



Adolescent type D personality and social networking sites addiction: A moderated mediation model of restorative outcomes and affective relationships



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ARTICLE INFO

Keywords:

Adolescents
Type D personality
Social networking sites addiction
Restorative outcomes
Affective relationships

ABSTRACT

Type D personality denotes the joint tendency towards negative affectivity and social inhibition. The recent research has regarded Type D personality as a risk factor of social networking sites addiction. The current study aimed to test whether restorative outcomes would mediate the relation between Type D personality and social networking sites addiction, and whether affective relationships would moderate simultaneously the mediating process. A valid sample of 679 adolescents (mean age = 13.29 ± 0.77 years) participated in our paper-and-pencil survey. Results showed that, after controlling for age and gender, Type D personality positively correlated with social networking sites addiction, and it increased social networking sites addiction via escalating participants' restorative outcomes. Moreover, only affective relationships with friends moderated the mediating effect: for adolescents with low levels of affective relationships with friends, the indirect effect of Type D personality on social networking sites addiction was significant; contrarily, the indirect effect for high levels of affective relationships with friends was non-significant. The current study indicated that Type D personality as a risk factor interacted with other factors (e.g., affective relationships with friends) to contribute to adolescent social networking sites addiction. The limitations and practical implications were discussed.

1. Introduction

Social networking sites addiction has been described as an inability of control one's use of online social networking (Andreassen, 2015), which comprises an addiction to a wide range of specific applications, such as Facebook addiction (e.g., Brailovskaia and Margraf, 2017; Brailovskaia et al., 2018). The adverse consequences of social networking sites addiction include personal emotional, mental and social dysfunction in various daily activities (Andreassen and Pallesen, 2014). Some researchers perceive social networking sites addiction to be a subtype of behavioral addiction (e.g., Griffiths et al., 2014; Kuss and Griffiths, 2017), the main characteristics of which encompass salience (e.g., permanent thinking of social networking sites), mood modification (e.g., mood improvement by social networking sites use), tolerance (e.g., increasing of social networking sites usage time to achieve prior positive outcomes), withdrawal symptoms (e.g., growing nervousness without social networking sites use), relapse (i.e., often leading to a reinstatement of problematic social networking sites use), and conflict

(e.g., interpersonal problems caused by excessive social networking sites use) (Griffiths et al., 2014; Kuss and Griffiths, 2017). In China, currently, most people are readily exposed to social networking sites from childhood. For instance, as of December 2015, China Internet Network Information Center (2016) reported that young netizens' usage rate of instant messaging tools (e.g., WeChat), Weibo and BBS were 92.4%, 37.6% and 18%, respectively, higher than the overall level of Internet users. Moreover, compared to their parents, the youth have the ability of easily visiting popular social networking sites such as WeChat (like Facebook) and Weibo (like Twitter), which raises their likelihood of social networking sites addiction and increases the attention of researchers to adolescent social networking sites addiction (e.g., Wang et al., 2018).

Originated from existing personality theory (Denollet et al., 1995; Denollet and Brutsaert, 1998), Denollet (2000) introduced the construct of distressed personality (i.e., Type D personality) and defined it by the combination of two personality traits, namely negative affectivity and social inhibition. 'Type D' individuals, referring to those who are

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<https://doi.org/10.1016/j.psychres.2018.11.036>

Received 8 July 2018; Received in revised form 16 November 2018; Accepted 16 November 2018

Available online 17 November 2018

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predisposed to Type D personality, are more likely to experience increased negative emotions across time and situations (i.e., negative affectivity), and tend to inhibit self-expression or stop themselves from sharing emotions with others (i.e., social inhibition). Mols and Denollet (2010) reviewed the relevant data in the general population, and showed that Type D characteristics have been associated with negative mental health status (e.g., anxiety and mental distress), poor physical health status (e.g., more somatic complaints) and disease-promoting mechanisms (e.g., cardiovascular disease).

'Type D' individuals may become addicted to using social networking sites, which perhaps attributes to the combined effect of both Type D personality traits and this online platform features. As virtual communities, social networking sites allow users to create personal/public profiles and interact with virtual/real-life friends (Kuss and Griffiths, 2011). More importantly, social networking sites have been commonly considered as one of the great platforms to pour out personal thoughts or experiences (Andreassen, 2015). As the 'Poor-Get-Richer' hypothesis suggests (Walther, 1996; Valkenburg et al., 2005), those who chronically feel unhappy and/or lack necessary social networks have the tendency to compensate for themselves with more frequent social networking sites usage. Therefore, 'Type D' individuals may become addicted to using social networking sites by means of excessive visiting online social networking (Holdoš, 2017).

