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The relationships between behavioral addictions and the five-factor model of personality

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Aims: Although relationships between addiction and personality have previously been explored, no study has ever simultaneously investigated the interrelationships between several behavioral addictions, and related these to the main dimensions of the five-factor model of personality. *Methods:* In this study, 218 university students completed questionnaires assessing seven different behavioral addictions (i.e., Facebook addiction, video game addiction, Internet addiction, exercise addiction, mobile phone addiction, compulsive buying, and study addiction) as well as an instrument assessing the main dimensions of the five-factor model of personality. *Results:* Of the 21 bivariate intercorrelations between the seven behavioral addictions, all were positive (and nine significantly). The results also showed that (i) Neuroticism was positively associated with Internet addiction, exercise addiction, compulsive buying, and study addiction, (ii) Extroversion was positively associated with Facebook addiction, exercise addiction, mobile phone addiction, and compulsive buying, (iii) Openness to experience was negatively associated with Facebook addiction and mobile phone addiction, (iv) Agreeableness was negatively associated with Internet addiction, exercise addiction, mobile phone addiction, and compulsive buying, and (v) Conscientiousness was negatively associated with Facebook addiction, video game addiction, Internet addiction, and compulsive buying and positively associated with exercise addiction and study addiction. *Conclusions:* The positive associations between the seven behavioral addictions suggest one or several underlying pathological factors. Hierarchical multiple regressions showed that personality traits explained between 6% and 17% of the variance in the seven behavioral addictions, suggesting that personality to a varying degree explains scores on measures of addictive behaviors.

Keywords: behavioral addictions, five-factor model of personality, Neuroticism, Extroversion, Conscientiousness

INTRODUCTION

The term *addiction* has traditionally been used in relation to excessive and uncontrollable use of psychoactive chemicals such as alcohol and a wide variety of other drugs (Rachlin, 1990; Walker, 1989). To date, only one non-chemical addiction (i.e., pathological gambling), has been formally recognized in official psychiatric diagnostic systems (e.g., American Psychiatric Association, 1987; World Health Organization, 1992). However, over the last two decades there has been an increased focus on the so-called non-chemical or behavioral addiction (Griffiths, 1996; Marks, 1990). Several subtypes of behavioral addictions have been described such as the use of Facebook (i.e., social networking) addiction (Andreassen, Torsheim, Brunborg & Pallesen, 2012), video game addiction (Fisher, 1994), Internet addiction (O'Reilly, 1996), exercise addiction (Griffiths, 1997), mobile phone addiction (Choliz, 2010), shopping addiction (Christenson et al., 1994), and workaholism (Andreassen, Hetland & Pallesen, 2010).

Walker (1989) defined a psychological addiction as "a persistent behavioral pattern characterized by: a desire or need to continue the activity which places it outside voluntary control; a tendency to increase the frequency or amount of the activity over time; psychological dependence on the pleasurable effects of the activity; and, a detrimental effect on the individual and society" (p. 185). Several authors have pointed to striking similarities between chemical and behavioral addictions. For instance, Griffiths (2005) argued that all addictions share some basic components: (i) *salience* (the behavior dominates thinking, feelings and behavior), (ii) *mood modification* (performing the behavior causes euphoria and/or other mood modifying experiences), (iii) *tolerance* (an increasing amount of the behavior is necessary to produce the former effects), (iv) *withdrawal* (experiencing unpleasant feelings when stopping or reducing the behavior), (v) *conflict* (the behavior causes conflict with other people or within the individual), and (vi) *relapse* (reversions to earlier patterns of the behavior after abstinence or control). In terms of sociological similarities both chemical and behavioral addiction seems to be associated with youth (Chambers & Potenza, 2003), similar influences from families and peers and with certain social groups (single, divorced, unemployed) as well as with crime (Griffiths, 1996). Evidence of similar impairment on tests of inhibition, cognitive flexibility, and planning tasks has been found in studies comparing gamblers and alcohol dependent individuals (Goudriaan, Oosterlaan, de Beurs & van den Brink, 2006).

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Serotonergic dysregulation has been implied in both chemical and behavioral addictions (Blanco, Orensanz-Munoz, Blanco-Jerez & Saiz-Ruiz, 1996), as well as activity in the brain reward system, the mesolimbic pathway from the ventral tegmental area to the nucleus accumbens (Grant, Potenza, Weinstein & Gorelick, 2010). Additionally, similar genetic vulnerabilities for developing chemical as well as behavioral addictions have been suggested (Comings, 1998). Studies have also indicated that similar psychological and pharmacological treatment approaches are effective for both chemical and behavioral addictions (Grant et al., 2010).

