



Social Anxiety and Social Networking Service Addiction Proneness in University Students: The Mediating Effects of Experiential Avoidance and Interpersonal Problems

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Objective This study examined the mediating effects of experiential avoidance and interpersonal problems on the relationship between social anxiety and social networking service (SNS) addiction proneness.

Methods An online survey was conducted on 400 university students in their 20s across Republic of Korea. The scales used in the study were the Social Interaction Anxiety Scale (SIAS), Korean Acceptance-Action Questionnaire-II (K-AAQ-II), Short form of the Korean Inventory of Interpersonal Problems Circumplex Scale (KIIP-SC), and SNS addiction proneness scale for university students. For data analysis, structural equation modeling was conducted, and phantom variables were used to verify the significance of individual indirect effects of the multiple mediation model.

Results Social anxiety had no direct effect on SNS addiction proneness. Experiential avoidance and interpersonal problems completely mediate the relationship between social anxiety and SNS addiction proneness sequentially.

Conclusion Our result suggests that experiential avoidance leads to interpersonal problems and SNS addiction proneness. In other words, it is important to alleviate experiential avoidance in treating or preventing interpersonal problems and SNS addiction proneness among university students with social anxiety.

Psychiatry Investig 2022;19(6):462-469

Keywords Social anxiety; Social networking; Mediating; Universities.

INTRODUCTION

Social networking service (SNS) refers to an online service established for the purpose of sharing specific interests or activities by forming social relationships based on a wide human network online.¹ The use of SNS is rapidly increasing among all generations, and the use rate of university students (95.9%) is the highest.² The university student period emphasizes social relationships and has the developmental task of forming close interpersonal relationships.³ The active use of SNS by university students can be understood as a natural phenomenon in that the use of SNS can help form close inter-

personal relationships.⁴ Although the use of SNS provides convenience to people, there are also dysfunctional aspects. As the use of SNS gradually rises, the problem of SNS addiction also increases.⁵ Currently, at a time when the concept of SNS addiction has not been clearly established,⁶ Jung and Kim⁷ proposed the term 'SNS addiction proneness' to indicate that excessive preoccupation with online interpersonal relationships causes tolerance and withdrawal, and interferes with daily life.

In previous studies, SNS addiction proneness was explained by focusing on psychological factors such as social anxiety, depression, and loneliness.^{8,9} However, it is not clear how psychological factors lead to SNS addiction proneness. Shaffer et al.¹⁰ explained the process of initiation and change in addiction with the addiction syndrome model. The theory explains the addiction process from a comprehensive perspective by elucidating the interaction between distal antecedent factors (e.g., psychosocial factors, underlying vulnerability factors) and proximal antecedent factors (e.g., negative events) that affect the development of addiction.¹⁰

Received: September 5, 2021 **Revised:** February 9, 2022

Accepted: March 30, 2022

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According to the addiction syndrome model, psychosocial factors are essential for explaining addiction behavior.¹⁰ Psychosocial factors include psychopathology, such as anxiety. In this study, social anxiety was noted as a psychosocial factor that refers to a marked and persistent fear of being exposed, observed, and evaluated by strangers in social situations, and fear of showing shameful and embarrassing behavior that may result in a negative evaluation in these situations.¹¹ University students are more likely to experience social anxiety than other age groups,¹² and university students with social anxiety avoid interpersonal contact due to fear of negative evaluation despite the desire for social interaction.^{13,14} In SNS, threatening stimuli that cause anxiety, such as visual and verbal reactions of others, are very limited.¹⁵ Therefore, people with social anxiety can show themselves more easily on SNS.¹⁶ In actual face-to-face interaction situations, people with social anxiety predict that they will be negatively evaluated and rejected by others, so they can immerse themselves in social media to avoid these situations.¹⁷ Previous studies have shown that social anxiety has a positive effect on SNS addiction proneness.¹⁸⁻²⁰