1.1. The mediating role of restorative outcomes

Based on the attention restoration theory (Kaplan, 1995, 2001), restorative outcomes refer to the recovery of a person's mental dispose of mental fatigue when engaging in natural environments. For example, when a person is in an environment, if he/she feels that his/her ability to reflect on issues of importance is enhanced, it means that he/she has got restorative outcomes during exploring that environment. The notion of restorative outcomes has been employed from natural environments to man-made environments, such as virtual environments (Jones et al., 2018). Social networking sites may also serve as one of the artificial restorative environments and permit users to achieve restorative outcomes psychologically during the interaction process. First, social networking sites allow users to forget about their problems temporarily and heighten their feelings of happiness, enjoyment, and relaxation (Andreassen, 2015). For example, online bereavement communities as restorative environments help bereaved people overcome grief (Döveling, 2015). More importantly, compared to natural restorative environments, social networking sites have the advantage of being accessed easily at most restorative moments. In this vein, for 'Type D' adolescents, the aspiration of restorative outcomes may be an alluring factor that drives them to use social networking sites, and further leads to social networking sites addiction.

Although not yet examined, there is some evidence indirectly supporting the mediating role of restorative outcomes in the relation between Type D personality and adolescent social networking sites addiction. According to the uses and gratifications theory (Okazaki, 2006), users try to obtain gratifications from online social networking based on their own needs or motivations. As such, restorative outcomes may be seen as a representation of social gratifications of adolescents. Compared to normative adolescents, 'Type D' teenagers may long for seeking social support, developing new social networks, and getting over the poor emotional state through social networking sites usage to a greater extent. Consistent with these perspectives, empirical research has shown that adolescents suffering negative emotions (e.g., depression) and social inhibition report higher intensity of social networking sites usage (Amichai-Hamburger and Hayat, 2013; Oberst et al., 2017).

Additionally, adolescents may anticipate repeating such a fully-gratified experience to retain and enlarge restorative outcomes (Okazaki, 2006). During the interaction with social networking sites, adolescents' self-control mechanism may 'seize up' owing to their

psychologically and physically immaturity (Brand et al., 2014; Nie et al., 2016). Empirical studies have revealed that adolescents' psychological motivation lead them to visit social networking sites (e.g., Krisanic, 2008; Raacke and Bondsraacke, 2008), and fulfilled gratifications or heightened enjoyments enable them to revisit and even addicted to social networking sites (Huang et al., 2014). Therefore, the present study predicted that 'Type D' adolescents who yearn for persistent restorative outcomes from online social networking are more likely to addicted to using social networking sites. Thus, the following hypothesis was proposed:

H1: Type D personality will positively predict social networking sites addiction via restorative outcomes.

1.2. The moderating role of affective relationships

Not all 'Type D' adolescents equivalently get more restorative outcomes from social networking sites and lead to social networking sites addiction. This discrepancy may stem from some protective factors (e.g. affective relationships) that might alter the impact of Type D personality on restorative outcomes and social networking sites addiction. Affective relationships can be perceived as the subjective representation of close social relationships, which are essential to the development of adolescents (Gini, 2008). Takahashi and Sakamoto (2000) assessed the construct of affective relationships by assigning psychological functions to significant others, which involved family members and multiple significant nonfamily individuals. Considering the most proximal relationships for adolescents (i.e. affective relationships with parents and friends), the current study expects that the association between Type D personality and adolescent social networking sites addiction will be moderated simultaneously by affective relationships with both parents and friends. In the following section, we would review previous research findings to support this postulation in turn.

First, referring to the family system theory (Davies and Sturge-Apple, 2014), stronger affective relationships with parents (i.e., parent-adolescent relationship) have the potential to buffer adolescents from the negative impact of Type D personality. For the majority of adolescents, parents are one of the most important and influential adults who provide emotional support, warm attention, and meticulous care to them (Peterson and Bush, 2015). Within better parent-adolescent relationships, adolescents are less likely to suffer negative affective and foster problem behaviors, which helps them to adapt well and complete the process of socialization (Wentzel, 1998; Peterson and Bush, 2015; Schofield et al., 2016; Withers et al., 2016).

Furthermore, building on the theory of personality development (Sullivan, 1953), adolescents' affective relationships with friends (i.e., friendships) may also moderate the direct and indirect relation between Type D personality and adolescent social networking sites addiction. Sullivan (1953) states that close friendships provide developmental advantages (e.g., companionship) with adolescents, particularly as a source of support for those experiencing risk factors. For 'Type D' adolescents, close friendships may establish a protective context when they face social challenges, thereby discontinuing their pursuit of other supportive contexts. Prior studies have found that involving in a reciprocated friendship can buffer the association between plenty of risk stressors (e.g., negative life events) and later psychosocial maladjustment (Wasserstein and Annette, 1996; Laursen et al., 2007; Wang et al., 2017). Taken together, the following integrative moderating hypothesis was proposed:

H2: Positive affective relationships with both parents and friends will alleviate the direct and indirect associations between Type D personality and adolescent social networking sites addiction.