Another factor that may contribute to both chemical and behavioral addictions is personality (Grant et al., 2010). One of the most influential personality theories is the five-factor model of personality which differentiates between five main dimensions: (1) *Neuroticism* (e.g., being nervous and anxiety prone), (2) *Extroversion* (e.g., being talkative and outgoing), (3) *Openness to experience* (being imaginative and intellectually oriented), (4) *Agreeableness* (e.g., being sympathetic and warm) and (5) *Conscientiousness* (e.g., being organized and prompt) (Wiggins, 1996). The traits of the five-factor model have been validated across several cultures (McCrae, Costa, del Pilar, Rolland & Parker, 1998). According to Buss (1991) the five-factor model reflects individual differences which are strongly related to solving social adaptive problems in an evolutionary context. For example: (i) Who will burden me with their problems and fail to cope well with adversity (Neuroticism)? (ii) Who will gain high status in the social hierarchy (Extroversion)? (iii) Who are able to provide good advice (Openness)? (iv) Who will be a good cooperator and reciprocator (Agreeableness)? And (v) Who will work industriously and dependably (Conscientiousness)? Previous studies have shown that alcohol use disorders are positively associated with Neuroticism and negatively associated with Agreeableness and Conscientiousness (Martin & Sher, 1994). In another study it was shown that patients suffering from any substance use disorder were characterized by higher scores on Neuroticism and Openness, and lower scores on Extroversion, Agreeableness and Conscientiousness compared to patients suffering from other mental disorders (Trull & Sher, 1994).

Studies have also been conducted focusing on the relationship between the aforementioned behavioral addictions and the different dimensions of the five-factor model of personality. In relation to addiction to social networking, one study found that excessive social media use was positively associated with Extroversion and negatively associated with Conscientiousness (Wilson, Fornasier & White, 2010). However, a recent study of Facebook addiction found it to be positively related to Neuroticism and Extroversion, and negatively related to Conscientiousness (Andreassen, Torsheim et al., 2012). Video game addiction has been found to be positively related to Neuroticism (Charlton & Danforth, 2010; Huh & Bowman, 2008; Mehroof & Griffiths, 2010; Peters & Malesky, 2008) and Extroversion (Huh & Bowman, 2008), and negatively related to Extroversion (Peters & Malesky, 2008), Agreeableness (Collins, Freeman & Chamarro-Premuzic, 2012; Peters & Malesky, 2008) and Conscientiousness (Peters & Malesky, 2008). A related addiction is Internet addiction or problematic Internet use, which in several studies has been associated with Neuroticism (Cao & Su, 2007; Öztürk & Özmen, 2011; Serin, 2011; Tsai et al., 2009). In one study, Internet addiction was negatively associated with Extroversion and Conscientiousness (Gnisci, Perugini, Pedone & Di Conza, 2011) whereas Serin (2011) found it to be positively associated with Extroversion.

Mobile phone addiction is another behavioral addiction that has been linked to the different dimensions of the five-factor model of personality. Bianchi and Phillips (2005) found that problematic mobile phone use was positively related to Extroversion, a finding supported by Augner and Hacker (2012) who also found it to be positively associated with Neuroticism. Exercise addiction has been claimed to be related to Extroversion albeit one study failed to substantiate that claim (Mathers & Walker, 1999). Kern (2010) found that exercise addiction was positively related to Neuroticism and Openness among students, whereas it was positively related to Agreeableness and Openness among recreational practitioners. Another study found that exercise dependent individuals scored higher on Neuroticism than a control group (Bamber, Cockerill & Carroll, 2000). Hausenblas and Giacobbi (2004) found exercise addiction to be positively related to Extroversion and Neuroticism and negatively related to Agreeableness.

In relation to compulsive buying, Mowen and Spears (1999) found it to be positively related to Neuroticism and Agreeableness and negatively related to Conscientiousness. Later studies have found compulsive buying to be positively related to Extroversion (Verplanken & Herabadi, 2001) and negatively related to Conscientiousness (Rodriguez-Villarino, Gonzalez-Lorenzo, Fernandez-Gonzalez, Lameiras-Fernandez & Foltz, 2006; Verplanken & Herabadi, 2001; Wang & Yang, 2008). Studies on workaholism have shown the obsessive drive component of workaholism is positively related to Neuroticism (Andreassen et al., 2010; Burke, Matthiesen & Pallesen, 2006; Clark, Lelchook & Taylor, 2010), Conscientiousness (Andreassen et al., 2010; Aziz & Tronzo, 2011; Burke et al., 2006), and Openness (Aziz & Tronzo, 2011), and negatively related to Agreeableness (Andreassen et al., 2010) and Openness (Burke et al., 2006).