In the addiction syndrome model, it is assumed that the underlying vulnerability factors for substance and behavioral addiction are the same.¹⁰ In this study, experiential avoidance was selected as the underlying vulnerability factor that induces SNS addiction proneness. Experiential avoidance refers to the process of excessive negative evaluation of unwanted physical sensations, emotions, thoughts, and memories that cause psychological distress and try to control or avoid them.²¹ Previous studies have reported that experiential avoidance plays a key role in generating and maintaining addiction as a psychological vulnerability factor.²²⁻²⁵ Hormes et al.²⁶ reported that people with high experiential avoidance use SNS to disperse and alleviate negative thoughts or emotions such as anxiety, sadness, or loneliness. Previous studies have found that experiential avoidance is positively related to SNS addiction proneness.²⁷⁻²⁹

Experiential avoidance attitude is one of the core clinical characteristics of the diagnostic criteria for social anxiety disorder.¹¹ People with social anxiety negatively evaluate situations in which they interact with others and try to avoid these social situations or reduce anxiety through attention diversion.^{30,31} This means that higher social anxiety can lead to experiential avoidance.³² In fact, in previous studies, social anxiety positively predicted experiential avoidance.³³⁻³⁵

In the addiction syndrome model, proximal antecedent factors related to distal antecedent factors of addiction influence the development of addiction.¹⁰ In this study, interpersonal problems were selected as the proximal antecedent factors. Interpersonal problems mean experiencing difficulties

in forming and maintaining positive interpersonal relationships.³⁶ Interpersonal problems, which are negative events, are closely related to social anxiety, which is a distal antecedent factor of addiction. People with social anxiety have a fear of negative evaluations and are more likely to have difficulties interacting with others.³⁷ Wenzel³⁸ stated that people with social anxiety have low emotional and social intimacy with others and experience interpersonal problems. Previous studies have also shown that social anxiety positively predicts interpersonal problems.^{39,40} As such, people who experience interpersonal problems do not get satisfaction from interpersonal relationships, so they can explore and immerse themselves in behaviors that can satisfy their interpersonal needs.⁴¹

According to the social compensation hypothesis that explains the SNS addiction proneness, individuals who have difficulties in forming interpersonal relationships or experience a lot of interpersonal problems become more engrossed in compensatory SNS activities.⁴² SNS fulfills the basic human desire for belonging and connectivity by activating interpersonal interactions that appear online.⁴³ Therefore, people who experience interpersonal problems may view SNS as a functional alternative for interpersonal relationship formation and can use it excessively.⁴⁴ In fact, in previous studies, interpersonal problems were positively associated with SNS addiction proneness.^{4,39,45}

The addiction syndrome model explains that the interaction of distal antecedent factors and proximal antecedent factors can influence the development of addiction.¹⁰ Based on this model, social anxiety, which is a psychosocial factor, can influence SNS addiction proneness through experiential avoidance, which is an underlying vulnerability factor, and interpersonal problems, which are proximal antecedent factors. Unlike the simple mediation model, the multiple mediation model can simultaneously identify multiple mechanisms ranging from independent variables to dependent variables,⁴⁶ which can provide a deeper insight into how social anxiety influences SNS addiction proneness.

In addition, in previous studies, experiential avoidance was found to be an important risk factor for interpersonal problems.^{47,48} People with experiential avoidance do not have the opportunity to establish and maintain interpersonal relationships or experience meaningful relationships, so it is difficult to experience close interpersonal relationships.⁴⁹ In other words, avoiding interpersonal situations through experiential avoidance can temporarily reduce anxiety and tension, but such avoidant attitudes can lead to disconnection or conflict in interpersonal relationships, leading to maladaptive interpersonal relationships.³² Based on these previous studies, it can be predicted that the relationship between social anxiety and SNS addiction proneness can be sequentially mediat-

ed by experiential avoidance and interpersonal problems.

