. ASQ Discomfort with Closeness, ASQ Relationships as Secondary, ECR-R Avoidance, and SAAM Avoidance formed a subgroup representing deactivating strategies, characteristic of avoidant attachment. This group entertained positive relationships with Control and Avoidance of uncertainty, as well as with psychological symptoms of Mistrust and Social Phobia. This group also bordered on secure attachment variables, such as ASQ Confidence and SAAM Security, which, in turn, displayed a protective role for Mistrust and Social Phobia. The symptom scales were more peripherally connected, indicating that they might be influenced by maladaptive consequences of IU beliefs and attachment constructs to varying degrees.

Centrality measures indicated which variables were in key positions in the network. Strength centrality, for instance, revealed the robustness of a node's connectivity to other nodes. Figure 2 showed that Worry, Reassurance (seeking), and Doubt had the highest strength centrality values. In a more specific way, betweenness centrality quantified a node's brokerage role, measuring its presence along the shortest paths interlinking other nodes. Again, Reassurance (seeking), and Doubt were among the top-ranked variables for betweenness centrality.

In addition to these, Need for Approval and Discomfort with Closeness were also prominent in terms of betweenness centrality. Specifically, Need for Approval was situated between maladaptive responses to uncertainty and measures of anxious attachment, while Discomfort with Closeness bridged the gap between psychological symptoms and deactivating strategies. A node with high closeness centrality can quickly influence or be influenced by other nodes in the network because it is, on average, closer to them in terms of path length. Notably, Reassurance (seeking), Doubt, Need for Approval and Discomfort with Closeness were again among the top-ranked variables for closeness centrality underscoring their crucial role.

As depicted in Figure 3a, the confidence intervals (CIs) obtained through bootstrapping for the edge weights were notably narrow. As a result, many edge-weights were significantly different from one-another (Figure 3b). Out of 141 edges represented in the network plot, 80 non-zero edges were found to be reliably estimated, with the CIs not encompassing zero (see Supplementary Materials, Table S2). Notably, the identified top-twenty edges did not link variables of different categories; instead, they signified connections between pairs within the same domain.

Analyzing reliable edges across different domains through qualitative assessment enabled us to delineate thematic areas based on content analysis. This approach aimed to deepen our understanding of the network's structure, unveiling five distinct thematic areas: Social Interaction and Approval Seeking (i.e., Reassurance-Need for Approval, Doubting-Need for Approval, Need for Approval-Social Phobia, Reassurance-Discomfort with Closeness, Discomfort with Closeness-Mistrust, Reassurance-Anxiety [SAAM], Reassurance-Preoccupation with Relationships, IU Beliefs-Preoccupation with Relationships); Internal States and Anxiety-Related

Fig. 1.

