Relationship between family history of alcohol addiction, parents' education level, and smartphone problem use scale scores

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Background and aims: Smartphones are ubiquitous. As smartphones increased in popularity, researchers realized that people were becoming dependent on their smartphones. The purpose here was to provide a better understanding of the factors related to problematic smartphone use (PSPU). *Methods:* The participants were 100 undergraduates (25 males, 75 females) whose ages ranged from 18 to 23 (mean age = 20 years). The participants completed questionnaires to assess gender, ethnicity, year in college, father's education level, mother's education level, family income, age, family history of alcoholism, and PSPU. The Family Tree Questionnaire assessed family history of alcoholism. The Mobile Phone Problem Use Scale (MPPUS) and the Adapted Cell Phone Addiction Test (ACPAT) were used to determine the degree of PSPU. Whereas the MPPUS measures tolerance, escape from other problems, withdrawal, craving, and negative life consequences, the ACPAT measures preoccupation (salience), excessive use, neglecting work, anticipation, lack of control, and neglecting social life. *Results:* Family history of alcoholism and father's education level together explained 26% of the variance in the MPPUS scores and 25% of the variance in the ACPAT scores. The inclusion of mother's education level, ethnicity, family income, age, year in college, and gender did not significantly increase the proportion of variance explained for either MPPUS or ACPAT scores. *Discussion and conclusions:* Family history of alcoholism and father's education level are good predictors of PSPU. As 74%–75% of the variance in PSPU scale scores was not explained, future studies should aim to explain this variance.

Keywords: problematic smartphone use, family history, parents' education, Mobile Phone Problem Use Scale, Adapted Cell Phone Addiction Test, behavioral addiction

INTRODUCTION

Mobile phones, including smartphones, are ubiquitous. In support, the mobile phone penetration rate (i.e., the number of mobile phone subscriptions per 100 individuals) has increased dramatically from 2001 to 2015. According to the International Telecommunication Union, from 2005 to 2015, there was a 72% increase (from 68% in 2005 to 118% in 2015), a 55% increase (from 82% in 2005 to 125% in 2015), and a 306% increase (from 23% in 2005 to 93% in 2015) in the penetration rate in the United States, developed countries (including the United States), and developing countries, respectively (International Telecommunication Union, 2016).

Mobile phone use, including smartphone use, has positive and negative outcomes. One positive outcome is an increased connection with family and friends through interactions with others on social networks, watching and sharing videos and pictures, playing video games, exchanging e-mails, and/or utilizing a host of readily available applications. Other positive outcomes include increased productivity while waiting, an increased ability to organize one's daily life, an enhanced ability to accomplish day-to-day tasks, and convenient access to entertainment (e.g., videos and music). In fact, 65% reported that smartphones made it a lot easier to stay in touch with the people they care about, 69% reported that smartphones made it easier to plan and schedule their daily routine, and 67% reported that smartphones made it easier to be productive while doing things like sitting in traffic or waiting in line (Pew Research Center, 2015). In support of the idea that smartphones make it easier for people to accomplish day-to-day tasks, 68% of smartphone users reported that they had used their phone in the past year to look up information about a health condition, 57% had used their phone to do online banking, 44% had used their phone to look up real estate listings or other information about a place to live, and 18% to submit a job application (Pew Research Center, 2015). Watching videos and listening to music are, in particular, popular with younger smartphone users. About 75% and 64% of respondents ages 18–29 reported watching a video and listening to music, respectively, at least once in the past 2 weeks (Pew Research Center, 2015). Negative outcomes associated with smartphone use include the use of smartphones while driving, which has a detrimental effect on driving performance (Alm & Nilsson, 1995; Consiglio,

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Driscoll, Witte, & Berg, 2003; Hancock, Lesch, & Simmons, 2003), and increases the number of car accidents (Laberge-Nadeau et al., 2003; Redelmeier & Tibshirani, 1997; Violanti, 1998; Violanti & Marshall, 1996), the accumulation of large financial debts (Funston & McNeill, 2015), and increased cyberbullying (Charlton, Panting, & Hannan, 2002). According to Kamibeppu and Sugiura (2005), smartphone use is associated with behavioral problems, such as staying up late at night exchanging text messages and emotional dependence (e.g., the user thinks he/she cannot live without their smartphone). In addition, smartphone users are more likely than non-users to experience somatic symptoms, insomnia, social dysfunction, anxiety, and depression (Jenaro, Flores, Gómez-Vela, González-Gil, & Cabello, 2007).

