

The Impact of Parasocial Relationships and Subjective Economic Status on Online Social Anxiety and Peer Loneliness Among Freshmen from the Perspective of Uncertainty Reduction Theory: An Empirical Study Based on Network Analysis

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Abstract: This study explored the network structural relationships among parasocial relationships, subjective economic status, online social anxiety, and peer loneliness in freshmen (N=385). Gender difference analysis revealed that females scored significantly higher than males in online social anxiety (social recognition anxiety, interaction anxiety, privacy anxiety) and peer loneliness ($p < 0.05$), while males scored significantly higher in parasocial relationships (cognitive, emotional, behavioral dimensions; $p < 0.01$). Further network analysis showed that the emotional dimension of parasocial relationships was negatively correlated with online interaction anxiety (weight = -0.03), and subjective economic status was negatively correlated with social anxiety (weight = -0.06) and peer loneliness (weight = -0.11, more pronounced in females). Social recognition anxiety (e.g., fear of others' evaluations) emerged as the most central node (highest strength centrality) in the network. This study is the first to integrate uncertainty reduction theory with network analysis, revealing dynamic associations among variables and providing precise intervention targets (e.g., key node interventions) for college students' mental health. Future research could longitudinally track network evolution or conduct cross-cultural comparisons to validate generalizability.

Keywords: Uncertainty reduction theory; Parasocial relationships; Online social anxiety.

1. Introduction

In the digitally interconnected and globalized modern society, uncertainty has become a critical factor influencing individuals' psychological states and behaviors. The Uncertainty Reduction Theory (URT), proposed by Berger and Calabrese (1975), emphasizes that individuals reduce uncertainty through information acquisition during social interactions. In today's social media-dominated environment, online interactions provide channels for uncertainty reduction but also exacerbate psychological stress due to information overload and identity ambiguity.

Online social anxiety, a common psychological issue triggered by virtual interactions, manifests as tension, discomfort, or fear in online social contexts. Zhou et al. (2020) reported that 25%–35% of internet users experience some form of online social anxiety. For instance, individuals may feel anxious about posting content due to fear of negative feedback (Pantic & Valkenburg, 2016). Features of online communication—such as the absence of nonverbal cues, the permanence of digital records, and heightened visibility—heighten uncertainty and exacerbate anxiety (Joinson, 2001; Przybylski & Weinstein, 2013). Asynchronous communication further fuels overthinking and rumination, worsening social anxiety (Kraut et al., 1998; Walther, 1996).

Peer loneliness reflects feelings of isolation and disconnection within peer groups. Valkenburg and Peter (2007) found that adolescents with prolonged social media use reported higher peer loneliness. While online platforms offer connectivity, they often foster superficial relationships, leaving individuals with numerous “friends” but few meaningful connections (Bargh & McKenna, 2004;

McPherson et al., 2006). Reduced nonverbal cues in online interactions can lead to misunderstandings, hindering relationship development and increasing loneliness (Joinson, 2001). Healthy peer relationships are vital for socioemotional development (Harper, 1996), yet digital environments may disrupt this process (Steinberg, 2008).

Parasocial relationships, initially conceptualized by Horton and Wohl (1956), describe one-sided bonds with media figures. In today's social media era, such relationships are increasingly common (Giles, 2002; Rubin et al., 2004). These connections provide emotional support, reducing uncertainty during loneliness or adversity (Rubin & McHugh, 1987; Moyer-Gusé & Collins, 2009).

Subjective socioeconomic status (SES), reflecting self-perceived economic standing, influences uncertainty in social contexts. SES shapes perceptions of resource control, social comparison, and support (Adler et al., 2008; Twenge & Campbell, 2002), thereby affecting uncertainty levels.

Guided by URT, this study investigates how parasocial relationships and subjective SES interact with online social anxiety and peer loneliness. Prior research has not comprehensively explored these dynamics through URT in online contexts, a gap this study addresses.

2. Methods

2.1. Participants

A total of 1,142 freshmen completed online questionnaires via <http://www.sojump.com>. After excluding 757 invalid responses (outliers in completion time or incomplete items), 385 valid responses remained (168 males, mean age=18.55; 217 females, mean age=18). All participants provided

informed consent, and data were anonymized.

