



## Young adults' internet addiction: Prediction by the interaction of parental marital conflict and respiratory sinus arrhythmia



Hui Zhang<sup>a</sup>, Tracy L. Spinrad<sup>b</sup>, Nancy Eisenberg<sup>c</sup>, Yun Luo<sup>a</sup>, Zhenhong Wang<sup>a,\*</sup>

<sup>a</sup> Shaanxi Provincial Key Laboratory of Behavior and Cognitive Neuroscience, School of Psychology, Shaanxi Normal University, China

<sup>b</sup> T. Denny Sanford School of Social and Family Dynamics, Arizona State University, United States

<sup>c</sup> Department of Psychology, Arizona State University, United States

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### ABSTRACT

The aim of the current study was to address the potential moderating roles of respiratory sinus arrhythmia (RSA; baseline and suppression) and participant sex in the relation between parents' marital conflict and young adults' internet addiction. Participants included 105 (65 men) Chinese young adults who reported on their internet addiction and their parents' marital conflict. Marital conflict interacted with RSA suppression to predict internet addiction. Specifically, high RSA suppression was associated with low internet addiction, regardless of parental marital conflict; however, for participants with low RSA suppression, a positive relation between marital conflict and internet addiction was found. Internet addiction also was predicted by a significant three-way interaction among baseline RSA, marital conflict, and participant sex. Specifically, for men, marital conflict positively predicted internet addiction under conditions of low (but not high) baseline RSA. For women, marital conflict positively predicted internet addiction under conditions of high (but not low) baseline RSA. Findings highlight the importance of simultaneous consideration of physiological factors, in conjunction with family factors, in the prediction of young adults' internet addiction.

### 1. Introduction

Internet addiction refers to internet use that is excessive, uncontrollable, and compulsive (Kuss et al., 2013; Lam, 2015; Wartberg et al., 2016; Young, 1998). There has been a rise in this type of addiction for adolescents and adults (Jelenchick et al., 2012; Ko et al., 2012; Li et al., 2014; Shek and Yu, 2016; Yen et al., 2012). Internet addiction has been associated with various deleterious outcomes, such as physical, socioemotional, and interpersonal problems (Cao et al., 2011; Li et al., 2016; Liang et al., 2016). This study sought to understand factors that contribute to young adults' internet addiction, with a particular focus on both individual and family factors.

#### 1.1. Parental marital conflict and internet addiction

The family environment has been viewed as a particularly important context for individuals' social development and adjustment (Bowen, 1966; Ko et al., 2015). Family stressors, such as parental marital conflict, are related to individuals' problematic behaviors, including alcohol, drugs, or other substance use problems (e.g., Choo and Shek, 2013; Fish et al., 2015; Li et al., 2014). In recent years, research

has examined a link between parental marital conflict and a new form of addiction—internet addiction (Deng et al., 2012; Yen et al., 2007; Wang et al., 2011; Wu et al., 2016). For example, Yang et al. (2016) found that parental conflict in the home was related to high levels of internet addiction in a sample of Chinese college students.

Although marital conflict has been shown to predict a wide variety of maladaptive outcomes including internet addiction (De Leo and Wulfert, 2013; Koss et al., 2011; Yang et al., 2016), not all individuals are affected equally by detrimental or supportive environments (e.g., El-Sheikh et al., 2001; El-Sheikh and Whitson, 2006; Hastings et al., 2008). According to the diathesis-stress/dual-risk theory (DST; Monroe and Simons, 1991), individuals' sensitivity to stressful situations (or negative environmental contexts) depends on whether they are vulnerable (e.g., high biological reactivity, negative emotionality, or serotonin linked polymorphic region [5-HTTLPR] short alleles). Therefore, it is plausible to assume that parental marital conflict may place some adults, particularly vulnerable individuals, at risk for developing internet addiction.

\* Corresponding author at: Shaanxi Provincial Key Laboratory of Behavior and Cognitive Neuroscience, School of Psychology, Shaanxi Normal University, Xi'an 710062, China.  
E-mail address: [wangzhenhong@snnu.edu.cn](mailto:wangzhenhong@snnu.edu.cn) (Z. Wang).

### 1.2. Respiratory sinus arrhythmia and internet addiction

In terms of individual characteristics, self-regulation has been identified as a potential contributing factor to addictive behaviors, including internet addiction (Baumeister, 2003; Oh, 2003). People with deficient self-regulation might be at risk for addiction because of their failures to adequately monitor, judge, and control their internet usage (Caplan, 2010; LaRose et al., 2003). Respiratory sinus arrhythmia, a measure of the magnitude of heart rate variation across the respiratory cycle, is considered a physiological biomarker of the capacity for (emotional) self-regulation, which is not confounded by self-report (e.g., Berntson et al., 1997; Beauchaine, 2015; Gentzler et al., 2009; Porges, 1991).