Existing studies have mainly focused on the direct relationship between social anxiety and SNS addiction proneness, and therefore have limitations in explaining the specific mechanism by which SNS addiction proneness occurs. Therefore, in this study, we try to explain the detailed mechanism by which social anxiety influences SNS addiction proneness. The hypotheses of this study are as follows (Figure 1).

Hypothesis 1. Social anxiety is positively related to SNS addiction proneness.

Hypothesis 2. Experiential avoidance mediates the relationship between social anxiety and SNS addiction proneness.

Hypothesis 3. Interpersonal problems mediate the relationship between social anxiety and SNS addiction proneness.

Hypothesis 4. Experiential avoidance and interpersonal relationship problems sequentially mediate the relationship between social anxiety and SNS addiction proneness.

METHODS

Participants

With the approval of the Institutional Review Board of Dankook University, an online self-report questionnaire (Google questionnaire form) was administered to university students in their 20s in Seoul, Gyeonggi-do, Chungcheong-do, and other regions. A total of 400 people agreed to participate in the study, and a prescribed mobile gift card was provided. Of these, 377 questionnaires were used for the final analysis, excluding 23 who did not use SNS or gave insincere responses. Among 377 patients, 169 (44.8%) were male and 208 (55.2%) were female.

In the distribution by age, 211 (56%) were aged 19 to 22, 142 (37.6%) were aged 23 to 26, and 24 (6.4%) were aged 27 to 29, with an average age of 22.42 (standard deviation=2.35). The distribution by grade was 66 freshmen (17.5%), 107 sophomores (28.4%), 90 juniors (23.9%), and 114 seniors (30.2%). Demographic characteristics of the participants are presented in Table 1.

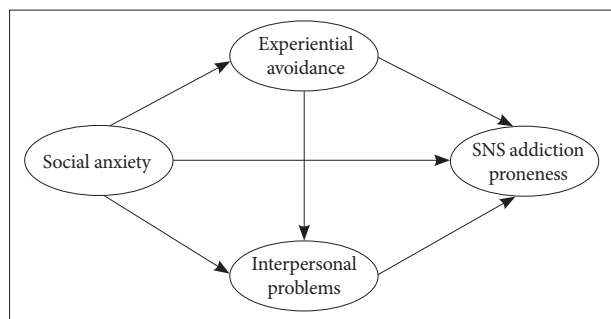


Figure 1. Research model. SNS, social networking service.

Measurements

Social anxiety

Social anxiety was measured using the Social Interaction Anxiety Scale (SIAS) developed by Mattick and Clarke⁵⁰ and translated into Korean and validated by Kim.⁵¹ This scale consists of 19 items (e.g., “I am worried about expressing myself

Table 1. Demographic characteristic of the participants (N=377)

Variables	Values
Sex	
Male	169 (44.8)
Female	208 (55.2)
Grade	
Freshman	66 (17.5)
Sophomore	107 (28.4)
Junior	90 (23.9)
Senior	114 (30.2)
Age (yr)	
19–22	211 (56)
23–26	142 (37.6)
27–29	24 (6.4)
Most popular SNS platforms*	
Instagram	339 (53.7)
Facebook	169 (26.8)
Twitter	71 (11.3)
Naver Band	26 (4.1)
Kakao Story	17 (2.7)
SNS usage period	
<1 mon	4 (1.1)
<6 mon	20 (5.3)
6 mon ≥, <1 yr	39 (10.3)
1 yr ≥, <2 yr	27 (7.2)
2 yr ≥	287 (76.1)
Daily SNS usage hours	
< 1 hr	79 (21)
1 hr ≥, <2 hr	125 (33.1)
2 hr ≥, <3 hr	85 (22.6)
3 hr ≥, <4 hr	55 (14.5)
4 hr ≥	33 (8.8)
SNS usage frequency	
1–2 times a week	41 (10.9)
3–4 times a week	9 (2.4)
1–2 times a day	31 (8.2)
3–4 times a day	91 (24.1)
5 or more times a day	205 (54.4)

Values are presented as N (%). *duplicate responses were allowed. SNS, social networking service

because I might look weird,” “I’m often worried because I don’t know what to say in social situations”), and each item is rated on a 5-point Likert scale ranging from ‘strongly disagree’ (1 point) to ‘strongly agree’ (5 points). The higher the score, the higher the level of anxiety experienced in social interactions. In the study of Kim,⁵¹ Cronbach’s α was 0.92, and in this study, Cronbach’s α was 0.93.

