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Problematic Phone Use as an Emerging Risk to the Comorbidity of Social Anxiety and  
Depression

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### **Abstract**

The co-occurrence of social anxiety disorder and major depressive disorder is among the most prevalent of all mental health comorbidities. Social Anxiety has many negative effects on a person's life, including impaired functioning in a relationship or occupation. Depression greatly affects individuals, making people feel low self-esteem among peers and feelings of isolation. Developmental theories have begun to recognize that disengagement from social interaction is a common feature of SAD and MDD and may play an important role in SAD/MDD comorbidity. Problematic phone use is an emerging risk factor for the comorbidity of social anxiety and depression. High social media and mobile gaming use has been correlated with social anxiety and depression in individuals. The purpose of this study was to address problematic phone use, specifically excessive use of social media and mobile gaming, as a major risk factor for the comorbidity of social anxiety and depression. It was hypothesized that Time 1 problematic social media use and mobile gaming will moderate the association of Time 2 social anxiety symptoms with time 2 depression symptoms, such that the association is stronger at higher levels of problematic phone use. Zero-order correlations were computed. Multiple regression was used to investigate the relationship between social anxiety and depression and whether this relationship is dependent on problematic social media or mobile gaming use. This study concluded that the relationship between social anxiety and depression was not dependent on problematic mobile gaming but was dependent on problematic social media use. The comorbidity of social anxiety and depression is dependent on the interaction of social anxiety and social media use. The association between social anxiety and depression weakened as a function of social media use, and the association was not significant if SMAQ scores were 36 or higher.

### **Problematic Phone Use as an Emerging Risk to the Comorbidity of Social Anxiety and Depression**

The co-occurrence of social anxiety disorder and major depressive disorder is among the most prevalent of all mental health comorbidities (Chen & Yu, 2019). Social anxiety (SAD) is defined as the persistent fear of one or more social situations where the person is exposed to unfamiliar people or to possible criticism by others. The person fears that they will act in a way that will be embarrassing (APA, 2022). As one of the most common psychiatric disorders, SAD affects around 12.1% of US adults at some point in their life, and in the past year 7.1% of adults were diagnosed with social anxiety disorder (NIH, 2022). Social Anxiety has many negative effects on a person's life, including impaired functioning in a relationship or occupation (Chen & Yu, 2019). Depressed individuals often have social anxiety due to being hypersensitive in social environments and feeling threatened by social interactions (Chen & Yu, 2019). Major depressive disorder (MDD) is defined as experiencing a period of two weeks or more in which depressed mood and/or anhedonia is present most of the day, nearly every day (APA, 2022). Around 21 million adults, or 8.4% of the US population, have had at least one major depressive episode (NIH, 2022). Depression greatly affects individuals, making people feel low self-esteem among peers and feelings of isolation (Chen & Yu, 2019). Not only do social anxiety and depression greatly affect individuals, but they affect society as a whole. Depression and social anxiety are correlated with daily functional limitations and high societal costs, such as direct medical costs (Greenberg & Fournier, 2015). Depression is very costly, and the prevalence of major depressive disorder has increased by 21.5% between 2005 and 2010 (Greenberg & Fournier, 2015). Higher severity of depression and social anxiety is linked to higher rates of direct medical costs, which suggests how expensive mood disorders can be to the individual and

to society (Greenberg & Fournier, 2015). Since social anxiety and depression disorders affect many people, there is a need to understand risk factors for social anxiety and depression comorbidity.

SAD and MDD are both associated with avoidance of in-person social interactions. In the case of MDD, Lewinsohn's (1974) behavioral theory proposes that depression is associated with a reduction in the reinforcement of social interactions and other adaptive behaviors, leading to a reduction in engagement in social and other adaptive behaviors. In the case of SAD, Heimberg and colleagues (2014) propose that socially anxious individuals avoid social situations due to a fear of negative evaluation. Developmental theories have begun to recognize that disengagement from social interaction is a common feature of SAD and MDD and may play an important role in SAD/MDD comorbidity. Thus, there is a need to understand factors that perpetuate disengagement from social interaction because they may serve as risk factors of SAD/MDD comorbidity (Langer & Rodebaugh, 2014; Richey et al., 2019). Problematic phone use is one example of a potential risk factor.