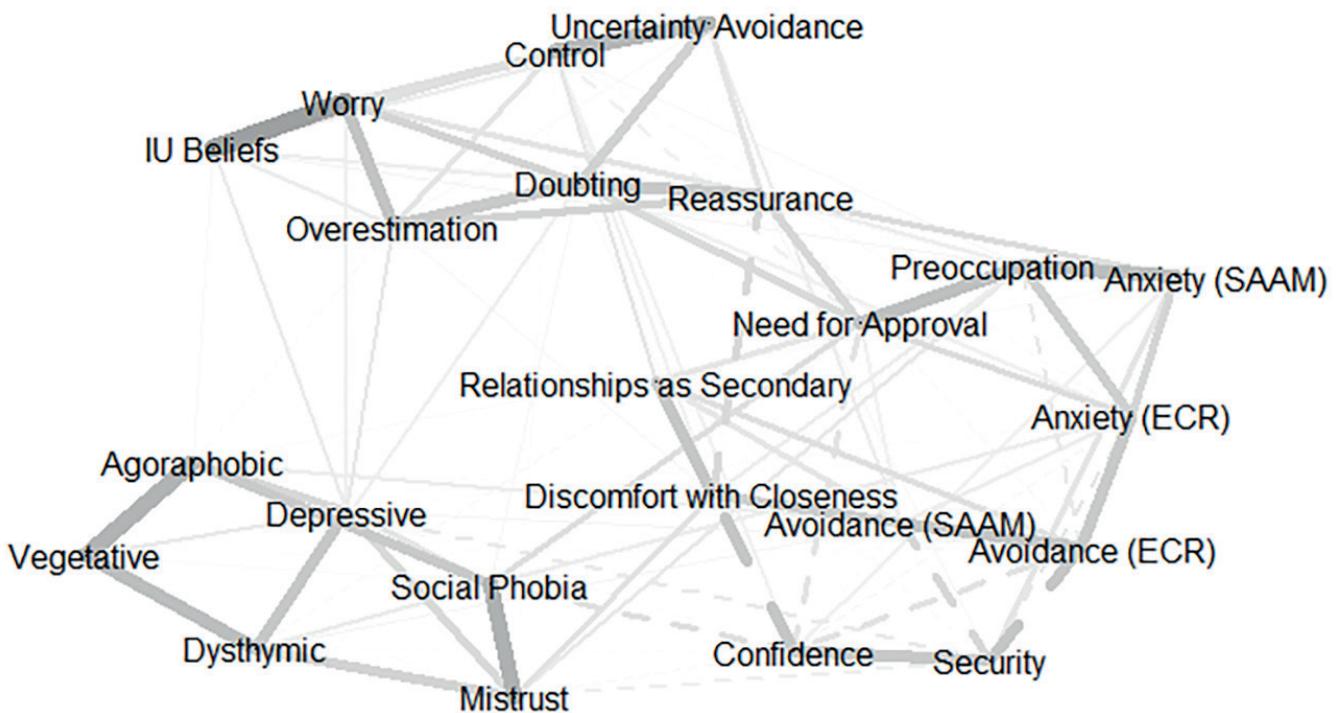
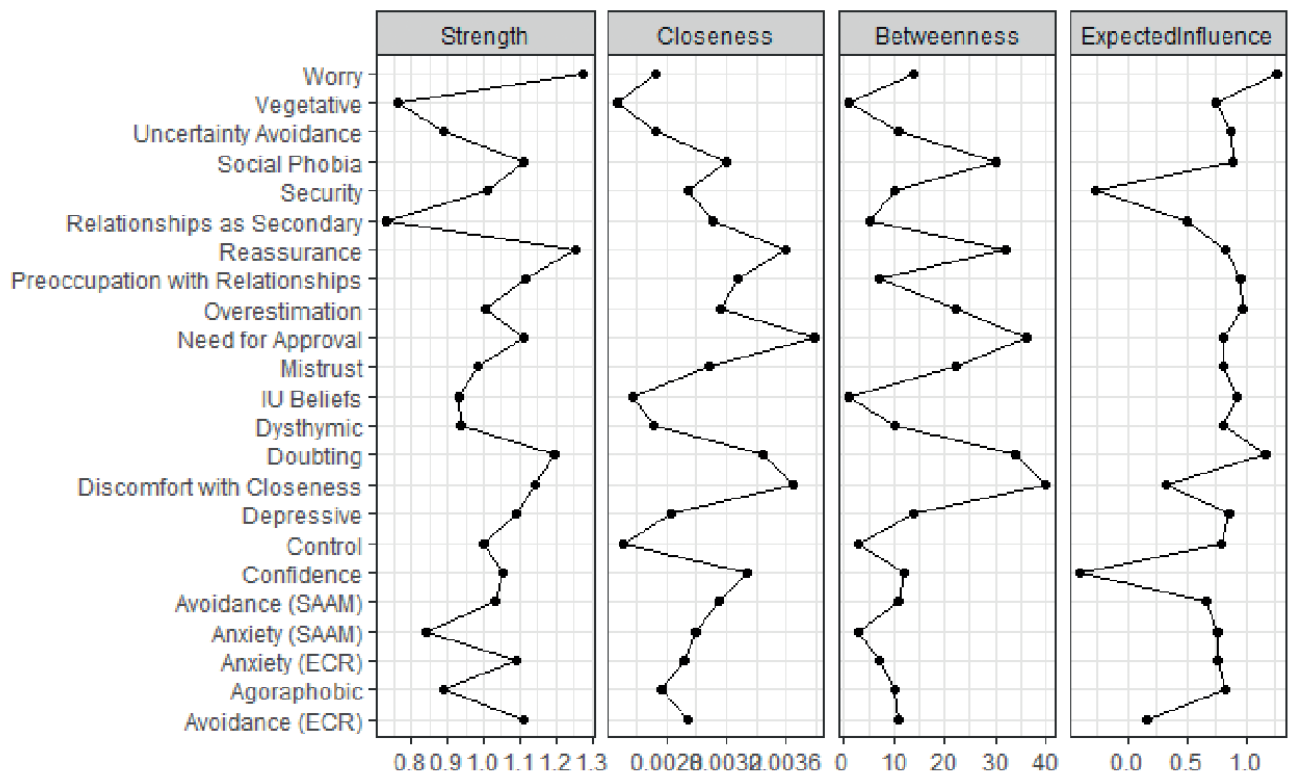