2.2. Page Numbers

Online Social Anxiety Scale (SAS-SMU): 20-item Likert scale (1=strongly disagree to 5=strongly agree), measuring social recognition anxiety, interaction anxiety, and privacy anxiety (Cronbach's $\alpha=0.96$).

Peer Loneliness Scale: 12-item subscale from the Louvain Loneliness Scale for Children and Adolescents (LLCA; Marcoen et al., 1987; $\alpha=0.93$).

Parasocial Relationships Scale: 10-item scale assessing cognitive, emotional, and behavioral dimensions (Ge, 2017; $\alpha=0.87$).

Subjective SES: MacArthur 10-rung ladder scale (Adler et al., 2000).

2.3. Statistical Analysis

SPSS was used for descriptive statistics and independent t-

tests. Network analysis was conducted via JASP 0.16.3 (R-based). EBICglasso regularization (Foygel & Drton, 2010) estimated partial correlations (threshold=0.15). Node centrality (strength, closeness, betweenness) and edge stability were assessed via bootstrapping (95% CI; 1,000 resamples).

3. Results

3.1. Analysis of Online Social Anxiety, Peer Loneliness, Subjective Socioeconomic Status, And Differences in Quasi-Social Relationships Between Men and Women

Females scored higher in online social anxiety subscales ($p<0.05$) and peer loneliness ($p<0.05$), while males scored higher in parasocial relationship dimensions ($p<0.01$; Table 1).

Table 1. Gender Differences in Variables (M \pm SD)

Variable	M \pm SD		t	p
	Male	Female		
Online Social Anxiety (SASSMU)				
Social Recognition Anxiety (SASSMU1)	16.98 \pm 6.71	18.39 \pm 5.69	-2.234	0.026*
Interaction Anxiety (SASSMU2)	12.42 \pm 5.31	13.69 \pm 4.37	-2.562	0.011*
Privacy Anxiety (SASSMU3)	13.95 \pm 6.21	15.46 \pm 5.71	-2.474	0.014*
Peer Loneliness (LERR)	22.46 \pm 8.59	24.38 \pm 7.52	-2.331	0.020*
Parasocial Relationships (PSR)				
Cognitive (PSR1)	1.65 \pm 0.48	1.45 \pm 0.50	4.040	<.001***
Emotional (PSR2)	5.45 \pm 0.98	4.95 \pm 1.20	4.358	<.001***
Behavioral (PSR3)	11.43 \pm 1.40	11.03 \pm 1.52	2.629	0.009**
Subjective Socioeconomic Status (STATUS)	4.35 \pm 1.85	4.50 \pm 1.37	-0.958	0.339

3.2. Network Structure Analysis of Subjective Socioeconomic Status, Online Social Anxiety, Quasi-Social Relations and Peer Loneliness

This study conducted visual estimations of the overall networks, male subgroup networks, and female subgroup networks for online social anxiety, peer loneliness, parasocial relationships, and subjective socioeconomic status among freshmen. In the network structure diagram of the total sample (Figure 1), the networks of subjective socioeconomic status, online social anxiety, parasocial relationships, and peer loneliness are displayed. The results showed that 16 out of 28 edges were non-zero. Within the online social anxiety network, social recognition anxiety (SASSMU1), interaction anxiety (SASSMU2), and privacy anxiety exhibited strong positive edges (weights = 0.34, 0.45, and 0.24, respectively). In the parasocial relationships network, cognitive, emotional, and behavioral dimensions showed strong positive edges (weights = 0.63, 0.39, and 0.30, respectively). Notably, the emotional dimension of parasocial relationships and interaction anxiety (SASSMU2) in online social anxiety displayed a negative edge (weight = -0.03).

After gender stratification, the network structures for males and females are illustrated in Figure 2 and Figure 3, respectively. In the male subgroup network, the emotional dimension of parasocial relationships and interaction anxiety (SASSMU2) maintained a negative edge (weight = -0.03). In the network linking subjective socioeconomic status and

online social anxiety, subjective socioeconomic status showed a negative edge with social recognition anxiety (SASSMU1; weight = -0.06) and peer loneliness (weight = -0.09).