Experiential avoidance

Experiential avoidance was measured using the Korean Acceptance-Action Questionnaire-II (K-AAQ-II), originally developed by Bond et al.⁵² and translated into Korean and validated by Heo et al.⁵³ This scale consists of 8 items (e.g., “I’m afraid to feel my emotions,” “Emotions cause problems in my daily life”), and each item is rated on a 7-point Likert scale ranging from ‘strongly disagree’ (1 point) to ‘strongly agree’ (7 points). A higher score indicates a higher level of experiential avoidance. In the study of Heo et al.,⁵³ Cronbach’s α was 0.85, and in this study, Cronbach’s α was 0.90.

Interpersonal problems

Interpersonal problems were measured using the Short form of the Korean Inventory of Interpersonal Problems Circumplex Scale (KIIP-SC), which was developed by Horowitz et al.⁵⁴ and reconstructed by Alden et al.⁵⁵ and standardized by Hong et al.⁵⁶ This scale consists of eight sub-factors: exploitable (e.g., “It’s hard to make my argument because I’m afraid of hurting other people’s feelings”), nonassertive (e.g., “It’s hard to make my argument”), overly nurturant (e.g., “Trying too hard not to disappoint others”), domineering (e.g., “Oftentimes, there are conflicts with others due to arbitrary judgment and decision-making”), vindictive (e.g., “Difficulty supporting the argument of others”), intrusive (e.g., “Watching what others are doing makes me want to meddle”), cold (e.g., “Difficulty feeling close to others”), and socially avoidant (e.g., “Difficulty getting along with people”). This scale consists of 40 items, and each item is rated on a 5-point Likert scale ranging from ‘strongly disagree’ (1 point) to ‘strongly agree’ (5 points). Higher scores indicated more difficulties in interpersonal relationships. In this study, Horney’s⁵⁷ theory was applied, and interpersonal problems were divided into three areas. The first area, “moving toward people,” includes nonassertive, exploitable, and overly nurturant. The second area, “Moving against people,” includes domineering, vindictive, and intrusive. Finally, the third area, “Moving away from people,” includes cold and socially avoidant. In the study of Hong et al.,⁵⁶ Cronbach’s α was 0.89, and in this study, Cronbach’s α was 0.96.

SNS addiction proneness

SNS addiction proneness was measured using the SNS ad-

diction proneness scale for university students developed and validated by Jung and Kim.⁷ The SNS addiction proneness scale for university students consists of four sub-factors: control failure and disturbance of adaptive life (e.g., “I have regretted not being able to reduce my SNS usage time”), preoccupation and tolerance (e.g., “I feel more and more urges to use SNS”), avoidance of negative emotions (e.g., “I use SNS to make me feel good”), and virtual life orientation and withdrawal (e.g., “When I can’t use SNS, I get annoyed”). This scale consists of 24 items, and each item is rated on a 5-point Likert scale ranging from ‘strongly disagree’ (1 point) to ‘strongly agree’ (5 points). The higher the score, the higher the SNS addiction proneness. In the study of Jung and Kim,⁷ Cronbach’s α was 0.92, and in this study, Cronbach’s α was 0.95.