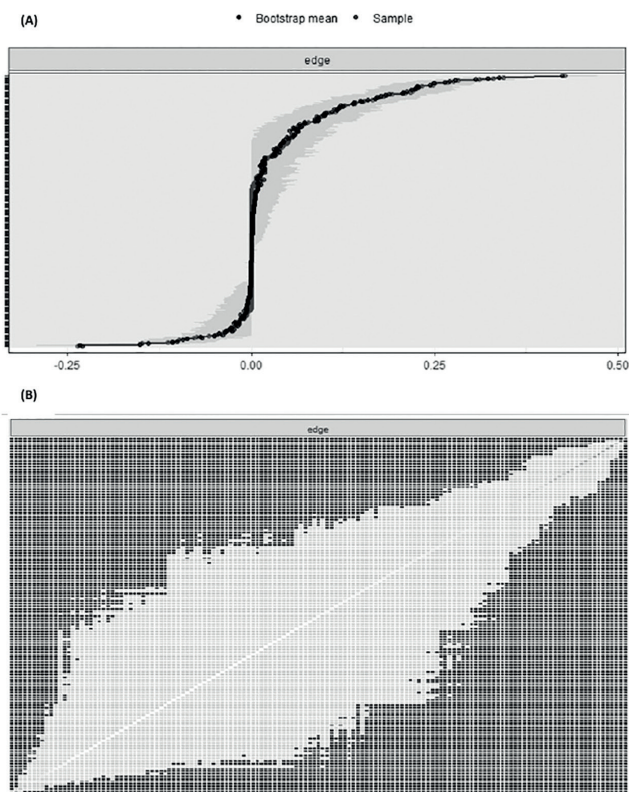
Fig. 2.



Constructs (i.e., Anxiety [ECR]-Social Phobia, Doubting-Anxiety [ECR], Uncertainty Avoidance-Avoidance [SAAM], Avoidance [SAAM]-Agoraphobic, Overestimation-Discomfort with Closeness); Depressive and Dysthymic States (i.e., Overestimation-Depressive, Security-Depressive, Worry-Depressive, IU Beliefs-Depressive, Avoidance [ECR]-

Depressive, Doubting-Dysthymic, Avoidance [SAAM]-Dysthymic); Mistrust and Control Issues (i.e., Discomfort with Closeness-Mistrust, Control-Relationships as Secondary, Preoccupation with Relationships-Mistrust, Security-Mistrust); Confidence and Social Phobia (i.e., Confidence-Social Phobia, Doubting-Social Phobia).

Fig. 3.



Next, we examined the average correlation of centrality indices with the original sample estimates as a function of the proportion of dropped cases. The maximum drop proportions to retain a correlation of 0.70 in at least 95% of the samples were 0.36, 0.44, and 0.67 for betweenness, closeness, and strength, respectively. For edges, we obtained a value of 0.75. These values met the recommended cutoff (i.e., CS-coefficient > 0.25) for moderately stable estimation, with strength centrality and edges showing a good degree of stability (i.e., CS-coefficient > 0.50).