In the female subgroup network, subjective socioeconomic status and peer loneliness exhibited a negative edge (weight = -0.11).

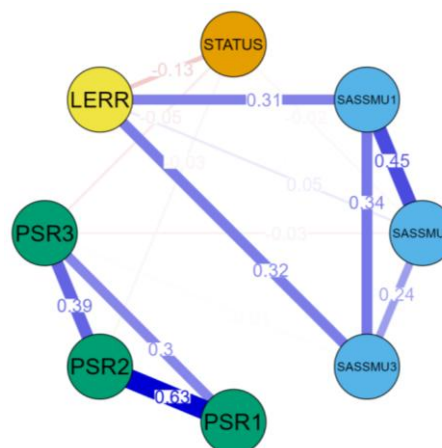


Figure 1. Overall network structure diagram

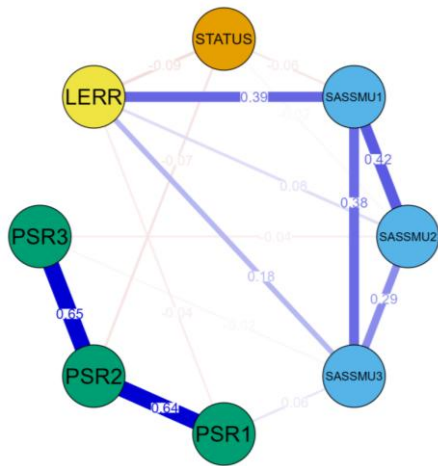


Figure 2. Network structure of male students

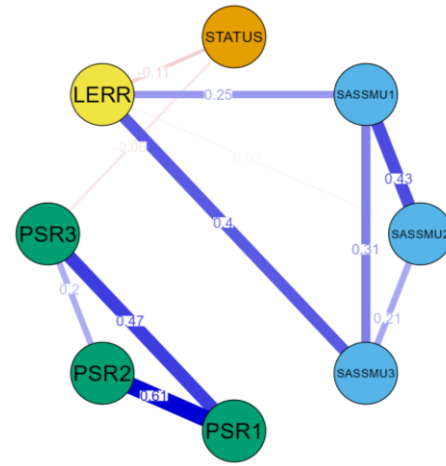


Figure 3. Female network structure diagram

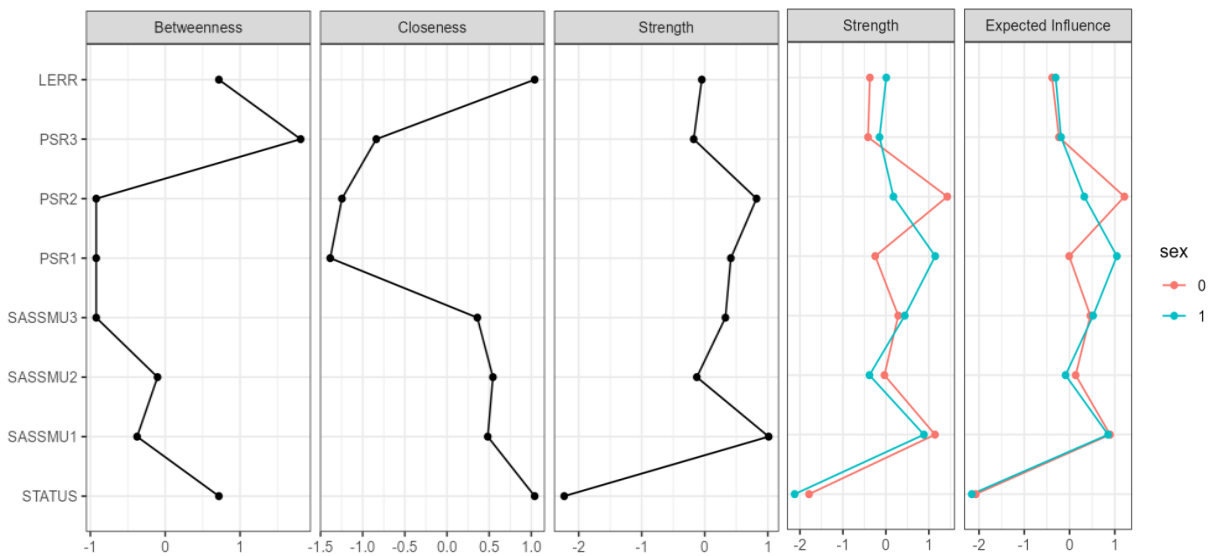


Figure 4. Central analysis

3.3. Centrality Analysis

Figure 4 shows the centrality analysis of central results. In the total sample, "social identification anxiety (SASSMU1)" has the strongest intensity centrality in the network, followed by affective and cognitive aspects in quasi-social relationships. In contrast, the influence of subjective socioeconomic status is the lowest. Additionally, behavioral aspects in quasi-social relationships (PSR3) have the strongest mediating centrality, while peer loneliness and subjective socioeconomic status exhibit the strongest close centrality. After gender grouping, it was found that women have higher intensity centrality in the emotional aspects of quasi-social relationships compared to men, showing stronger intensity centrality. However, in the emotional aspects of quasi-social relationships, men have higher intensity centrality.

4. Discussion

Gender differences revealed that female students generally exhibited higher levels of online social anxiety and peer loneliness, consistent with prior findings that women are more sensitive to social evaluation and prone to negative emotional experiences (Lee et al., 2020). According to Uncertainty Reduction Theory (Berger & Calabrese, 1975), females may face greater uncertainty in online social environments due to their heightened focus on social cues and

relationship maintenance. The absence of such cues in digital interactions likely exacerbates their anxiety. Conversely, males' higher scores across parasocial relationship dimensions suggest a preference for fulfilling social needs through media figures (e.g., influencers, gaming streamers; Horton & Wohl, 1956). This substitutive social interaction may buffer anxiety associated with direct online engagement.