Data analysis

In this study, the Korean version of IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA), and AMOS 22.0 (IBM Corp., Armonk, NY, USA), were used for data analysis. First, a Pearson correlation analysis was conducted to verify the correlation between social anxiety, experiential avoidance, interpersonal problems, and SNS addiction proneness. Skewness and kurtosis were checked to verify whether the multivariate normality assumption was satisfied. Second, according to the two-step analysis method of Anderson and Gerbing,⁵⁸ the measurement model was verified in the first step, and the structural model was verified in the second step. Specifically, we verified whether the measurement model was suitable through confirmatory factor analysis. Next, to evaluate the fit of the model, χ^2 (CMIN) and Root Mean Square Error of Approximation (RMSEA), which are absolute fit indices, and the comparative fit index (CFI) and Tucker-Lewis index (TLI), which are incremental fit indices, were used. Although the χ^2 value is a representative fit index, it is sensitive to the sample size;⁵⁹ thus, by examining TLI and RMSEA considering the simplicity of the model and CFI, which is least affected by the sample size, we evaluated the model fit.⁶⁰ In general, RMSEA is evaluated as excellent if it is less than 0.05, good if it is 0.08 or less, and average if it is 0.10.⁶¹ In the case of CFI and TLI, a value of 0.9 or more is considered a good level, and a value of 0.95 is evaluated as excellent.⁶² Finally, to verify the significance of individual indirect effects of the multiple mediation model, phantom variables were created, and bootstrapping was performed.⁶³

RESULTS

Correlation analysis

Table 2 presents the descriptive statistics and correlations of study variables. For all variables, the absolute value of skew-

ness did not exceed 2, and the absolute value of kurtosis did not exceed 7, so the multivariate normality assumption was satisfied.⁶⁴ Therefore, it is possible to verify the structural equation model. Correlation analysis showed that social anxiety was positively correlated with experiential avoidance ($r=0.764$, $p<0.01$), interpersonal problems ($r=0.813$, $p<0.01$), and SNS addiction proneness ($r=0.771$, $p<0.01$). Experiential avoidance was positively correlated with interpersonal problems ($r=0.797$, $p<0.01$) and SNS addiction proneness ($r=0.808$, $p<0.01$). Lastly, interpersonal problems were positively correlated with SNS addiction proneness ($r=0.794$, $p<0.01$).

Examination of the measurement model

The fit index of the measurement model was $\chi^2=102.277$, degrees of freedom (df)=57, CFI=0.991, TLI=0.988, RMSEA=0.046 (90% CI=0.031–0.060). The value of χ^2 was rejected ($p<0.05$), but CFI, TLI, and RMSEA all showed excellent levels, indicating that the model fit for the model was acceptable. The factor loadings of the measured variables for each latent variable were statistically significant ($p<0.001$) as follows: social anxiety was 0.90–0.91, experiential avoidance 0.84–0.91, interpersonal problems 0.79–0.91, and SNS addiction proneness 0.86–0.92. Therefore, it is judged that the measurement variables measure the relevant latent variables well.

Examination of the structural model

The value of χ^2 was rejected ($p<0.05$), but CFI, TLI, and RMSEA all showed excellent levels, indicating that the model fit for the model was acceptable (Table 3). Regarding the pathways between variables, social anxiety was positively related

to experiential avoidance ($\beta=0.83$, $p<0.001$) and interpersonal problems ($\beta=0.61$, $p<0.001$), but was not significantly related to SNS addiction proneness. Experiential avoidance was positively related to interpersonal problems ($\beta=0.38$, $p<0.001$) and SNS addiction proneness ($\beta=0.48$, $p<0.001$). Finally, interpersonal problems were positively related to SNS addiction proneness ($\beta=0.35$, $p<0.05$) (Figure 2).