Discussion

This study set out to explore the intricate interplay between IU, attachment styles, and mental health outcomes. Anchored in the framework of network analysis, our primary aim was to elucidate the complex relationships and potential intervention targets within this triad.

Resonating with seminal clinical research on GAD patients (Dugas et al., 1998), the strongest association in the IU cluster linked IU beliefs and worry. A strong relation between control and avoidance was also prominent in this cluster. Individuals who actively attempted to control uncertainty to prevent negative outcomes were also more likely to avoid

situations where uncertainty was inescapable. This finding aligns with the concept of a self-rewarding amplifying loop (Hayes et al., 2004), where avoiding negative internal experiences leads to a temporary sense of control, which is perceived as rewarding. This loop typically perpetuates a cycle of avoidance and control attempts, further entrenching these maladaptive reactions to uncertainty (Sankar et al., 2017). Overestimation of threat, doubting, and seeking reassurance were not only interconnected, but they were also linked to the second central cluster that included attachment constructs. This suggests that some maladaptive consequences of IU could be influenced by underlying hyperactivating attachment strategies, as evidenced in previous research (Clark et al., 2020; Wright et al., 2017).

Significant interconnectivity within attachment constructs aligned with theories of adult attachment (Mikulincer et al., 2003), with two major subgroups representing hyperactivating strategies (e.g., anxious attachment) and deactivating strategies (e.g., avoidant attachment). Research indicates that hyperactivating strategies are significantly linked to doubt, overestimation of threat, and reassurance-seeking behaviors, while deactivating strategies correlate with attempts to manage uncertainty, avoidance behaviors, and psychological symptoms, including mistrust and social phobia. These patterns support the hypothesis that anxious and avoidant attachments heighten vulnerability to uncertainty. Anxiously attached individuals, often receiving inconsistent care, perceive uncertainty as a sign of potential rejection, leading to the adoption of hyperactivating strategies to secure support against threat-related concerns (Mikulincer et al., 2003; Shaver et al., 2016). This attachment style, alongside high intolerance of uncertainty (IU), is marked by self-doubt, a need for reassurance, and catastrophic thinking, fearing the worst in everyday situations (Shihata et al., 2016). Conversely, those with avoidant attachment, having experienced emotional unavailability from caregivers, emphasize self-reliance and suppress negative emotions to avoid distress from potential rejection (Lenzi et al., 2013; Mikulincer et al., 2003; Shaver et al., 2016). This leads to deactivating strategies aimed at controlling or evading uncertainties and results in difficulties with trust and social fear (Liotti et al., 2023), indicating a distinct approach to handling uncertainty between the two attachment styles.

Previous research on attachment and IU neglected the role of secure attachment (Clark et al., 2020; Wright et al., 2017). However, secure attachment is generally associated with healthy, adaptive coping strategies and a positive approach to relationships (Stevenson et al., 2019). Accordingly, we hypothesized that secure attachment could be beneficial in managing uncertainty in various aspects of life. For example, individuals with secure attachment typically have well-developed emotional regulation skills (Stevenson et al., 2019). They are better equipped to manage and process their emotions, even in uncertain or stressful situations. Moreover, securely attached individuals generally have a positive view of themselves and a trusting view of others (Mikulincer et al., 2003) that could enable them to approach uncertain situations with a sense of confidence and optimism, rather than fear and suspicion. Contrary to the initial hypothesis, secure attachment

was not directly linked to IU beliefs and maladaptive reactions to uncertainty. Instead, confidence and security showed strong, direct, negative associations with hyperactivating and deactivating strategies, as well as with psychological symptoms. This implies that secure attachment might indirectly influence reactions to uncertainty, potentially providing greater resilience against the mental health consequences arising from uncertainty, rather than directly impacting the reactions to uncertainty itself.