1.3. The present study

To date, only a few studies have examined the mediating and moderating mechanisms underlying the relation between Type D

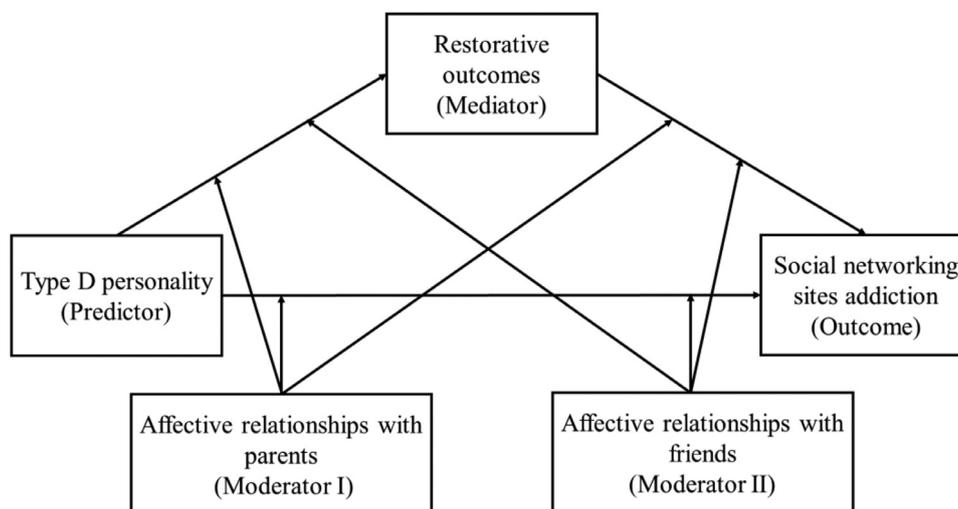


Fig. 1. The proposed moderated mediation model.

personality and social networking sites addiction (e.g., Błażnio et al., 2017), which were conducted among samples of young adults. Given the high prevalence of online addictive behaviors among adolescents (e.g., Park et al., 2008; Weinstein et al., 2014), it is of theoretical and practical importance to take ‘Type D’ adolescents as the vulnerable population of social networking sites addiction. Consequently, our study utilized a sample of adolescents to examine a moderated mediation model in which, first, restorative outcomes from social networking sites mediated the association between Type D personality and adolescent social networking sites addiction; second, the direct and indirect relations between Type D personality and social networking sites addiction through restorative outcomes were moderated by adolescents’ affective relationships with both parents and friends (Fig. 1).

2. Methods

2.1. Participants

The participants were recruited from one randomly selected junior high school in a sub-provincial city of Fujian province located in the southeast coast of China. As students from Grade nine faced high pressure from entrance examination preparation, we only distributed the questionnaires to all classes of Grade seven and eight. A total of 821 questionnaires were collected through our survey, and 679 were valid, yielding a valid response rate of 82.7%. These respondents consisted of 322 girls and 351 boys (6 students did not report their gender). Among them, the average age was 13.29 (SD = 0.77), ranging from 11 to 16. Among them, 53.3% were from Grade seven and 46.1% were from Grade eight (4 students did not report their grade). About 86.7% of the students were from the urban areas and 8.1% were from the rural areas (35 participants did not fill out their areas on the questionnaire).

2.2. Measures

2.2.1. Type D personality traits

Adolescent personality of Type D was measured by Type D Personality scale. This scale was developed by Denollet (2005) and adapted into the context of Chinese culture by Bai et al., (2007). The Chinese version of the scale consists of 7 items relating to negative affectivity and 7 items related to social inhibition. A sample item is “I would rather keep other people at a distance.” Participants rated each item on a 5-point Likert scale (0 = “definitely disagree” to 4 = “definitely agree”). Responses of all items were averaged, with higher scores indicating higher levels of Type D personality traits. In the current study, Cronbach’s alpha coefficient of this scale was 0.89. The composite

reliability was 0.89, and the average variance extracted value was 0.40.

2.2.2. Restorative outcomes from social networking sites

Adolescent restorative outcomes from social networking sites were assessed by the Chinese version of Restoration Environment Scale of Museum (Kaplan et al., 1993; Ye et al., 2014). One subscale (i.e., restorative outcomes) was adapted in the present study, which consists of 5 items (e.g., “I feel refreshed and restored when I use social networking sites”). Participants rated each item on a 7-point scale (1 = “completely disagree” to 7 = “completely agree”). The means across all items were calculated, with higher scores indicating higher levels of restorative outcomes from social networking sites. For the current research, Cronbach’s alpha coefficient of this scale was 0.84. The composite reliability was 0.84, and the average variance extracted value was 0.52.

2.2.3. Social networking sites addiction

Adolescent level of social networking sites addiction was measured by the adaption of the Facebook Intrusion Questionnaire (Elphinston and Noller, 2011), which consists of 8 items (e.g., “I have been unable to reduce my social networking sites’ use”) assessing the associations between the involvement of social networking sites and eight aspects of behavioral addiction (e.g., salience). Participants rated each item on a 7-point scale (1 = “never” to 7 = “always”). Responses were averaged for all items, with higher scores referring to higher levels of social networking sites addiction. The Facebook Intrusion Questionnaire has shown good validity and reliability in Chinese adolescent (Błażnio et al., 2016a,b). For the present study, Cronbach’s alpha coefficient of this scale was 0.85. The composite reliability was 0.85, and the average variance extracted value was 0.41.