Further network analysis uncovered complex interaction patterns among variables. The centrality of social recognition anxiety indicates that freshmen's core concern in online interactions revolves around how their self-image is perceived and evaluated, validating the pivotal role of "digital self-presentation" in youth social anxiety (Zhao et al., 2021). The negative association between the emotional dimension of parasocial relationships and online interaction anxiety (weight = -0.03) supports the "emotional substitution hypothesis" — emotional bonds with media figures may alleviate stress from real online interactions (Stever, 2017). However, this buffering effect was more pronounced in males (weight = -0.03 vs. non-significant in females).

The negative links between subjective economic status and social anxiety/loneliness (weights = -0.06 to -0.11) align with the resource buffering theory (Hobfoll, 1989), suggesting that economic security reduces vulnerability in social contexts. Notably, this protective effect was stronger for females (loneliness weight = -0.11 vs. males' -0.09), potentially because women are more sensitive to economic pressures

constraining social participation (Ridgeway, 2011).

Centrality analysis highlighted social recognition anxiety as the node with the highest strength centrality, implying that interventions targeting self-presentation skills (e.g., digital literacy training) could yield broad network effects (Morelli et al., 2019). The prominent betweenness centrality of the behavioral dimension of parasocial relationships suggests that regulating interactions with media figures (e.g., moderating screen time) may disrupt negative emotional pathways (Cohen, 2001). Gender-specific centrality patterns call for tailored interventions: females may benefit from enhanced emotional support to improve parasocial relationship quality, while males might gain from transferring parasocial skills to real-world interactions.

This study pioneers the integration of Uncertainty Reduction Theory with network analysis, revealing nuanced dynamic associations among variables and transcending limitations of traditional linear models (Epskamp et al., 2018). Future research should longitudinally track network evolution, particularly during the transition from university adaptation to stability (Wrzus et al., 2022). Additionally, exploring interventions targeting specific nodes (e.g., social recognition anxiety) could clarify their cascading effects on the entire network (Robinaugh et al., 2020). Cross-cultural comparisons may further elucidate universal patterns linking socioeconomic factors to online emotional experiences.

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