It is generally accepted that individuals who have a positive family history of alcohol dependence (i.e., have close biological relatives with alcohol dependence) are themselves at an increased risk of alcohol dependence (Cotton, 1979; Goodwin, Schulsinger, Hermansen, Guze, & Winokur, 1973; Stabenau & Hesselbrock, 1983). In addition, rates of alcohol dependence increase with male sex, younger age, lower education, unmarried status, lower income, and other variables indicative of social disadvantage (Crum, Helzer, & Anthony, 1993; Swendsen et al., 2009). Interestingly, the relationship between parental education and substance abuse was found to differ substantially by race and ethnicity (Bachman, O'Malley, Johnston, Schulenberg, & Wallace, 2011). In light of the fact that problematic smartphone use (PSPU) shares many of the characteristics of drug and alcohol dependence (e.g., Chóliz, 2010), we hypothesized that family history of alcohol dependence would be related to two valid and reliable measures of PSPU; namely, the Mobile Phone Problem Use Scale (MPPUS; Bianchi & Phillips, 2005) and the Adapted Cell Phone Addiction Test (ACPAT; Smetaniuk, 2014). In light of the aforementioned studies that reported a relationship between sociodemographic variables and alcohol dependence, we examined the relationships between age, gender, ethnicity, year in college, the education level of the participants' father and mother, and family income and MPPUS and ACPAT scores.

METHODS

Participants

The participants were 100 undergraduates (25 males, 75 females) from Carthage College who were currently taking a course in the Department of Psychological Science. The age of the participants ranged from 18 to 23 with a mean age of 20 years. Participants completed a questionnaire that asked about the participants' age, gender, ethnicity, year in college, the education level of their father and mother, their family income, family history of alcohol dependence, whether they owned a smartphone, and PSPU.

Materials

The questionnaires were distributed through hard copy surveys and an online survey completed through Google Docs.

Participants were provided with the Family Tree Questionnaire (FTQ), a valid and reliable measure of family history of alcohol use (Mann, Sobell, Sobell, & Pavan, 1985; Stoltenberg, Mudd, Blow, & Hill, 1998). The FTQ is a brief, easily administered questionnaire that was used to gather self-reports of participants' family history of first-degree (siblings, parents) and second-degree (grandparents, uncles, aunts) relatives' history of alcohol-related problems. Participants classified their relatives into one of several possible drinker groups ranging from total lifelong abstainers to definite problem drinkers. Family members who were adopted, half-siblings, and step-relatives were excluded. Each family member was scored on a 6-point Likert scale: 1 = *never drank* (a person who never consumed alcoholic beverages); 2 = *social drinker* (a person who drinks moderately and is not known to have a drinking problem); 3 = *possible problem drinker* (a person who you believe or were told might have [or had] a drinking problem, but whom you are certain actually had a drinking problem); 4 = *definite problem drinker* (persons who are known to have received treatment for a drinking problem), 5 = *no relative* (only applicable for brothers and sisters), and 6 = *don't know/don't remember* (Mann et al., 1985). The participants who reported having at least one first- or second-degree relative that was a definite problem drinker were considered as having a positive family history of alcohol dependence (Mann et al., 1985). Family drinking density was calculated as the number of definite problem drinkers divided by the total number of relatives (Di Sclafani, Finn, & Fein, 2007, 2008).

Participants completed the MPPUS (Bianchi & Phillips, 2005) to measure the degree of smartphone problem use. The MPPUS is the most widely used and cited PSPU scale and is considered by some as the gold standard of PSPU scales. The MPPUS is a 27-item scale, in which each item is measured on a 10-point Likert scale (1 = *not true at all* and 10 = *extremely true*). The total MPPUS score was used to determine the severity of the PSPU. This questionnaire measured the issues of tolerance (i.e., needing more to produce the same initial effect), escape from other problems, withdrawal (e.g., irritability, nervousness, and restlessness), craving, and negative life consequences in the areas of social, familial, work, and financial difficulties. The participants were placed into one of three categories that determined the degree of concern regarding their smartphone use. The range of MPPUS scores that defined each of the degree of concern categories used here were described in published reports (Bianchi & Phillips, 2005; Smetaniuk, 2014). One would have a low-to-moderate, moderate-to-high, and high-to-severe degree of concern for those who scored between 27 and 76, 77 and 126, and greater than 126, respectively (Bianchi & Phillips, 2005; Smetaniuk, 2014).