2.2.4. Affective relationships with parents

Adolescent affective relationships with parents were measured by the adaption of the Chinese version of Affective Relationships Scale. The original scale was developed by Takahashi and Sakamoto (2000), and the Chinese version of this scale was revised by Hou (2009). The Chinese version of Affective Relationships Scale consists of 12 items of six psychological functions: seeking proximity, receiving emotional support, receiving encouragement and help, and so forth (e.g., “I would like my father/mother and me to share our difficulties”). According to our research purpose, the study assessed the affective relationships with “parents” instead of the affective relationships with “father or mother” (e.g., “I would like my parents and me to share our difficulties”). Participants rated each item on a 5-point scale (1 = “completely disagree” to 5 = “completely agree”). The means across all items were calculated, with higher scores indicating higher levels of affective relationships with

parents. In this study, Cronbach's alpha coefficient was 0.91 for the Affective Relationships Scale with parents. The composite reliability was 0.91, and the average variance extracted value was 0.46.

2.2.5. Affective relationships with friends

Adolescent affective relationships with friends were also measured by the adaption of the Chinese version of the Affective Relationships Scale (Takahashi and Sakamoto, 2000; Hou, 2009). Our study also made a slight adjustment to the expression in the Chinese version of this scale, that is, to change the affective relationships with “the same-gender friends or the opposite-gender friend” into the affective relationships with “friends”. The scale consists of 12 items rated on a 5-point scale (1 = “completely disagree” to 5 “completely agree”). A representative item was: “I would like to be with my friends when I feel sad”. Responses were averaged for all items, with higher scores referring to higher levels of affective relationships with friends. For the present study, Cronbach's alpha coefficient was 0.92 for the Affective Relationships Scale with friends. The composite reliability was 0.92, and the average variance extracted value was 0.48.

2.3. Procedure

The investigation was approved by the first author's university's Ethics Committee. After informed consents were approved from school principals, teachers and the participants themselves, the survey was conducted in classrooms in March 2018. Pencil and paper questionnaires were distributed to target classes by well-trained research assistants. Students were invited to fill out self-report questionnaires anonymously and voluntarily, and they were free to terminate the participation at any time. All participants received a small gift as a reward after complete all the questionnaires.

2.4. Statistical analysis

First, the current study calculated descriptive statistic and bivariate correlations by using SPSS software (version 24.0). Second, the present study conducted mediation analysis by employing Hayes's (2013) PROCESS macro for SPSS (Model 4) to test the mediating effect of restorative outcomes. Finally, our study further explored whether the mediation process was moderated by affective relationships with both parents and friends and the moderated mediation analysis was performed by using Model 76 of the PROCESS macro. Hayes's (2013) PROCESS macro provides bootstrap confidence intervals (CIs, a highly accurate confidence interval) to examine the indirect effect of Model 4 and the conditional indirect effect of Model 76 based on 5000 random samples. An effect is considered significant if the 95% confidence interval does not include zero. All variables were standardized prior to analyses.

3. Results

3.1. Preliminary analyses

Descriptive statistics (i.e., means, standard deviations, skewness and kurtosis) and bivariate correlations among the data were presented in Table 1. The skewness and kurtosis values showed that all variables were normally distributed (i.e., skewness < |2.0| and kurtosis < |7.0|; Hancock and Mueller, 2010). Bivariate correlation coefficients indicated that Type D personality was positively correlated with social networking sites addiction ($r = 0.29, p < 0.001$) and restorative outcomes ($r = 0.11, p < 0.01$), whereas Type D personality was negatively but weakly correlated with affective relationships with parents ($r = -0.11, p < 0.01$). Additionally, affective relationships with friends was positively correlated with social networking sites addiction ($r = 0.27, p < 0.001$) and restorative outcomes ($r = 0.25, p < 0.001$).

Table 1
Descriptive statistics and bivariate correlations among variables.

	1	2	3	4	5
1. Type D	–				
2. Social networking sites addiction	0.29***	–			
3. Restorative outcomes	0.11**	0.59***	–		
4. Affective relationships with parents	-0.11**	0.004	0.06	–	
5. Affective relationships with friends	-0.07	0.27***	0.25***	0.37***	–
Skewness	0.56	0.65	0.21	-1.00	-1.03
Kurtosis	-0.14	0.25	-0.29	0.87	1.11
Boys-Mean scores	1.35	2.65	3.36	3.83	3.96
Boys-Standard Deviations	0.78	1.18	1.43	0.86	0.85
Girls-Mean scores	1.43	2.97	3.43	3.95	4.13
Girls-Standard Deviations	0.83	1.18	1.32	0.82	0.74

Note. $N = 679$.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

3.2. Testing for mediation

Our study followed Hayes's (2013) procedure of Model 4 to conduct the mediation analysis. As shown in Fig. 2, after controlling for covariates (i.e. gender and age), Type D personality was found to be positively associated with restorative outcomes ($\beta = 0.10, p < 0.01$), which in turn predicted social networking sites addiction ($\beta = 0.56, p < 0.001$). The residual direct effect was also significant ($\beta = 0.22, p < 0.001$), which indicated that restorative outcomes partially mediated the association between Type D personality and adolescent social networking sites addiction (indirect effect = 0.06, $SE = 0.02$, 95%CI = [0.01, 0.11], accounting for 20.00% of the total effect). This model accounted for 42% of the variance in social networking sites addiction among adolescents.