Problematic phone use is an emerging risk factor for the comorbidity of social anxiety and depression. There are higher rates of problematic phone use among those with social anxiety and depression than those without it (Wang & Sheng, 2019). Desire for social approval, common among socially anxious persons, is associated with excessive cell phone use (Gutierrez & Fonseca, 2016). Problematic phone use can occur across a variety of applications, such as social media and mobile games. Social anxiety and depression are associated with avoidance of social interactions, and social media can be a less threatening platform for social encounters (Chen & Yu, 2019), potentially leading to fewer in-person social activity. Social media is an outlet for these individuals to receive reassurance and quickly enhance their self-esteem. The excessive

use of social media to enhance mood is related to less real-life social interaction, which increases the risk for social anxiety and depression (Chen & Yu, 2019). Mobile-gaming can be a temporary escape for those with depression and social anxiety, but it is associated with increased loneliness and social deficiencies (Wang & Sheng, 2019). Excessive mobile gaming is related to increasing depression and social anxiety, and it causes individuals to have trouble with real life situations or relationships (Wang & Sheng, 2019). Overall, research supports problematic use of social media and mobile gaming apps as potentially increasing risk for SAD and MDD. However, no study has yet used longitudinal design to examine whether the association of SAD and MDD symptoms depends on earlier problematic social media and mobile gaming use.

The purpose of this study was to address problematic phone use, specifically excessive use of social media and mobile gaming, as a major risk factor for the comorbidity of social anxiety and depression. The hypothesis is based on theories that place social withdrawal as a key risk factor for SAD and MDD, and it is based on prior studies finding an association of problematic social media and mobile gaming with SAD and MDD symptoms. It was hypothesized that Time 1 problematic social media use and mobile gaming will moderate the association of Time 2 social anxiety symptoms with time 2 depression symptoms, such that the association is stronger at higher levels of problematic phone use.

## **Methods**

### *Participants*

There were 79 participants used in this study, and they were all undergraduate students enrolled in general psychology at the University of Arkansas for course credit. There were 65 women (82.3%) and 14 men (17.7%). Participant age ranged from 18 to 29 ( $M = 19.10$ ,  $SD = 1.61$ ). Racial Identity of the sample included 66 identifying as White (83.5%), 8 as Hispanic

(10.1%), 7 as Latino (8.9%), 5 as Asian (6.3%), 3 as Black or African American (3%), 2 as American Indian or Alaska Native (2.5%), and 4 identified as another race (5.1%). All participants were volunteers and took part in a series of surveys online. The questionnaires were administered by Qualtrics (Qualtrics, Provo, UT).

### *Procedure*

The measures were administered using Qualtrics (Qualtrics, Provo, UT). The participants filled out the questionnaire online on their own device after reading an Informed Consent document and agreeing to the study. This study consisted of a baseline survey, a survey at Time 1, and a survey at Time 2. The baseline survey consisted of demographic questions about the participant. The surveys for time 1 and 2 were identical and include questions regarding problematic phone use, social anxiety, and depression. Forty-eight hours after completing the baseline survey, participants received the Time 1 survey and they had 24 hours to complete it after receiving the survey link. Participants received the Time 2 survey two weeks after completing the Time 1 survey, and they had to complete it in 24 hours after receiving the survey link.

### *Measures*

**Social Media Addiction Questionnaire (SMAQ; Hawi & Samaha, 2017).** The SMAQ measures how dependent participants are on social media and how distressing social media addiction or problematic use can be (see Appendix. Figure 1; Hawi & Samaha, 2017). The SMAQ is reported on a 7-point Likert-type scale, and ranges from strongly disagree to strongly agree (Hawi & Samaha, 2017). Respondents answer the questions based on their relationship with online social media and how much it affects their daily life. The questionnaire asks participants how often they think about social media and if not being on social media causes

distress (Hawi & Samaha, 2017). The SMAQ showed high internal consistency,  $\alpha = .85$  (Hawi & Samaha, 2017). In this study, the SMAQ showed high internal consistency,  $\alpha = .88$ .