Although there is some convergence across the aforementioned studies, some discrepancies have been noted, most probably due to the use of different instruments and different study samples. Very few studies have investigated several behavioral addictions simultaneously in the same study. Villella et al. (2011) investigated the prevalence and the interrelationships between five behavioral addictions (pathological gambling, compulsive buying, Internet addiction, workaholism, and exercise addiction), whereas Lejoyeux, Avril, Richoux, Embouazza and Nivoli (2008) used a similar approach when studying exercise dependence, compulsive buying, and Internet addiction. However, as far as the authors are aware, no study has ever simultaneously investigated the interrelationships between several behavioral addictions, and related these to the main dimensions of the five-factor model of personality. Consequently, the present study was conducted to explore the interrelationship between seven different behavioral addictions (i.e., Facebook addiction, video game addiction, Internet addiction, exercise addiction, mobile phone addiction, compulsive buying, and study addiction) and how these relate to the main dimensions of the five-factor model of personality.

METHODS

Sample

The sample comprised 218 psychology undergraduate students at the University of Bergen, Norway (171 females and 45 males; two did not report their gender) with a mean age of 20.7 years (*SD* = 3.0 years).

Procedure

A 'paper and pencil' questionnaire comprising the NEO-Five-Factor Inventory-Revised (McCrae & Costa, 2004) as well as seven instruments (see below) assessing seven different behavioral addictions was administered to University of Bergen students in their first year study of psychology. The data collection used opportunistic sampling and took place during two lectures in September 2011, where all students present were invited to participate. Approximately 90% agreed to do so. No monetary or other material reward was given upon participation. The questionnaire was completed anonymously.

Instruments

Bergen Facebook Addiction Scale (BFAS). Facebook addiction was assessed with the BFAS. The scale contains six items reflecting the six core addiction elements (Griffiths, 2005). Each item is answered on a five-point Likert scale ranging from *very rarely* (1) to *very often* (5), and therefore yielded an overall score ranging from 6 to 30 (Andreassen, Torsheim et al., 2012) all adhering to a time frame of one year. The Cronbach's alpha for the BFAS was .86 in the present study.

Game Addiction Scale for Adolescents (GASA). Video game addiction was assessed with the GASA. The scale has seven items reflecting the six core addiction components (Griffiths, 2005) as well as one item related to problems generated by the addiction. The response alternatives range from *never* (1) to *very often* (5), and therefore yielded a total overall score ranging from 7 to 35. According to the instructions the responses should reflect behavior during the last six months (Lemmens, Valkenburg & Peter, 2009). In the present study the Cronbach's alpha for the GASA was .83.

Young's Diagnostic Questionnaire (YDQ). Internet addiction was assessed with the YDQ that comprises eight items. Originally, the response alternatives were dichotomous (i.e., yes/no). In order to increase the variance a five-point Likert scale was used for the response alternatives in the present study, where each response ranged from *never or very rarely* (1) to *very often or always* (5), and therefore yielded an overall score ranging from 8 to 40 (Young, 1998). The YDQ is based on the diagnostic criteria for pathological gambling (American Psychiatric Association, 1987). In the present study the YDQ yielded a Cronbach's alpha of .80.

The Exercise Addiction Inventory (EAI). Exercise addiction was assessed with the EAI. The scale has six items and is based on the six core elements of addiction (Griffiths, 2005). Each item contains a statement that is answered along a five-point Likert scale, ranging from *strongly disagree* (1) to *strongly agree* (5), and therefore yielded an overall score ranging from 6 to 30 (Terry, Szabo & Griffiths, 2004). The Cronbach's alpha for the EAI was .82 in the present study.

Mobile Phone Addiction Index (MPAI). Mobile phone addiction was assessed with the MPAI (Leung, 2007), which is derived from the Mobile Phone Problem Usage Scale (Bianchi & Phillips, 2005). The MPAI contains eight items, and is based upon Young's Diagnostic Questionnaire for Internet Addiction (Young, 1998). Each item is scored along a five-point Likert scale, ranging from *not at all* (1) to *always* (5), and therefore yielded an overall score ranging from 8 to 40. In the present study the MPAI obtained a Cronbach's alpha of .84.

Compulsive Buying Scale (CBS). Compulsive Buying was measured by the CBS. The scale contains 13 items, all answered on a five-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (5), and therefore yielded an overall score ranging from 13 to 65. The items are based on theoretical and clinical knowledge about compulsive buying (Young, 1998). In the present study the Cronbach's alpha of the CBS was .85.