The third central cluster within the network plot consisted of psychological symptom scales, with notable interconnectivity. Analysis of the most robust links between symptoms and other nodes identified five thematic areas. The maladaptive consequences of IU were notably prominent in the Depressive and Dysthymic States and the Internal States and Anxiety-Related Constructs. The former thematic area was characterized by a marked tendency towards relationship avoidance, risk overestimation, chronic worry, and challenges in managing uncertainty. These patterns can be expressed through various behaviors and emotional states, including the amplification of negative outcomes, reluctance to engage in intimate relationships, and a persistently low mood. This aligns with prior research, which has identified IU as a transdiagnostic factor impacting a broad spectrum of maladaptive responses. Beyond mere worry, IU is implicated in a range of problematic behaviors and symptoms, including those related to anxiety and depression (Miranda et al., 2008). Attachment states were more prominently featured in the second thematic area, in which the emerging psychological profile points to an individual who experiences significant anxiety in various aspects of their life. This includes a heightened fear in social and interpersonal contexts, a strong inclination to avoid uncertain or potentially threatening situations, and challenges in forming and maintaining close relationships due to fears and overestimations of risk (Mikulincer et al., 2003).

According to recent influential papers (McNally, 2016; Price et al., 2019), network analysis is indicative of targets for effective psychological interventions. For instance, the concept of strength centrality is viewed as critical because nodes with high strength centrality, such as Worry, Reassurance (seeking), and Doubt in our study, are believed to maintain the integrity of the entire network. These maladaptive consequences of IU were also among the top-ranked variables in terms of betweenness centrality, which is deemed important to detect nodes that explain the co-occurrence of different variables in the network. Given the robustness of centrality indices estimated in the present study, we can conclude that addressing the IU-related reactions to uncertainty might help to dispel the co-occurrence of IU beliefs and attachment styles, supporting individuals to better cope with uncertainty in everyday life circumstances.

The present study has several limitations, including a non-random sampling method, the reliance on self-reported data, and the utilization of a cross-sectional design. These limitations may restrict the representativeness of the sample and preclude the possibility to infer causal relationships. To address these issues, future research could implement randomized sampling techniques to enhance the generalizability of the

findings. Furthermore, integrating objective measures such as physiological assessments alongside self-reported data could offer a more comprehensive understanding of the constructs under study. Additionally, adopting longitudinal or experimental designs could enable researchers to explore causal dynamics and the evolution of intolerance of uncertainty (IU), attachment styles, and psychological symptoms over time.

Despite these limitations, the study leveraged its strengths through the employment of a comprehensive network analysis and a large sample size. The network analysis facilitated the identification of central nodes within the network, such as worry, reassurance seeking, and doubt, which could suggest targets for psychological interventions (McNally, 2016). Clinicians could use the insights from this study to modify these central nodes, potentially leading to improved mental health outcomes. Additionally, the comprehensive assessment of clients' IU and attachment styles, facilitated by the diverse instrumentation used in the study, can inform more nuanced and effective therapeutic approaches.

Ethical approval

All procedures performed in studies involving human participants complied with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Data availability statement

Data are available online at:

https://osf.io/bc38u/?view_only=22d3e45298084031aa9f0e87c476ba77

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Authors' contribution

The authors collaboratively discussed the content of this article. ML, OM, and CT conceived the study. ML, OM, and CT developed the theoretical framework and research hypotheses. CT was responsible for data collection. AM curated and prepared the dataset for formal analysis. ML and AM conducted the data analysis and wrote the initial draft. The final version of the manuscript was authored by ML, AM, OM, and CT.

Declaration of Conflicting Interests

The authors declare that the research was conducted without any commercial or financial relationships that could be interpreted as a potential conflict of interest.

Supplementary Material

The Supplementary Material for this article is available online at: https://osf.io/bc38u/?view_only=22d3e45298084031aa9f0e87c476ba77

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ChatGPT was employed for manuscript proofreading to ensure grammatical and syntactical consistency. M.L. validated ChatGPT's output.

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