3.3. Testing for moderated mediation

To examine the moderated mediation hypothesis, this study used Model 76 of PROCESS macro to examine whether the direct and indirect relations between Type D personality and social networking sites addiction were moderated by both affective relationships with both parents and friends. As Table 2 presents, only the interaction effect of Type D personality and affective relationships with friends on restorative outcomes was significant ($\beta = -0.08, p < 0.05$, see as Model 2). This model accounted for 44% of the variance in adolescent social networking sites addiction.

3.4. Supplementary moderated mediation analyses

As presented in Fig. 3a, affective relationships with parents did not moderate the indirect links between Type D personality and restorative outcomes, nor did it moderate the direct relations between Type D personality and social networking sites addiction; only affective relationships with friends moderated the associations between Type D personality and restorative outcomes. Accordingly, for simplified purpose, we used Model 7 of PROCESS macro to test the statistical significance of the moderated-mediation effect of affective relationships with friends. In this model, covariates to restorative outcomes and social networking sites addiction are gender, age and affective relationships with parents, for which affective relationships with friends only moderates one connection (Type D personality→restorative outcomes, see as Fig. 3b).

For descriptive purpose, we plotted predicted restorative outcomes against Type D personality in terms of the bootstrapping results (Fig. 4), separately for low and high levels of affective relationships with friends

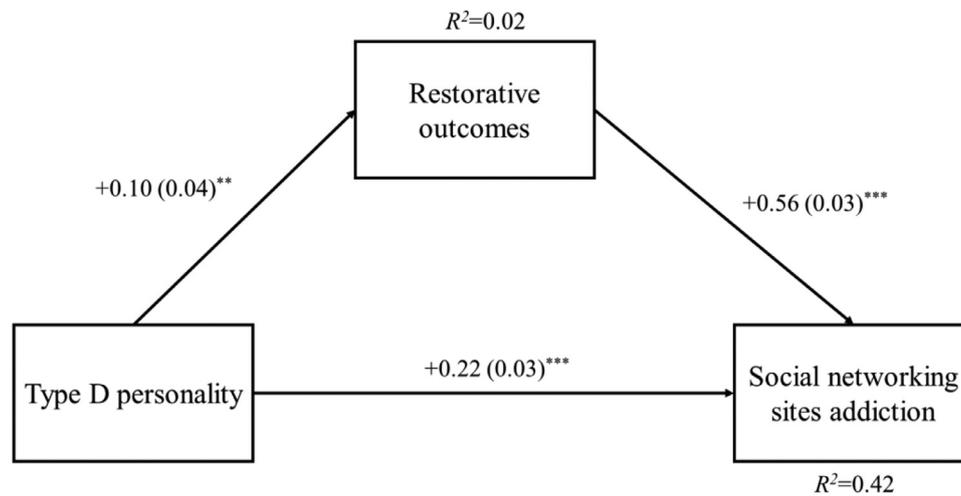


Fig. 2. The mediation of restorative outcomes ($N = 679$). Path values are the path coefficients (standard errors). All covariates (age and gender) were controlled during this analysis.

(1 SD below the mean and 1 SD above the mean, respectively). Simple slope tests indicated that for adolescents with low levels of affective relationships with friends, higher levels of Type D personality were associated with higher levels of restorative outcomes ($b_{simple} = 0.20, p < 0.001$); however, for adolescents with high levels of affective relationships with friends, the relation between Type D personality and restorative outcomes became non-significant ($b_{simple} = 0.04, p > 0.05$). The bootstrapping results further indicated that the indirect effect of Type D personality on social networking sites addiction via restorative outcomes was moderated by affective relationships with friends. For adolescents with low levels of affective relationships with friends, the indirect effect of Type D personality on social networking sites addiction via restorative outcomes was 0.11, $SE = 0.03, 95\%CI = [0.06, 0.16]$. In contrast, the indirect effect for adolescents with high levels of affective relationships with friends was 0.02, $SE = 0.03, 95\%CI = [-0.04, 0.09]$.

4. Discussion

The current study is one of the first few studies that explored possible mechanisms through which Type D personality influences adolescent social networking sites addiction (Blachnio et al., 2017; Holdoř, 2017). The important contribution of this study is to innovatively

regard social networking sites as possible restorative environments and shed new light on *how* and *when* Type D personality is related to adolescent social networking sites addiction. This study will discuss each of the research hypotheses in the following sections.