Study Addiction Scale. In order to measure study addiction the Bergen Work Addiction Scale (Andreassen, Griffiths, Hetland & Pallesen, 2012) was adjusted by replacing the word *work* with *studying*. The final scale comprised seven items and is based on the core elements of addiction (Griffiths, 2005) in addition to one item pertaining to health problems arising from the addiction (Leshner, 1997). The response alternatives range from *never* (1) to *always* (5), and therefore yielded an overall score ranging between 7 and 35. In the present study the Cronbach's alpha of the study addiction scale was .74.

Revised NEO Five-Factor Inventory-Revised (NEO-FFI-R). The dimension of the five-factor model of personality was assessed by the NEO-FFI-R (McCrae & Costa, 2004). The NEO-FFI-R comprises 60 items, 12 belonging to each of the following five subscales: Neuroticism, Extroversion, Openness to experience, Agreeableness, and Conscientiousness. All items are answered on a five-point Likert scale ranging from *strongly disagree* (0) to *strongly agree* (4). The Cronbach's alpha for the subscales of Neuroticism, Extroversion, Openness to experience, Agreeableness and Conscientiousness, in the present study were .85, .77, .77, .77, and .84, respectively.

Statistics

Pearson's product-moment correlation coefficients were calculated in order to assess the interrelationship between the study variables. The relationship between gender and the other study variables were based on point-biserial correlation coefficients.

In order to examine how gender, age, and the dimensions of the five-factor model of personality related to the behavioral addictions, seven hierarchical multiple regression analyses were conducted. In each of these, the scores on the behavioral addictions comprised the dependent variable. In the first stage (Step 1), gender and age were included as independent variables. In the second stage (Step 2), the gender adjusted T-scores (mean = 50, *SD* = 10) for the five personality dimensions assessed by the NEO-FFI-R were included as independent variables. Preliminary analyses were con-

ducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. The scores of the Game Addiction Scale for Adolescents (Lemmens et al., 2009) were transformed by a logarithmic function due to deviations from the assumptions of normality before conducting the regression analysis.

RESULTS

Table 1 presents mean scores and standard deviations for all the study variables as well as their interrelationships. Facebook addiction correlated positively with Internet addiction, mobile phone addiction and compulsive buying. Video game addiction correlated positively with Internet addiction. Exercise addiction correlated positively with study addiction. Mobile phone addiction correlated positively with Facebook addiction, compulsive buying and study addiction. Compulsive buying correlated positively with Facebook addiction, Internet addiction and mobile phone addiction. Study addiction correlated positively with mobile phone addiction and with exercise addiction. Regression analyses were then performed on all types of addictive behavior (see Table 2).

Facebook addiction

The regression analysis for Facebook addiction showed that the independent variables in Step 1 explained 5.8% of the variance ($F_{2,209} = 6.4$, $p < .01$). The independent variables added in Step 2 additionally explained 12.6% of the variance ($\Delta F_{5,204} = 6.3$, $p < .01$). The independent variables explained a total of 18.4% of the variance ($F_{7,204} = 6.6$, $p < .01$). Significant independent variables in Step 2 were age ($\beta = –.16$), Extroversion ($\beta = .17$), Openness (–.14), and Conscientiousness ($\beta = –.30$).

Video game addiction

The regression analyses for video game addiction showed that the two independent variables in Step 1 explained 23.5% of the variance ($F_{2,211} = 32.4$, $p < .01$). The five independent variables entered in Step 2 additionally explained 6.1% of the variance ($\Delta F_{5,206} = 3.6$, $p < .01$). The independent variables explained a total of 29.6% of the variance ($F_{7,206} = 12.3$, $p < .01$) in video game addiction. Significant independent variables in Step 2 were gender (m = 1, f = 2) (b = –.45) and Conscientiousness ($\beta = –.14$).

Table 1. Mean scores and standard deviations, and percentages, and correlations between the study variables

	Variable	Mean *(SD)*	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1.	Gender[a] (males = 1, females = 2)	20.6% males 79.2% females	–.02	–.11	.14*	–.31**	.13	.10	.13	–.48**	–.01	–.04	.21**	.24**	.08
2.	Age	20.6 (3.0)		–.05	–.14*	.05	–.20	.04	–.21**	.02	–.17*	–.14*	–.15*	–.10	–.11
3.	Neuroticism	49.7 (8.9)			–.47**	–.01	–.25**	–.25**	.12	.22**	.26**	.03	.06	.17*	.33**
4.	Extroversion	49.5 (8.7)				.03	.27**	.28**	.05	–.17*	–.07	.24**	.13	.08	–.06
5.	Openness	47.0 (10.4)					.03	–.09	–.16*	.15*	–.01	.01	–.19**	–.07	–.01
6.	Agreeableness	52.5 (10.8)						.37**	–.15*	–.23**	–.26**	–.02	–.13	–.24**	–.02
7.	Conscientiousness	50.8 (10.6)							–.28**	–.24**	–.34**	.26**	–.05	–.28**	.14*
8.	Facebook addiction	13.0 (5.2)								–.01	.69**	.05	.54**	.43**	.02
9.	Video game addiction	8.3 (2.9)									.27**	.03	–.02	.01	.04
10.	Internet addiction	16.6 (4.5)										.06	.50**	.44**	.10
11.	Exercise addiction	15.2 (5.4)											.13	.05	.27**
12.	Mobile phone addiction	13.7 (5.0)												.37**	.15*
13.	Compulsive buying	31.2 (9.6)													.00
14.	Study addiction	17.8 (4.3)													