**Problematic Mobile Gaming Questionnaire (PMGQ; Pan et al., 2019).** The PMGQ measures how much participants use their cell phone to play games and how addictive it can be (see Appendix. Figure 2). The PMGQ is a 4- point Likert- type scale and asks participants to rate items from strongly disagree to strongly agree (Pan & Chiu, 2019). Some questions from the PMGQ ask respondents if they experience physical distress from gaming for a long time, or if they feel distressed when they are not playing mobile games (Pan & Chiu, 2019). The PMGQ has had high internal consistency with  $\alpha = .92$  (Pan & Chiu, 2019). In this study, the PMGQ had high internal consistency with  $\alpha = .88$ .

**Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998).** The 17- item SIAS measures social interaction anxiety and was derived from social anxiety inventories and fear surveys (Rodebaugh & Woods, 2007). The 17- item version omits the three reverse- scored items, and was derived from the original 20- item measure (Mattick & Clarke, 1998). It consists of a 5- point scale, and participants rate themselves by choosing from “not at all” to “extremely” (Mattick & Clarke, 1998). Questions asked if the respondent was afraid to speak in front of certain people or if they had feelings of nervousness or distress in social interactions (Mattick & Clarke, 1998). High scores indicated greater fears of social encounters (Mattick & Clarke, 1998). The SIAS has good reliability,  $\alpha = .94$  (Mattick & Clarke, 1998). In this study, the SIAS had acceptable internal consistency,  $\alpha = .78$ .

**Patient Health Questionnaire (PHQ-9; Kroenke & Spitzer, 2001).** The 9- item PHQ-9 measures depression symptoms over the last two weeks (see Appendix. Figure 4) (Kroenke & Spitzer, 2001). The PHQ-9 has participants choose from 4 response options, ranging from “not at



all” to “nearly every day” (Kroenke & Spitzer, 2001). Respondents choose from questions like, “Feeling down, depressed, or hopeless” or, “Little interest or pleasure in doing things” (Kroenke & Spitzer, 2001). Major depression is diagnosed if respondents meet 5 or more depression symptom criteria for “more than half of the days” for the last 2 weeks (Kroenke & Spitzer, 2001). The PHQ-9 has shown good internal consistency in previous studies,  $\alpha = .89$  (Kroenke & Spitzer, 2001). In this study the PHQ-9 had high internal consistency with  $\alpha = .85$ .

### *Analytic Plan*

Zero-order correlations were computed. Multiple regression was used to investigate the relationship between social anxiety and depression and whether this relationship is dependent on problematic social media or mobile gaming use. It was planned to follow up significant interactions with Johnson-Neyman analyses.

## **Results**

### **Correlations**

Zero-order correlations (see Table 1) showed that Time 2 social anxiety was positively correlated with depression. T1 social media use was positively correlated with Time 2 social anxiety and marginally correlated with depression. Time 1 problematic mobile gaming was positively correlated with depression, but not with social anxiety.

Table 1. Descriptive Statistics and Correlations of Study Variables.

	T2 SIAS	T1 SMAQ	T1 PMGQ	T2 PHQ-9
T2 SIAS	--			
T1 SMAQ	.25*	--		
T1 PMGQ	.09	.36**	--	
T2 PHQ-9	.27*	.21	.26*	--
Mean	6.84	31.52	24.25	7.35
SD	5.03	10.06	11.23	5.51

Note. \*\*  $p < .01$ , \*  $p < .05$ .