4.1. The mediating role of restorative outcomes

As expected, our study found that Type D personality was positively associated with restorative outcomes from social networking sites, which in turn escalated adolescent social networking sites addiction. Therefore, restorative outcomes can serve as one of the pivotal mediating mechanisms for explaining why ‘Type D’ adolescents are more likely to reliance on social networking sites. In line with the uses and gratifications theory (Okazaki, 2006), mood regulation and perceived social support may serve as important strengthening motivations that drive ‘Type D’ adolescents to participate in social networking sites. Consequently, ‘Type D’ adolescents get more restorative outcomes from social networking sites, and that may trigger their revisit and problematic behaviors (Huang et al., 2014). Furthermore, based on the cognitive-behavioral model (Davis, 2001), Type D personality as a pre-disposed vulnerability that may affect individuals' normative online behaviors with certain online interaction experience (i.e. restorative outcomes).

Table 2
Testing the moderated mediation effect of Type D personality on social networking sites addiction.

Predictors	Model 1(Social networking sites addiction)		Model 2(Restorative outcomes)		Model 3(Social networking sites addiction)	
	β	t	β	t	β	t
Gender	0.10	2.68**	-0.003	-0.08	0.10	3.31**
Age	0.06	1.64	0.05	1.33	0.03	1.15
Type D	0.29	8.33***	0.12	3.20**	0.23	7.87***
Affective relationships with parents	-0.09	-2.42*	-0.03	-0.83	-0.08	-2.38*
Affective relationships with parents \times Type D	0.05	1.62	0.02	0.58	0.04	1.54
Affective relationships with friends	0.31	8.04***	0.27	6.64***	0.17	5.11***
Affective relationships with friends \times Type D	-0.01	-0.30	-0.08	-2.39*	0.03	1.15
Restorative outcomes					0.53	17.15***
Affective relationships with parents \times Restorative outcomes					-0.02	-0.52
Affective relationships with parents \times Restorative outcomes					0.03	0.94
R^2	0.19		0.09		0.44	
F	21.77***		9.22***		53.04***	

Note. $N = 679$. Each column is a regression model that predicts the criterion at the top of the column. Covariates = gender and age.

* $p < 0.05$.
 ** $p < 0.01$.
 *** $p < 0.001$.