*$p < .05$, **$p < .01$, [a] Mean and *SD* are percentages. The correlation coefficients are point-biserial correlation coefficients.

Table 2. Results of hierarchical multiple regression analyses where age, gender, and the five-factor model dimensions Neuroticism, Extroversion, Openness to experience, Agreeableness and Conscientiousness) as independent variables for the scores on instruments assessing seven behavioral addictions (Facebook addiction, video game addiction, Internet addiction, exercise addiction, mobile phone addiction, compulsive buying, and study addiction)

	Facebook addiction		Video game addiction		Internet addiction		Exercise addiction		Mobile phone addiction		Compulsive buying		Study addiction	
Predictor	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1	.058**		.235**		.028		.021		.064**		.065**		.018	
Gender (1 = M, 2 = F)		.127		–.484**		.016		–.040		.206**		.233**		.076
Age		–.202**		.008		–.166*		–.138*		–.144*		–.098		–.108
Step 2	.126**		.061*		.172**		.143**		.069*		.172**		.168**	
Gender (1 = M, 2 = F)		.108		–.448**		.030		–.063		.171*		.268**		.111
Age		–.155*		.023		–.128*		–.109		–.106		–.047		–.094
Neuroticism		.112		.128		.215**		.183*		.111		.200**		.409**
Extroversion		.171*		.024		.124		.272**		.202**		.250**		.047
Openness		–.144*		.002		–.017		.020		–.139*		–.005		.057
Agreeableness		–.066		–.088		–.143*		–.146*		–.158*		–.197**		–.035
Conscientiousness		–.297**		–.141*		–.272**		.290**		–.043		–.251**		.243**

*$p < .05$, **$p < .01$, ΔR^2 = change in R-squared, β = standardized regression coefficient.

Internet addiction

The regression analyses for Internet addiction showed that the two independent variables in Step 1 explained 2.8% of the variance ($F_{2,212}$= 3.0, $p > .05$). When the five independent variables in Step 2 were entered, they explained 17.2% of the variance ($\Delta F_{5,207}$ = 8.9, $p < .01$). In total, the independent variables explained 19.9% ($F_{7,207}$ = 7.4, $p < .01$) of the variance. Significant independent variables in Step 2 were age (β = –.13), Neuroticism (β = .22), Agreeableness (β = –.14), and Conscientiousness (β = –.27).

Exercise addiction

The regression analyses for exercise addiction showed that 2.1% of the variance was explained by the two independent variables in Step 1 ($F_{2,212}$ = 2.2, $p > .05$). The five independent variables added in Step 2 explained a total of 14.3% of the variance ($\Delta F_{5,207}$ = 7.1, $p < .01$). In total, the model explained 16.4% of the variance ($F_{7,207}$ = 5.8, $p < .01$). Neuroticism (β = .18), Extroversion (β = .27), Agreeableness (β = –.15), and Conscientiousness (β = .29) comprised the significant independent variables in step 2.

Mobile phone addiction

The regression analyses for mobile phone addiction showed that the independent variables in Step 1 explained 6.4% of the variance ($F_{2,210}$ = 7.2, $p < .01$). The five independent variables entered in Step 2 explained 6.9% of the variance ($\Delta F_{5,205}$ = 3.3, $p < .01$). In total, the independent variables explained 13.3% of the variance ($F_{7,205}$ = 4.5, $p < .01$). Independent variables that were significant in Step 2 comprised gender (β = .17), Extroversion (β = .20), Openness (β = –.14), and Agreeableness (β = –.16).

Compulsive buying

The regression analyses for compulsive buying comprised the dependent variable the two independent variables entered in Step 1 and explained 6.5% of the variance ($F_{2,213}$= 7.4, $p < .01$). The independent variables included in Step 2 explained 17.2% of the variance ($\Delta F_{5,208}$ = 9.4, $p < .01$). The final model explained 23.7% ($F_{7,208}$ = 9.3, $p < .01$) of the variance. Significant predictors in Step 2 were gender (b = .27), Neuroticism (β = .20), Extroversion (β = .25), Agreeableness (β = –.20), and Conscientiousness (β = –.25).