Testing for mediating effect verification

In this study, a bootstrapping technique using a virtual phantom variable was used to test the individual and sequential mediating effects of experiential avoidance and interpersonal problems. For bootstrapping, 5,000 samples were resampled, and the mediating effects were verified at a 95% confidence interval. Table 4 showed that the indirect effect ($\beta=0.464$, $p<0.01$) of social anxiety on SNS addiction proneness through experiential avoidance was found to be statistically significant, with a 95% confidence interval of 0.269–0.686. Next, the indirect effect ($\beta=0.248$, $p<0.05$) of social anxiety on SNS addiction proneness through interpersonal problems was found to be

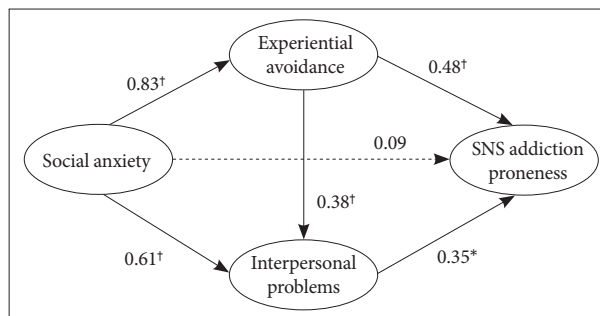


Figure 2. Path analysis of social anxiety, experiential avoidance, interpersonal problems, and SNS addiction proneness among university students ($N=377$). * $p<0.05$; † $p<0.01$. SNS, social networking service.

Table 2. Descriptive statistics and correlations of latent variables ($N=377$)

	1	2	3	4
Social anxiety	1			
Experiential avoidance	0.764*	1		
Interpersonal problems	0.813*	0.797*	1	
SNS addiction proneness	0.771*	0.808*	0.794*	1
Mean	2.74	3.60	2.56	2.72
Standard deviation	0.78	1.29	0.75	0.88
Skewness	-0.058	-0.062	-0.086	-0.282
Kurtosis	-0.503	-0.980	-0.740	-0.961

* $p<0.01$. SNS, social networking service

Table 3. Fit index of hypothetical model

	χ^2	df	CFI	TLI	RMSEA (90% CI)
Hypothetical model	94.388	56	0.992	0.989	0.043 (0.027–0.057)

df, degrees of freedom; CFI, comparative fit index; TLI, Tucker-Lewis index; RMSEA, Root Mean Square Error of Approximation; CI, confidence interval

Table 4. Specific mediating effects on SNS addiction proneness

Path	β	SE	95% CI	
			Lower	Upper
SA → EA → SAP	0.464†	0.105	0.269	0.686
SA → IP → SAP	0.248*	0.129	0.028	0.524
SA → EA → IP → SAP	0.127*	0.064	0.015	0.267

* $p<0.05$; † $p<0.01$. SNS, social networking service; SE, standard error; CI, confidence interval; SA, social anxiety; EA, experiential avoidance; SAP, SNS addiction proneness; IP, interpersonal problems

statistically significant, and the 95% confidence interval of this value was 0.028–0.524. Finally, the indirect effect ($\beta=0.127$, $p<0.05$) of social anxiety on SNS addiction proneness by sequentially mediating experiential avoidance and interpersonal problems was found to be statistically significant, with a 95% confidence interval of 0.015 to 0.267. Since 0 was not included in all confidence intervals of the three paths, the indirect effects of the three paths were statistically significant.

DISCUSSION

The purpose of this study was to verify whether experiential avoidance and interpersonal problems sequentially exert a mediating effect on the relationship between social anxiety and SNS addiction proneness. The main results of this study are as follows: First, it was found that social anxiety had no direct effect on SNS addiction proneness. This is in contrast to studies that show that social anxiety is directly related to SNS addiction proneness.¹⁸⁻²⁰ However, this result is consistent with studies reporting that social anxiety does not have a significant effect on SNS addiction proneness.^{65,66} These results suggest that it is necessary to pay attention to the role of mediating variables acting between two variables rather than social anxiety itself in inducing SNS addiction proneness.

Second, it was found that experiential avoidance fully mediated the relationship between social anxiety and SNS addiction proneness. These results are consistent with previous studies³³⁻³⁵ that social anxiety has a positive impact on experiential avoidance, and previous studies have shown that experiential avoidance has a positive influence on SNS addiction proneness.²⁷⁻²⁹ People with social anxiety negatively evaluate situations in which they interact with others and try to avoid these social situations or reduce anxiety through attention diversion.^{30,31} In other words, the greater the anxiety or fear of social interaction, the greater the desire to avoid the experience related to it, and this means that such avoidance behavior can induce SNS addiction proneness.