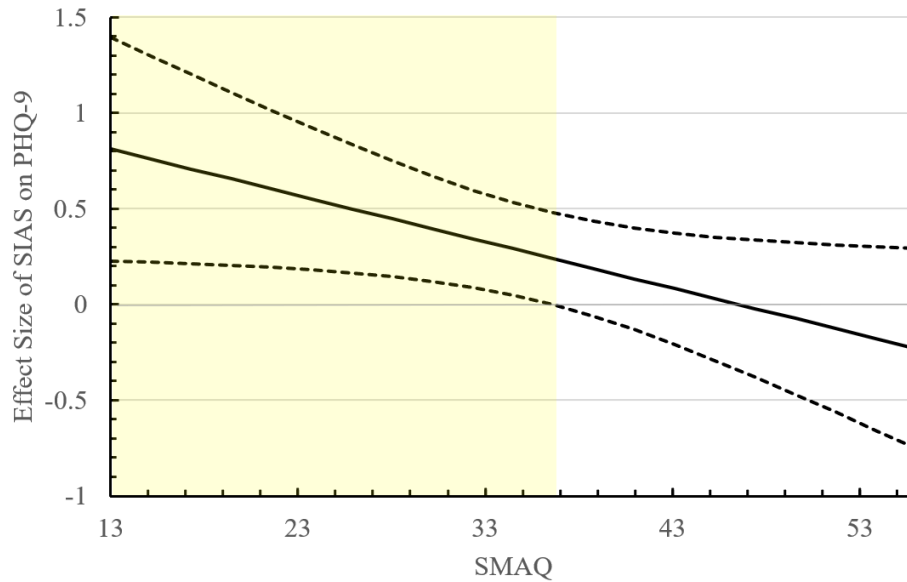
### Social Media Addiction

Model 1 revealed that Time 2 Social Anxiety was a significant predictor of Time 2 Depression,  $F = 6.188$ ,  $p = .015$ ,  $R^2 = .074$ , see Table 2. Model 2 resulted in a marginally significant change,  $\Delta R^2 = .071$ ,  $F = 3.103$ ,  $p = .051$ , accounting for 14.5% of the variance in depression. Time 2 social anxiety remained a significant predictor of depression,  $B = 1.133$ ,  $t = 2.582$ ,  $p = .012$ . Time 1 problematic social media use did not predict depression,  $B = .064$ ,  $t = 1.046$ ,  $p = .299$ . There was an interaction of Time 1 problematic social media use and Time 2 social anxiety,  $B = -.024$ ,  $t = -2.078$ ,  $p = .041$ . Johnson-Neyman analysis suggested that the association between social anxiety and depression weakened as a function of social media use. At SMAQ scores of 36 or higher, the association between social anxiety and depression was not significant.

Table 2. Depression Regressed onto Social Anxiety, Social Media Addiction, and their Interaction

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.354	.600		12.252	.000
	t2_siassf_cent_haley	.297	.119	.273	2.488	.015
2	(Constant)	5.636	2.045		2.756	.007
	t2_siassf_cent_haley	1.133	.439	1.040	2.582	.012
	t1_smaq_cent_haley	.064	.061	.117	1.046	.299
	t1_smaq_x_t2_siassf	-.024	.012	-.827	-2.078	.041

Figure 1. The Effect of SIAS on PHQ-9 at Different Scores on the SMAQ.



**Problematic Mobile Gaming**

Model 2 resulted in a significant change,  $\Delta R^2=.085$ ,  $F= 3.77$ ,  $p= .027$ , accounting for 15.9% of the variance in depression (see Table 3). Time 2 social anxiety remained a significant predictor of depression,  $B = .329$ ,  $t = 2.714$ ,  $p = .008$ . Time 1 problematic mobile gaming use predicted depression,  $B = .111$ ,  $t = 2.076$ ,  $p= .041$ . The interaction of Time 1 problematic mobile gaming use and Time 2 social anxiety was not related to depression,  $B= -.020$ ,  $t = -1.659$ ,  $p= .101$ .

Table 3. Depression Regressed onto Social Anxiety, Problematic Mobile Gaming, and their Interaction

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.354	.600		12.252	.000
	t2_siassf_cent_haley	.297	.119	.273	2.488	.015
2	(Constant)	7.470	.584		12.792	.000
	t2_siassf_cent_haley	.329	.121	.302	2.714	.008
	t1_pmgq_cent_haley	.111	.053	.222	2.076	.041
	t1_pmgq_x_t2_siassf	-.020	.012	-.184	-1.659	.101

## Discussion

The results showed that the relationship between social anxiety and depression was not dependent on problematic mobile gaming (Table 2) but was dependent on problematic social media use (Table 1). The results revealed that problematic social media use is not independently a risk factor for depression, but the comorbidity of social anxiety and depression is dependent on the interaction of social anxiety and social media use. The association between social anxiety and depression weakened as a function of social media use, and the association was not significant if SMAQ scores were 36 or higher. Consistent with past studies (Chen & Yu, 2019), (Gutierrez & Fonseca, 2016), social media use was correlated with social anxiety. In this study, social media use was only marginally correlated with depression, which was inconsistent with earlier studies. Past studies (Chen & Yu; Gutierrez & Fonseca, 2016) concluded that social media addiction strengthened the relationship of social anxiety and depression, but this study found that social anxiety and depression are less correlated in people with more social media use. Problematic mobile gaming was correlated with depression, but not with social anxiety. This is inconsistent with past studies (Wang & Sheng, 2019) because they concluded that problematic mobile gaming was correlated with both depression and social anxiety.