Study addiction

The regression analyses for study addiction showed that the two independent variables in Step 1 explained 1.8% of the variance ($F_{2,212}$ = 1.9, $p > .05$). The independent variables entered in Step 2 explained an additional 16.8% of the variance ($\Delta F_{5,207}$ = 8.5, $p < .01$). The total amount of variance explained by the model was 18.6% ($F_{7,207}$ = 6.7, $p < .01$). Significant independent variables at Step 2 were Neuroticism (β = .41), and Conscientiousness (β = .24).

DISCUSSION

The present study adds to our understanding of behavioral addictions and their personality correlates by investigating the interrelationships between several addictive behaviors and how these relate to the main dimensions of the five-factor model of personality. It was found that the seven behavioral addictions were all positively related, nine of the 21 intercorrelations between them were significant, suggesting one or several underlying pathological factors. Hierarchical multiple regressions showed that personality traits explained between 6% and 17% of the variance in the seven behavioral addictions, suggesting that some behavioral addictions relates more to personality traits than others. In the following, the relationships between different addictive behaviors, as well as how each independent variable (age, gender, personality traits) relates to these, will be discussed in that order.

Relationships between different behavioral addictions

Of the total of 21 bivariate intercorrelations between the seven behavioral addictions all were positive, of which nine were significant. This suggests that behavioral addictions have one or several common underlying psychopathology dimensions (Villella et al., 2011), a finding that seems to go against the substitution hypothesis (Lin & Lin, 1982). Facebook addiction, Internet addiction, and mobile phone addiction all correlated highly with each other (> .50), and are suggestive of an underlying preference for online communication (Smahel, Brown & Blinka, 2012). A significant correlation was also found between video game addiction and Internet addiction and most likely reflects the fact that many of the most popular video games are played on the Internet (Wenzel, Bakken, Johansson, Götestam & Øren, 2009).

Compulsive buying correlated significantly with Facebook addiction, Internet addiction and mobile phone addiction. One possible explanation for this finding may be that advertisements for products and shopping opportunities are available via all the three media platforms (i.e., Facebook, Internet and mobile phones) and is in line with findings showing that compulsive buyers are more online-shopping-dependent than other consumers (Wang & Yang, 2008). The findings also indicated that exercise addiction and study addiction significantly correlated. Interestingly, these were the only two behavioral addictions that were positively associated with Conscientiousness, and it could therefore be argued that these two addictions could perhaps be regarded as *positive,* at least in the sense that they both probably produce increased feelings of self-efficacy (Glasser, 1976).

Gender and age

The regression analyses showed that video game addiction was positively associated with male gender, which is in line with several other studies conforming male preponderance (Griffiths & Meredith, 2009; Haagsma, Pieterse & Peters, 2012; Mentzoni et al., 2011). Mobile phone addiction was associated with female gender. This finding is also in line with previous studies (Augner & Hacker, 2012; Carbonell et al., in press) as well as with other data suggesting that females tend to score higher than males on measures of behavioral addictions involving social interaction (Andreassen, Torsheim et al., 2012). Females scored higher on compulsive buying than males, supporting previous findings in this field (Davenport, Houston & Griffiths, in press; Koran, Faber, Aboujaoude, Large & Serpe, 2006). It has been suggested that the female preponderance in compulsive buying might reflect that females are more prone than men to buy on

impulse and that they use buying in order to regulate emotions to a greater extent than men (Davenport et al., in press; Mueller et al., 2011). Age was negatively associated with Facebook addiction and with Internet addiction. This is in line with studies showing that young people use social network sites (Chou, Hunt, Beckjord, Moser & Hesse, 2009; Kuss & Griffiths, 2011) and Internet (Bernier & Laflamme, 2005) more than older people, and with studies that in general link impulsivity and addictive behaviors to young age (Griffiths, 1996; Kandel & Maloff, 1983).

Neuroticism

Neuroticism was positively related to all the seven behavioral addictions, and four of the associations were statistically significant (i.e., Internet addiction, exercise addiction, compulsive buying, and study addiction). One explanation for the findings is that Neuroticism may be a general vulnerability factor for the development of psychopathology (Winter & Kuiper, 1997). It has also been suggested that behavioral addictions may reflect a preference to do something alone to avoid feeling anxious (Tsai et al., 2009) or a maladaptive coping strategy (Hausenblas & Giacobbi, 2004). More specifically in relation to Internet addiction, it has been proposed that online communication is preferred to offline communication by people with high scores on Neuroticism due to social anxiety (Ehrenberg, Juckes, White & Walsh, 2008). The fact that study addiction was positively associated with Neuroticism most probably reflects underlying neurotic traits of insecurity, fear of failure and/or strict work ethics (Kets de Vries, 2005).