Participants also completed the ACPAT, another measure of PSPU (Smetaniuk, 2014). The ACPAT is a 20-item scale, in which each item is measured on a 5-point Likert scale (1 = *never* and 5 = *always*). Like the MPPUS, the ACPAT produces a total score. The participant's total score determined the degree of concern regarding their smartphone use. The range of ACPAT scores that defined each of the degree of concern categories used here were described in a published report (Smetaniuk, 2014). One would have a low-to-moderate, moderate-to-high, and high-to-severe

degree of concern for those who scored between 20 and 49, 50 and 79, and 80 and 100, respectively. The ACPAT measures preoccupation (salience), excessive use, neglecting work, anticipation, lack of control, and neglecting social life (Wyando & McMurran, 2004).

Statistical analysis

Data were subjected to hierarchical multiple regression analysis to determine the relationship between the study variables. Prior to performing a hierarchical multiple regression, a preliminary data analysis was conducted to determine if the assumptions of the statistical test had been met. α level was set to .05.

Ethics

The study procedures were carried out in accordance with the Declaration of Helsinki. The Institutional Review Board of Carthage College approved the study. All participants were informed about the study and provided informed consent.

RESULTS

Sample characteristics

Of the 100 participants, there were 25 males (25%) and 75 females (75%). The age of the participants ranged from 18 to 23 ($M = 20.09$, $SE = 0.13$). Ninety-nine of the 100 participants owned a smartphone. The sociodemographic characteristics of the sample are given in Table 1.

FTQ results

The participants who reported having at least one first- or second-degree relative that was a definite problem drinker were considered as having a positive family history of alcohol dependence (Mann et al., 1985). Twenty-nine of the 100 participants had a positive family history of alcohol dependence. Of those who had a positive family history of alcohol dependence, 17, 1, 2, and 9 reported having 1, 2, 3, and 4 first- or second-degree relatives that were definite problem drinkers, respectively. The drinking density (i.e., the number of definite problem drinkers divided by the number of first- and second-degree relatives) was low ($M = 0.0640$, $SE = 0.0119$). Note that participants were asked to recall the drinking behavior of their relatives to classify them (e.g., social drinker and possible problem drinker). Since long-term memory is fallible, discrepancies may exist between the data reported herein and the actual drinking status of the participants' first- and second-degree relatives.

MPPUS results

Consistent with others (e.g., Bianchi & Phillips, 2005), a Cronbach's α of .92 was obtained, indicating a high degree of internal consistency. The MPPUS data were slightly positively skewed (skewness = 0.37) and nearly normally distributed ($M = 103.1$, $SE = 3.8$). It was determined that

Table 1. The sociodemographic characteristics of the sample ($N = 100$). The age data given as $M \pm SE$

		Number
Gender	Male	25
	Female	75
Ethnicity	Native American	0
	Asian	3
	Black	1
	White	87
	Latino	6
	Multiracial	2
	Other	1
Year in college	Freshman	31
	Sophomore	18
	Junior	28
	Senior	23
Father's education level	Middle school	4
	High school	19
	Some college	13
	2 years of college	12
	4 years of college	31
	Graduate school	21
Mother's education level	Middle school	2
	High school	17
	Some college	18
	2 years of college	19
	4 years of college	27
	Graduate school	17
Family income	<$20,000/year	8
	$21,000–$40,000/year	13
	$41,000–$60,000/year	14
	$61,000–$80,000/year	17
	$81,000–$100,000/year	22
	>$100,000/year	26
Smartphone ownership	No	1
	Yes	99
Age	20.09 ± 0.03	

22% of the participants scored in the low-to-moderate degree of concern range (scores between 27 and 76), 42% scored in the moderate-to-high degree of concern range (scores between 77 and 126), and 36% scored in the high-to-severe degree of concern range (scores greater than 126).

A hierarchical multiple regression analysis was conducted to examine the relationship between MPPUS score and the variables drinking density (i.e., the number of definite problem drinkers divided by the number of first- and second-degree relatives), year in college, father's education level, mother's education level, family income, ethnicity, age, and gender. These results are given in Table 2. Preliminary data analysis using histograms and scatterplots revealed no threats to the assumption of linearity or to the underlying distributional assumptions of residuals of MPPUS score. To evaluate the idea that participants' MPPUS score is due, in part, to the degree of positive family history of alcohol dependence (indexed by drinking density), step 1 of a hierarchical multiple regression procedure predicted MPPUS score from drinking density. The R^2 in step 1 was statistically significant ($R^2 = .117$, $p = .0005$).