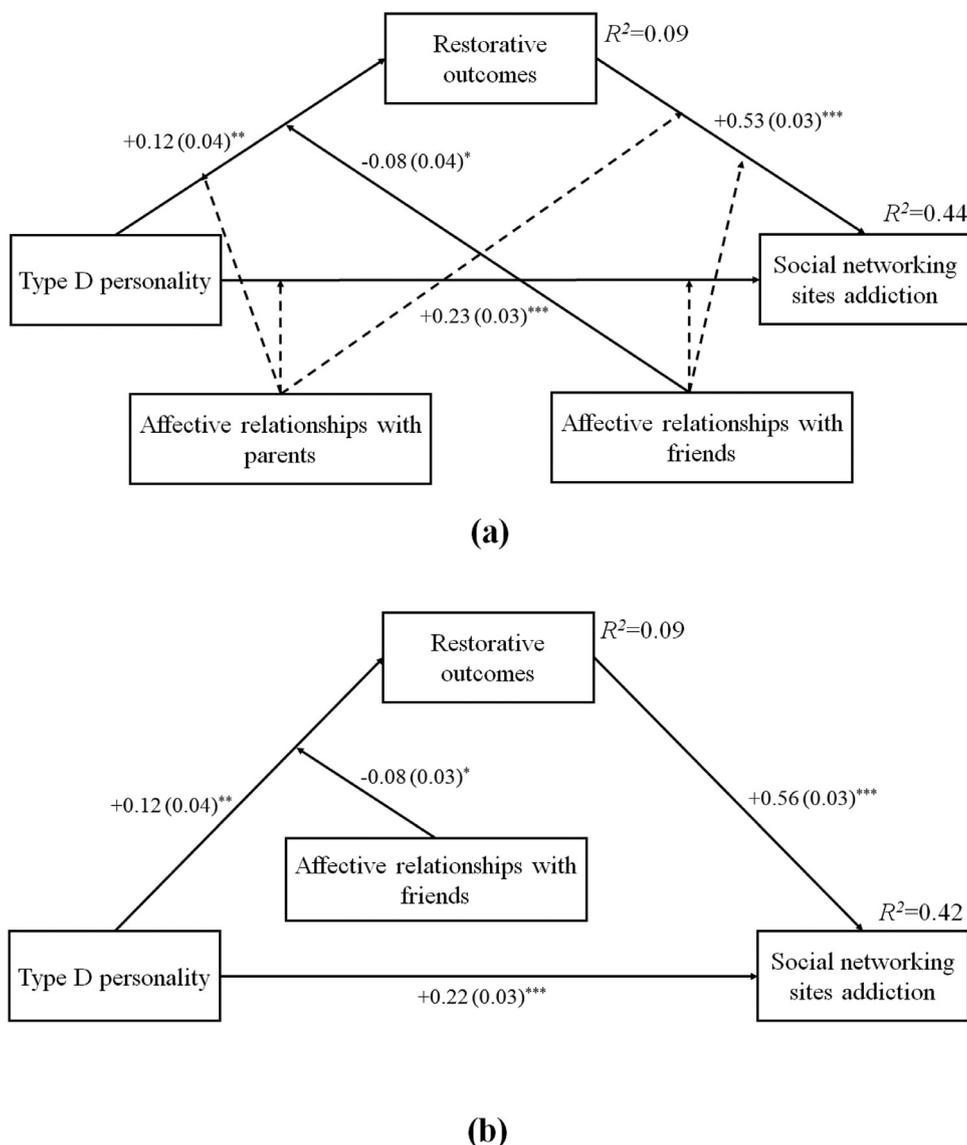


Fig. 3. (a) the proposed moderated mediation analysis (using Model 76 of Process macro, $N = 679$): covariates are gender and age, for which affective relationships with both parents and friends moderate all links (Type D personality→restorative outcomes→social networking sites addiction); (b) the simplified moderated mediation analysis (using Model 7 of Process macro, $N = 679$): covariates are gender, age and affective relationships with parents, for which affective relationships with friends only moderates one connection (Type D personality→restorative outcomes). Path values are the path coefficients (standard errors).

In addition, each of the separate pathways in our mediation model is remarkable. For the first connection of the mediation chain (i.e. Type D personality→restorative outcomes), our finding is consistent with the ‘Poor-Get-Richer’ hypothesis (Walther, 1996; Valkenburg et al., 2005) and the “emotion undoing” hypothesis (Fredrickson et al., 2000), both of which demonstrate that positive states exert a significant role in regulating individuals’ negative emotions. ‘Type D’ adolescents may need more positive states to reduce their persistent mental fatigue, which in turn could lead them to obtain more restorative effects from social networking sites. For the second link of our mediation model (i.e. restorative outcomes→social networking sites addiction), this study indicated that restorative outcomes were positively related to adolescent social networking sites addiction. This finding strengthens the previous studies on the associations of personal positive states (e.g. positive outcome expectancy or flow experience) with online addictive behaviors (Khang et al., 2013; Yang et al., 2014; Wu et al., 2016). Specifically, according to Bandura’s social learning theory (Katz et al., 2000), adolescents with higher restorative outcomes may try to repeatedly experience this positive state from online networks, which

possibly raise their risk of social networking sites addiction.

4.2. The moderating role of affective relationships

One interesting finding is that affective relationships with friends only moderated the path between Type D personality and restorative outcomes (first-stage moderation). The association between Type D personality and restorative outcomes was significant for adolescent with low level of affective relationships with friends; however, it was not significant for adolescents with high level of affective relationships with friends. According to the affective relationships models (Takahashi and Sakamoto, 2000), friends are one of the primary sources of social support. As such, the scarce of friendships is an unpleasant and painful event for anyone, especially for adolescents. Thus, for adolescents with low level of affective relationships with friends, they may make more efforts to establish online new social networks to compensate for heavily offline negative emotion and loneliness caused by Type D personality (Valkenburg et al., 2005). On the contrary, in the case of high level of affective relationships with friends, ‘Type D’ adolescents

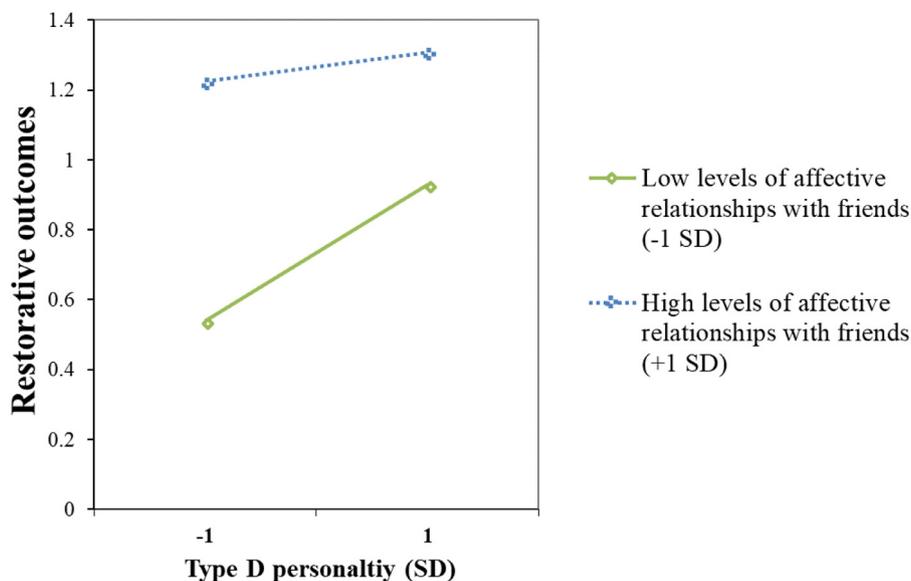


Fig. 4. The moderating role of affective relationships with friends in the relation between Type D personality and restorative outcomes (the interaction of Type D personality and affective relationships with friends probed at $-1/+1$ SD).

may visit social networking sites for the same purpose as normative teenagers, that is, to maintain existing interpersonal interaction rather than seek new friends (Valkenburg et al., 2005). Both ‘Type D’ and normative adolescents are able to communicate with friends in such online supportive environments and achieve similar psychological restorative outcomes, so the relationship between Type D personality and restorative outcome becomes non-significant. Therefore, strong affective relationships with friends may enable adolescents to utilize social networking sites for relationship maintenance and further provides certain psychological restorative outcomes regardless of whether they are ‘Type D’ or normative teenagers.