Third, it was found that interpersonal problems fully mediate the relationship between social anxiety and SNS addiction proneness. This supports the findings of a previous study³⁹ that interpersonal problems mediate the relationship between social anxiety and SNS addiction proneness. People with social anxiety are more likely to experience interpersonal problems³⁷ and people who experience interpersonal problems search for and immerse themselves in alternative behaviors that can satisfy their interpersonal needs.⁴¹ According to the social compensation hypothesis, individuals who have difficulties in interpersonal relationships become more engaged in SNS activities to receive compensation.⁴²

Finally, it was found that experiential avoidance and inter-

personal problems completely mediate the relationship between social anxiety and SNS addiction proneness sequentially. Individuals with social anxiety have a negative interpretation bias, which negatively interprets social situations.⁶⁷ As a result, most social situations are perceived as threatening, and they try to reduce their anxiety through avoidance responses.³² However, repeated experiential avoidance leads to maladaptive interpersonal relationships and eventually leads to interpersonal problems.^{47,48} People who suffer from these interpersonal problems do not get satisfaction from interpersonal relationships, so they can focus on using SNS as an alternative action that can satisfy their interpersonal needs.⁴¹

The contributions and implications of this study are as follows. First, this study is meaningful in that it verified the specific process of SNS addiction proneness based on the addiction syndrome model. Existing studies have a limitation in that they only focused on the relationship between psychological factors and SNS addiction proneness but did not provide a specific process for SNS addiction proneness. In other words, there are many preceding studies examining the direct relationship between social anxiety and SNS addiction proneness, but the explanation of how social anxiety leads to SNS addiction proneness was not clear. This study is meaningful in that based on the addiction syndrome model, social anxiety, experiential avoidance, and interpersonal problems were selected as major variables explaining SNS addiction proneness and comprehensively explained the path of SNS addiction proneness. Second, in this study, it was found that the effect of social anxiety on SNS addiction proneness was completely mediated by experiential avoidance or completely mediated by experiential avoidance and interpersonal problems sequentially. The results of this study suggest that clinicians need to primarily consider clients' social anxiety, experiential avoidance, and interpersonal problems in solving the problem of SNS addiction. In other words, clinicians need to help clients reduce their avoidance attitudes and interpersonal problems by lowering social anxiety in order to prevent negative consequences from excessive use of SNS.

The limitations of this study and suggestions for future research are as follows. First, since the study participants were limited to university students in their 20s, there is a limit to generalizing the results of this study to all age groups. Therefore, in future studies, it is necessary to validate the model proposed in this study for various age groups. Second, in this study, based on the addiction syndrome model, we tried to understand the addiction process by focusing on the psychosocial factors, underlying vulnerability factors, and proximal antecedent factors. However, the addiction syndrome model assumes that in addition to psychosocial factors, neurobiological factors influence addiction. Therefore, in future studies, it

is necessary to develop a model that comprehensively considers neurobiological and psychosocial factors in relation to SNS addiction proneness. Third, since this study used a cross-sectional design, there is a limit to the assumption of causal relationships between variables. Therefore, in future studies, it will be necessary to revalidate the model of this study through a longitudinal design.

Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

Author Contributions

Conceptualization: Sung-Su Kim, Sung-Man Bae. Data curation: Sung-Su Kim, Sung-Man Bae. Formal analysis: Sung-Su Kim. Investigation: Sung-Su Kim. Methodology: Sung-Su Kim, Sung-Man Bae. Supervision: Sung-Man Bae. Validation: Sung-Su Kim. Writing—Original Draft: Sung-Su Kim. Writing—Review & Editing: Sung-Man Bae.

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Funding Statement

None

Acknowledgments

We would like to thank Editage (www.editage.co.kr) for English language editing.

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