Extroversion

Extroversion was also positively related to all the seven behavioral addictions, and four of the associations were statistically significant (i.e., Facebook addiction, exercise addiction, mobile phone addiction, and compulsive buying). It is assumed that people with high scores on Extroversion seek out stimulation (Eysenck, 1967), thus this might be one explanation why Extroversion is associated with addictions more generally (Hill, Shen, Lowers & Locke, 2000). The findings between Extroversion, and both Facebook addiction and mobile phone addiction, were in line with previous studies (Andreassen, Torsheim et al., 2012; Bianchi & Phillips, 2005) and confirm the notion that extroverts may use these types of media as a way of expressing their social needs and tendencies (Bianchi & Phillips, 2005; Ross et al., 2009). The relationship between Extroversion and exercise addiction found in the present study might also reflect that Extroverts are typically energetic and active, which may make them more prone to exercise addiction than introverts (Hausenblas & Giacobbi, 2004). It was also found that Extroversion was associated with compulsive buying. This finding is consistent with previous studies as well as providing evidence to support the notion that Extroverts may purchase certain types of products excessively as means to express themselves or a group identity (Verplanken & Herabadi, 2001).

Openness to experience

Openness to experience was related, only negatively, to two behavioral addictions (i.e., Facebook addiction and mobile phone addiction). These findings are somewhat surprising in that previous studies have shown Openness to be positively associated with frequency of social media use (Correa, Hinsley & de Zuniga, 2010). However, as Facebook and mobile phones are no longer solely regarded as novel products for young adults (Prensky, 2001), this might explain the negative association between Openness and the two aforementioned behavioral addictions. An explanation to why Openness to experiences only showed an association to two of the seven behavioral addictions is that this specific personality dimension has been difficult to replicate across cultures, and therefore there is uncertainty about the validity of this specific dimension (John, Naumann & Soto, 2008).

Agreeableness

Agreeableness was negatively correlated with all seven behavioral addictions of which four associations were statistically significant (i.e., Internet addiction, exercise addiction, mobile phone addiction, and compulsive buying). The findings contrast those of Kern (2010) who found Agreeableness to be positively related to exercise addiction. They are also opposed to Mowen and Spears (1999) who reported that Agreeableness was positively associated with compulsive buying. However, the findings of the present study are in line with Hausenblas and Giacobbi (2004) who reported a negative association between Agreeableness and exercise addiction. Taking into consideration that previous studies have shown inconsistent results concerning the relationship between Agreeableness and behavioral addictions, it is interesting that the present study found such consistent results. One explanation for the results might be that people with behavioral addictions often come into conflict with others due to their behavior (Weinstein & Lejoyeux, 2010), which would directly conflict with some of the basic features of Agreeableness, such as being likeable, pleasant, and emphasizing harmony in relations with others (Graziano & Tobin, 2009). Therefore, it is proposed that high scores on Agreeableness may be a protective factor for developing behavioral addictions, due to a motive to avoid interpersonal conflicts.

Conscientiousness

Conscientiousness appeared to be the independent variable that had strongest relationship with the behavioral addictions investigated in the present study, both in number of significant associations and the magnitude of the associations. Conscientiousness was negatively and significantly related to Facebook addiction, video game addiction, Internet addiction, and compulsive buying, and positively and significantly related to exercise addiction and study addiction. The fact that Conscientiousness was negatively associated with Facebook addiction is in line with previous studies (Andreassen, Torsheim et al., 2012; Wilson et al., 2010), as are the findings concerning the negative association between Conscientiousness and video game addiction (Peters & Malesky, 2008), the negative association between Conscientiousness and Internet addiction (Gnisci et al., 2011), and the negative association between Conscientiousness and compulsive buying (Mowen & Spears, 1999; Rodriguez-Villarino et al., 2006; Verplanken & Herabadi, 2001; Wang & Yang, 2008).

These findings can been explained based on low priority of duties and obligations (Andreassen, Griffiths et al., 2012), lack of planning ability (Verplanken & Herabadi, 2001), low self-control, weakness for temptations (Wang & Yang, 2008), and procrastination (Lee, Kelly & Edwards, 2006) that typically characterizes people with low scores on Conscientiousness. In the present study, Conscientiousness was found to be positively related to both exercise addiction and study addiction. There are no previous studies that have linked or associated exercise addiction with Conscientiousness, although previous studies have found a positive association between Conscientiousness and exercise behavior (Courneya & Hellsten, 1998). Empirical research into study addiction is extremely scarce, but previous studies on a related behavior (i.e., workaholism), have showed it to be positively associated with Conscientiousness (Andreassen et al., 2010; Aziz & Tronzo, 2011; Burke et al., 2006).