However, our study did not find that affective relationships with friends moderated the association between restorative outcomes and adolescent social networking sites addiction (second stage moderation). This result could be explained by the critical role of online experience in the formation of problematic Internet use. According to online flow theory (Csikszentmihalyi and Csikszentmihalyi, 1992), restorative outcomes resembles one of fundamental and optimal experiential state during the interaction with social networking sites. Therefore, when adolescents are engrossed in certain online activities, they may put their real friends aside absolutely and only pay attention to the attractive virtual world. In addition, contrary to our expectation, affective relationships with parents did not moderate the direct and indirect relations between Type D personality and adolescent social networking sites addiction. A possible explanation is that peers are the central figure in the adolescents’ social network. Although parents play a unique and important role in adolescents’ social and emotional health (Peterson and Bush, 2015), normative developmental tasks require adolescents to establish intimate relationships with peers (Reitz-Krueger et al., 2015), especially friendships (Choukas-Bradley and Prinstein, 2014). Further research could examine the role of parents and other family members in the use of social networking sites among adolescents.

Collectively, by incorporating the mediating role of restorative outcomes and the moderating role of affective relationships with friends, the present study extends the notion of restorative environments to the study of Type D personality and social networking sites addiction. This moderate mediation model advances our understanding of the mechanisms underlying the association between Type D personality and social networking sites addiction among adolescents. The current study indicated that Type D personality can indirectly influence

adolescent social networking sites addiction by repeatedly achieving restorative outcomes. Moreover, as a risk factor, Type D personality interacts with other factors such as affective relationships with friends to contribute to adolescent social networking sites addiction.

4.3. Limitations and practical implications

Several limitations should be addressed. First, we need to be cautious about causal inferences due to the cross-sectional nature of the current research design. In specific, according to the literature dealing with changes of personality in substance-use disorders (e.g., Hicks et al., 2012), the relationship between social networking sites addiction and Type D personality might be bidirectional: chronic online addictive behaviors might also influence Type D personality traits. Therefore, future research should utilize other methodologies such as longitudinal designs to address this limitation. Second, the data was collected through adolescents’ self-reports; thus, future research should employ various measures (e.g., peer- or teacher-report) to better the accuracy of our findings. Third, although affective relationships with both parents and friends affective as moderators were simultaneously integrated into our model, the current study did not examine the moderating role of each important others (e.g., the same-gender friend vs. the opposite-gender friend). Given that adolescent girls and boys may have gender differences in making friends, future studies should be undertaken to conduct gender-specific analyses and examine the effect of same- and opposite-gender friends on adolescents online networking usage, respectively. Finally, the model was limited to adolescents recruited from a community sample instead of a clinical sample, which makes these findings less generalizable to other samples.

Despite these limitations, our findings have remarkable practical implications. First, given the negative impact of Type D personality among adolescents, early identifying and focusing on ‘Type D’ adolescents may be an effective way to reduce adolescent social networking sites addiction. Parents, teachers, and practitioners should pay special attention to adolescents who often show the joint tendency towards negative affectivity (e.g. irritability) and social inhibition (e.g. reticence), and further help them develop emotional regulation strategies and express themselves bravely. Second, our findings highlighted that restorative outcomes are a critical mechanism linking Type D personality and adolescent social networking sites addiction. Thus, families, schools, and the public should make great efforts to provide offline

restorative environments for adolescents, which helps to eliminate their mental fatigue, to refrain from “hiding” themselves in the virtual world. Third, this study showed that affective relationships with friends play a moderating role in the indirect association between Type D personality and social networking sites addiction. Therefore, creating a harmonious school atmosphere to build and maintain good peer relationships is beneficial to reduce the risk of social networking sites addiction among “Type D” adolescents.

5. Conclusions

In summary, this study contributes to existing literature by testing a moderated mediation model, which provides a deeper insight into understanding *how* and *when* Type D personality connects with adolescent social networking sites addiction. It provides evidence that the association between Type D personality and adolescent social networking sites addiction was partially mediated by restorative outcomes from social networking sites. Furthermore, the findings revealed that weak affective relationships with friends aggravated the adverse impact of Type D personality on restorative outcomes, which in turn increased the risk of social networking sites addiction among adolescent. These findings extend our knowledge of the mechanisms linking Type D personality and adolescent social networking sites addiction.

Acknowledgments

The current study was supported by the Outstanding Innovative Talents Cultivation Funded Programs 2018 of Renmin University of China and the Key Research Institute in Humanities and Social Sciences of the Ministry of Education (Academy of Psychology and Behavior, Tianjin Normal University, 14JJD190005). No financial interest and conflict in the present research.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.psychres.2018.11.036](https://doi.org/10.1016/j.psychres.2018.11.036).

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