There were some limitations to this study that could have affected the outcome. One limitation was the sample of participants may not have been generalizable. All participants were

in college and in a psychology class that requires them to receive SONA credits through taking studies. So, the results only apply to college students that grew up with this new social media and mobile gaming technology. Also, they were required to take surveys to earn credits so it is impossible to verify the accuracy of all responses. This study was observational, so we cannot infer causation. Future psychologists could try to test causation and possibly use a larger age group. Another limitation was the representation of gender in the study. More than 80% of the sample consisted of women. Future studies should try to achieve larger sample sizes with better gender representation so the study could have better external validity.

This research has potential to help future psychologists understand how problematic phone use is associated with social anxiety and depression. It is important to understand that phone usage can be an outlet for people with social anxiety and depression, and helps to escape reality (Chen & Yu, 2019). Problematic phone use is a new and emerging risk for socially anxious and depressed people, and is potentially harmful to their daily lives. With social media and mobile games becoming more popular in recent years, social anxiety and depression could become more common and affect more people (Gutiérrez & Fonseca, 2016).

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## Appendix

### SMAQ

I often think about social media when I am not using it.

I often use social media for no particular reason.

Arguments have arisen with others because of my social media use.

I interrupt whatever else I am doing when I feel the need to access social media.

I feel connected to others when I use social media.

I lose track of how much I am using social media.

The thought of not being able to access social media makes me feel distressed.

I have been unable to reduce my social media use

### PMGQ

I have often experienced dry/sore eyes, muscle aches, or other physical discomforts from playing mobile games for a long duration.

I often do not plan on playing mobile games, but cannot resist picking up my phone to play (swipe).

I have a habit of playing mobile games before going to sleep and therefore reducing sleep time or sleep quality.

Mobile games have had a negative impact on my academic performance or occupation.

Despite the negative consequence of mobile games, I have not decreased playing mobile games.

I have attempted to reduce my mobile gaming, but did not succeed.

Compared to 3 months ago, I am averaging more time every week playing mobile games.

I find that I am spending more time playing mobile games.

I have been told multiple times that I am spending more time playing mobile games.

If I cannot play a mobile game, I feel restless and irritable.

If I have a period of not playing mobile games, I start to feel uncomfortable.

I had an experience where I was playing a mobile game while simultaneously walking, crossing the street, riding a motorcycle, or driving and almost had a dangerous accident.

### SIAS

I get nervous if I have to speak with someone in authority (teacher, boss, etc.)

I have difficulty making eye-contact with others.  
I become tense if I have to talk about myself or my feelings.  
I find difficulty mixing comfortably with the people I work with.  
I tense-up if I meet an acquaintance in the street.  
When mixing socially I am uncomfortable.  
I feel tense if I am alone with just one other person.  
I am at ease meeting people at parties, etc.  
I have difficulty talking with other people.  
I find it easy to think of things to talk about.  
I worry about expressing myself in case I appear awkward.  
I find it difficult to disagree with another's point of view.  
I have difficulty talking to attractive persons of the opposite sex.  
I find myself worrying that I won't know what to say in social situations.  
I am nervous mixing with people I don't know well.  
I feel I'll say something embarrassing when talking.  
When mixing in a group I find myself worrying I will be ignored.  
I am tense mixing in a group.  
I am unsure whether to greet someone I know only slightly.

### **PHQ-9**

Over the last 2 weeks, how often have you been bothered by any of the following problems?

1. Little interest or pleasure in doing things.
2. Feeling down, depressed, or hopeless.
3. Trouble falling or staying asleep, or sleeping too much.
4. Feeling tired or having little energy.
5. Poor appetite or overeating.
6. Feeling bad about yourself-- or that you are a failure or have let yourself or your family down.
7. Trouble concentrating on things, such as reading the newspaper or watching television.
8. Moving or speaking so slowly that other people could have noticed? Or the opposite-- being so fidgety or restless that you have been moving around a lot more than usual.
9. Thoughts that you would be better off dead or of hurting yourself in some way.

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people? Not difficult at all, somewhat difficult, Very difficult, Extremely difficult.