Thus, the findings presented here are in line with the notion of people with high scores on Conscientiousness as being organized, industrious and hardworking (Lund, Tamnes, Moestue, Buss & Vollrath, 2007). The finding that some behavioral addictions were negatively associated with Conscientiousness (i.e., Facebook addiction, video game addiction, Internet addiction and compulsive buying) while others (i.e., exercise addiction and study addiction) were positively associated with Conscientiousness, might perhaps reflect the previously mentioned difference between negative and positive addictions, where the latter are characterized by producing feelings of increased self-efficacy (Glasser, 1976).

Overall considerations

Taken together, the results of the present study indicate that behavioral addictions seem to be related to personality traits, although the associations vary. Thus, the findings give reason to differentiate between addictive behaviors. Evolutionary psychologists have suggested that moderate scores on the five-factor personality traits facilitate social adaptation. However, extreme versions of these seem to predict maladaptive or counter-productive behavior (Nettle, 2006). Thus, it could perhaps be speculated that extreme scores on the traits of the five-factor model of personality represent vulnerabilities or risk factors for developing behavioral addictions or other mental disorders.

Neuroticism may be related to survival in the sense of looking out for physical or psychological threats. The present study suggests that this trait may be a risk factor for excessive behavior related to being prepared and on the top of things (exercise, studying, buying, Internet use). Extroversion seems to be a risk factor related to behaviors reflecting social and physical stimulation (Facebook use, exercise, mobile phone use, and buying). Openness was negatively related to mobile phone addiction, and may be a protective factor related to very common behaviors. Agreeableness was negatively related to several addictions (Internet use, exercise, mobile phone use, and buying) probably due to the conflict creating aspects many behavioral addictions may cause. Conscientiousness seems to be a protective factor for *unproductive behavioral addictions* (Facebook use, video gaming, Internet use, buying) but stands out as a risk factor for *positive* or *productive behavioral addictions* (exercise and studying). The distinction between *unproductive* and *productive* behavioral addictions bears some resemblance to the distinction between impulsive control disorders and obsessive–compulsive disorder (OCD). In line with this, it should be noted that OCD personality disorder has been conceived of as a maladaptive variant of Conscientiousness (Samuel & Widiger, 2011).

Strengths and limitations

Some limitations of the present study should be noted. The sample mainly comprised young female university students, therefore the findings cannot be generalized to other populations without some reservation. The validity of some of the behavioral addictions may be questionable. None of the addictions studied in the present study are recognized in current psychiatric diagnostic systems (e.g., American Psychiatric Association, 1994; World Health Organization, 1992). There have also been questions raised about the validity of some behavioral addictions. For example, has it been suggested that Internet addiction is a rather "empty concept", in that the addiction is not related to the Internet in itself but to its specific content and applications (Chou, Condron & Belland, 2005; Widyanto & Griffiths, 2006). In the present study, the whole range of scores of the instruments assessing behavioral addictions was used in the analyses. Therefore, some of the variance explained might reflect different levels of non-pathological scores. The reason for this approach is that clinical cut-offs have not have been developed for all the instruments used in the present study. As many of the behaviors described in the instruments used for assessing behavioral addictions may be considered unwanted and negative, there is a risk that the data might have been influenced by social desirability bias (Elmes, Kantowitz & Rediger III, 2003). However, the fact the all data were collected anonymously and confidentially presumably inhibited such bias. Furthermore, a cross-sectional design in the present study was employed and therefore drawing conclusions concerning causes and effects cannot be drawn. Also, all data in the present study were based on self-report, thus the results may have been influenced by the common method bias (Podsakoff, MacKenzie, Lee & Podsakoff, 2003). Finally, although the present study sample size provided acceptable statistical power (Cohen, 1988), the sample size was still quite small. Thus cross-validation of the current study with larger samples should be carried out. As far as the authors are aware, the present study is the first to simultaneously investigate as many as seven behavioral addictions and their interrelationship, and their relationship to the five-factor model of personality. Therefore, the paper significantly adds to the existing literature. The instruments used in the present study were standardized and all showed adequate reliability as the Cronbachs alpha's varied between .74 and .86. Future studies in this field should therefore use longitudinal designs in order to better assess the directionality between the concepts. In addition, future studies should use larger and more representative samples in terms of gender and age.

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