Table 2. The results of the hierarchical multiple regression analysis with drinking density, father's education level, mother's education level, ethnicity, family income, age, year in college, and gender as independent variables and MPPUS scores as the dependent variable

Step	Independent variable/predictor	MPPUS scores				
		B	$SE\ B$	β	ΔR^2	ΔF
1	Drinking density	109.796	30.651	.342***	.117	12.831***
2	Father's education level				.140	2.867*
	Middle school	32.668	15.628	.189*		
	High school	−15.155	10.382	−.158		
	Some college	6.797	11.062	.063		
	2 years of college	1.004	11.358	.009		
	4 years of college	0.951	9.551	.012		
	Graduate school	23.349	10.214	.253*		
3	Mother's education level				.054	1.335
	Middle school	−65.822	27.084	−.245*		
	High school	−2.278	11.722	−.023		
	Some college	3.624	10.804	.036		
	2 years of college	−0.222	10.854	−.002		
	Graduate school	−1.622	10.725	−.016		
4	Ethnicity				.040	0.421
	Asian	33.114	25.565	.123		
	Black	7.366	36.285	.020		
	Latino	16.714	18.625	.106		
	Multiracial	−33.350	26.305	−.124		
	Other	39.305	36.182	.104		
5	Family income				.047	0.975
	<$20,000	−5.074	32.781	−.034		
	$21,000–$40,000	−22.874	32.783	−.190		
	$41,000–$60,000	−24.248	31.359	−.224		
	$61,000–$80,000	−10.855	32.187	−.108		
	$81,000–$100,000	−27.014	31.122	−.297		
	>$100,000	−7.797	30.972	−.091		
6	Age	−3.297	3.036	−.114	.009	1.179
7	Year in college				.027	1.146
	Sophomore	15.908	12.459	.162		
	Junior	26.250	15.218	.313		
	Senior	33.798	19.313	.378		
8	Gender	4.327	9.561	.050	.002	0.205

Note. B: unstandardized regression coefficient; SE: standard error; β: standardized regression coefficient; ΔR^2: change in R-squared; ΔF: change in F.
*$p < .05$. ***$p < .001$.

In step 2, the contribution of father's education level to the prediction of MPPUS score was assessed. The R^2 change in step 2 was statistically significant (R^2 change $= .140$, $p = .013$). Drinking density and father's education level together explained 25.7% of the variance in MPPUS score. The inclusion of mother's education level, ethnicity, family income, age, year in college, and gender did not significantly increase the proportion of variance in MPPUS score explained (R^2 change: mother's education level, .054; ethnicity, .040; family income, .047; age, .009; year in college, .027; gender, .002; $ps > .05$). If we increase drinking density by 1 standard deviation there will be a .353 standard deviation increase in MPPUS score ($\beta = .353$, $p < .05$). With a 1 standard deviation increase in fathers with a middle school education, there will be a .189 standard deviation increase in MPPUS score ($\beta = .189$, $p < .05$). Surprisingly, with a 1 standard deviation increase in fathers with a graduate school education, there will be a 0.253 standard deviation increase in MPPUS score ($\beta = .253$, $p < .05$).

ACPAT results

Consistent with others (e.g., Smetaniuk, 2014), a Cronbach's α of .92 was obtained, indicating a high degree of internal consistency. The ACPAT data were slightly positively skewed (skewness $= 0.47$) and nearly normally distributed ($M = 39.4$, $SE = 1.4$). It was determined that 76% of the participants scored in the low-to-moderate degree of concern range (scores between 20 and 49), 24% scored in the moderate-to-high degree of concern range (scores between 50 and 79), and 0% scored in the high-to-severe degree of concern range (scores greater than 79).

To evaluate the idea that participants' ACPAT score is due, in part, to the degree of positive family history of alcohol dependence (indexed by drinking density), step 1 of a hierarchical multiple regression procedure predicted ACPAT score from drinking density. The results of this hierarchical multiple regression analysis are given in Table 3. The R^2 in step 1 was statistically significant ($R^2 = .086$, $p = .003$).

Table 3. The results of the hierarchical multiple regression analysis with drinking density, father's education level, mother's education level, ethnicity, family income, age, year in college, and gender as independent variables and ACPAT scores as the dependent variable

Step	Independent variable/predictor	ACPAT scores				
		B	$SE\ B$	β	ΔR^2	ΔF
1	Drinking density	33.483	11.100	0.293**	.086	9.099**
2	Father's education level				.166	3.372**
	Middle school	−1.210	5.582	−.020		
	High school	−5.991	3.708	−.175		
	Some college	4.285	3.951	.111		
	2 years of college	4.972	4.057	.125		
	4 years of college college	1.836	3.411	.063		
	Graduate school	10.769	3.648	.327**		
3	Mother's education level				.025	0.594
	Middle school	−10.014	10.088	−.105		
	High school	2.122	4.612	.060		
	Some college	3.805	4.454	.107		
	2 years of college	−.072	4.373	−.002		
	4 years of college	2.740	3.910	−.091		
4	Ethnicity				.080	2.009
	Asian	23.128	9.058	.242*		
	Black	.110	12.857	.001		
	Latino	−.070	6.559	−.001		
	Multiracial	−7.203	9.320	−.075		
	Other	22.116	12.820	.165		
5	Family income				.091	2.072
	<$20,000	−8.157	11.169	−.156		
	$21,000–$40,000	−7.430	11.170	−.174		
	$41,000–$60,000	−4.449	10.685	−.115		
	$61,000–$80,000	−7.323	10.967	−.205		
	$81,000–$100,000	−15.456	10.604	−.478		
	>$100,000	−3.614	10.553	−.118		
6	Age	−0.525	1.041	−.051	.002	0.254
7	Year in college				.021	0.944
	Sophomore	4.818	4.289	.138		
	Junior	8.694	5.239	.291		
	Senior	8.610	6.648	.270		
8	Gender	1.031	3.294	.033	.001	0.098

Note. B: unstandardized regression coefficient; SE: standard error; β: standardized regression coefficient; ΔR^2: change in R-squared; ΔF: change in F.
*$p < .05$. **$p < .01$.

In step 2, the contribution of father's education level to the prediction of ACPAT score was assessed. The R^2 change in step 2 was statistically significant (R^2 change = .166, $p = .005$). Drinking density and father's education level together explained 25.2% of the variance in ACPAT score. The inclusion of mother's education level, ethnicity, family income, age, year in college, and gender did not significantly increase the proportion of variance in ACPAT score explained (R^2 change: mother's education level, .025; ethnicity, .080; family income, .091; age, .002; year in college, .021; gender, .001; ps > .05). Finally, it should be noted that there was a strong positive correlation between MPPUS score and ACPAT score ($r = .848$, $p < .001$).

DISCUSSION

This is the first demonstration that the degree of positive family history of alcohol dependence (indexed by drinking density) accounted for a significant amount of variance in the scores from two valid and reliable indices of PSPU; namely, the MPPUS and the ACPAT. This finding is consistent with the prevailing view that compulsive disorders (e.g., PSPU, alcohol dependence, overeating, and pathological gambling) are due to an interaction between heritable and environmental factors. It is well known that family history of alcohol dependency confers a significant risk to children of alcohol-dependent parents to develop alcohol dependency and other substance abuse disorders (e.g., Lieb et al., 2002). Notably, this risk has a genetic basis (e.g., Merikangas, 1990). The heritability of pathological gambling is estimated to be from 50% to 60% (Lobo & Kennedy, 2009) and there have been consistent reports of a higher frequency of pathological gambling among individuals who perceived problematic gambling behavior in their parents (Gambino, Shaffer, Renner, & Gourtnage, 1993). Environmental factors associated with alcohol dependency and other substance abuse disorders include family,

developmental, perceived social support, and broader environmental influences (e.g., Marsh & Dale, 2005). According to Ohannessian and Hesselbrock (1993), a high perceived level of perceived social support "buffered" adult children of alcoholics from the negative effects of having a positive family history of alcoholism on drinking beliefs and behaviors. In light of this report, we hypothesize that a high level of perceived social support will "buffer" those with positive family history of alcohol dependence from developing PSMU. This hypothesis will be tested in future studies.

The finding of a relationship between a positive family history of alcoholism and PSPU raises the interesting possibility that compulsive disorders are due, in part, to a similar dysregulation of brain reward pathways that lead to a hyporesponsivity to rewarding stimuli and aberrant behavior. According to the Reward Deficiency Syndrome (RDS) (Blum, Cull, Braverman, & Comings, 1996) hypothesis, rewarding stimuli activate the mesocorticolimbic dopamine pathway and stimulate the release of dopamine from its terminal regions, the nucleus accumbens, amygdala, and prefrontal cortex (e.g., Koob, 1992). The increased dopamine release in these terminal regions decreases negative feelings and increases positive feelings. Notably, a deficiency in dopamine D2 receptors, which is important for coding reward, may predispose individuals to a higher risk of developing multiple addictive and compulsive behaviors. Thus, it is possible that those who suffer from a compulsive disorder carry a variant of the dopamine D2 receptor gene (i.e., the so-called reward gene) (Blum, Noble, Sheridan, Montgomery, & Ritchie, 1990). Interestingly, the predictive value for future RDS behaviors in participants carrying the DRD2 Tag A1 allele was 74% (Wilson, 2010).

Father's education level accounted for 14.0% and 16.6% of the variance in the MPPUS and ACPAT scores, respectively. As previously mentioned, alcohol dependence rates increase with variables indicative of social disadvantage, such as low education level (Crum et al., 1993; Swendsen et al., 2009). Compared to adults with higher education levels, adults with less education drink in more unrestrained way. That is, they drink larger quantities per drinking episode and are more likely to be problem drinkers (Casswell, Pledger, & Hooper, 2003). Interestingly, the relationship between education level and heavy adolescent drinking is mediated by parental monitoring (i.e., the degree of parental awareness of their child's whereabouts) and parental rules (i.e., the degree of restrictive rule setting behavior). Specifically, higher frequencies of heavy drinking by adolescents with lower education levels were due, in part, to less restrictive parental rules about alcohol and less parental monitoring (Vermeulen-Smit, Ter Bogt, Verdurmen, Van Dorsselaer, & Vollebergh, 2012). Thus, we hypothesize that the relationship between father's education level and PSPU is mediated by the smartphone behavior of the parent (which is modeled for the child), parental monitoring, and parental rules. This hypothesis will be tested in future studies.

It should be noted that there was disagreement between the MPPUS and the ACPAT with regard to the percentage of participants in each of the degree of concern categories. About 22%, 42%, and 36% of the participants' scores on the MPPUS were in the concern range of low-to-moderate, moderate-to-high, and high-to-severe, respectively. In contrast, 76%, 24%, and 0% of the participants' ACPAT scores were in the concern range of low-to-moderate, moderate-to-high, and high-to-severe, respectively. The most plausible explanation for the disagreement between the scales is they measure non-overlapping aspects of PSPU. Specifically, the MPPUS measures tolerance, escape from other problems, withdrawal, craving, and negative life consequences in the areas of social, familial, work, and financial difficulties, whereas the ACPAT measures preoccupation (salience), excessive use, neglecting work, anticipation, lack of control, and neglecting social life.

The disagreement between the MPPUS and the ACPAT raises larger issues. Namely, that there are perhaps too many indices of PSPU and the range in estimated levels of PSPU is too wide. Greater than 23 different instruments have been developed to measure PSPU. On the whole, the estimated levels of PSPU range from 0% to 38% (Pedrero Pérez, Rodríguez Monje, & Ruiz Sánchez De León, 2012). Some of the variables that explain this wide range are differences in the conceptual basis used to define PSPU, the population studied, and the statistical criteria used to define the PSPU categories.

Positive family history of alcohol dependence and father's education level together explained 25.7% and 25.2% of the variance in MPPUS scores and ACPAT scores, respectively. The inclusion of mother's education level, ethnicity, family income, age, year in college, and gender did not significantly increase the proportion of variance explained for either MPPUS or ACPAT scores. Note that present study has limited generalizability due to the fact that a convenience sample was used. Given that 74%–75% of the variance in PSPU scores was not explained and a convenience sample was used, future studies will attempt to explain the remaining variance in PSPU scores by measuring additional psychological constructs in a large, representative sample. PSPU is associated with a variety of psychological constructs, such as anxiety, neuroticism, extroversion, and stress reactivity (Augner & Hacker, 2012; Bianchi & Phillips, 2005; Igarashi, Motoyoshi, Takai, & Yoshida, 2008; Lu et al., 2011; Phillips, Butt, & Blaszczynski, 2006). Thus, in future studies, we will develop a model that accounts for a larger percentage of PSPU scores by adding measures of anxiety, personality, and stress reactivity to our existing model.

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