Baseline RSA (i.e., the measure of RSA in resting state) and RSA suppression (i.e., estimated by RSA change from baseline to challenging state) are two commonly used RSA indices. Baseline RSA is thought to reflect individuals' capacity to maintain physiological homeostasis under normal circumstances, whereas RSA suppression reflects the physiological processes that permit individuals to shift their focus from internal homeostatic demands to demands that require coping or emotional and behavioral regulation (Berntson et al., 1997; Porges, 2001). In the presence of moderately challenging tasks, greater RSA suppression (or a moderate decrease in RSA from baseline to tasks) is generally thought to facilitate individuals' ability to adapt flexibly to environmental demands, although it has been suggested that excessive RSA suppression (a comparably strong RSA decrease) might reflect more pronounced stress or higher demand (Beauchaine, 2001; Calkins et al., 2007; Gentzler et al., 2009; Porges et al., 1994; Zhang et al., 2015). Empirically, higher baseline RSA or RSA suppression (i.e., moderate decrease in RSA) has been found to be related to various aspects of positive adjustment, such as effective emotion regulation strategies, better social competence and greater prosociality (Eisenberg et al., 1995; Gentzler et al., 2009; Miller et al., 2017; Taylor et al., 2015). Conversely, lower baseline RSA or RSA suppression (i.e., increases or low decreases in RSA) have been associated with psychopathology and other indices of maladjustment, such as emotion dysregulation, externalizing and internalizing problems (Beauchaine, 2015; Davis et al., 2016; Eisenberg et al., 2012).

In the limited research on the relations of RSA to internet addiction (and its related symptoms), findings have been somewhat mixed (Hsieh and Hsiao, 2016; Lin et al., 2014). For instance, Lin et al. (2014) showed that school-aged children with symptoms of internet addiction had significantly lower levels of high frequency heart rate variability (HF-HRV; a measure of RSA) compared to non-internet addicts. Coyne and associates (2015) found that pathologic video game use was associated with RSA withdrawal, but the direction of effects depended on the context of the task (i.e., family problem solving, cognitive stimulation; Coyne et al., 2015). Most recently, Hsieh and Hsiao (2016) reported that people categorized as having a high risk for internet addiction tended to exhibit lower RSA than people categorized as low-risk for internet addiction both before and after the induction of positive and negative emotions. Thus, it appears that RSA measures may predict internet addiction, although context also seems to matter.

### 1.3. RSA as a moderator

Recently, there has been an emerging body of literature concerning the moderating effect of RSA (i.e., baseline RSA and RSA suppression) in the relations of family-related factors to individuals' adaptation, although the interaction patterns are somewhat varied (e.g., El-Sheikh et al., 2013b; Leary and Katz, 2004; Obradović et al., 2010; Whitson and El-Sheikh, 2003). For example, among 8- to 16-year olds, harsh parenting positively predicted the probability of adolescents' marijuana use and other drug use, but only for children who exhibited lower levels of baseline RSA (Hinnant et al., 2015). In addition, El-Sheikh and Whitson (2006) reported that higher marital conflict was associated

with more internalizing problems among children with low, but not high, RSA suppression during a mock argument. Thus, relatively high baseline RSA and RSA suppression seem to act as protective factors and might ameliorate the negative effect of family adversity on individual outcomes (e.g., Diamond et al., 2012; Dyer et al., 2016; El-Sheikh, 2001; El-Sheikh et al., 2001; Hastings et al., 2008; Van der Graaff et al., 2016).

Overall, as noted earlier, both theoretical notions and empirical research support the idea that family context and individual characteristics interact to predict developmental outcomes. Thus, our goal was to examine the joint prediction of young adults' internet addiction from individuals' physiological regulation and family context. It is particularly important to study these processes in non-U.S. samples, such as China, because there has been very little focus on the prediction of problem behaviors from familial and biological characteristics using Asian samples.

### 1.4. Sex as a moderator

Because there are many differences between men and women in biological, physical, cognitive as well as social-emotional development, many researchers have advocated considering sex-related differences in the study of psychopathology (e.g., Beauchaine, 2001, 2009; Zahn-Waxler et al., 2006; Zahn-Waxler et al., 2008). A number of recent studies have provided evidence for sex differences in the relations among family environment, RSA, and individual outcomes (e.g., Eisenberg et al., 2012; El-Sheikh and Hinnant, 2011). For example, Van der Graaff et al. (2016) found that higher parental support predicted higher empathic concern for girls with high levels of baseline RSA, but not for boys (Van der Graaff et al., 2016). Hinnant et al. (2015) emphasized the need to examine sex as a potential moderator when predicting psychopathology from biosocial characteristics. Thus, although exploratory, we examined whether the hypothesized relations varied by individuals' sex.

### 1.5. The present study

In summary, we examined the potential moderating roles of baseline RSA and RSA suppression during a mathematical challenge task in the relation between parental marital conflict and internet addiction. We expected that the relation between parents' marital conflict and internet addiction would be stronger under conditions of low baseline RSA and low RSA suppression. In addition, we also tested whether sex moderated these relations, although we did not have specific hypotheses about the nature of this potential moderation.

## 2. Method

### 2.1. Participants

One hundred and five eligible undergraduate students aged 17–21 years (65 men,  $M_{\text{age}} = 18.9$ ) took part in the laboratory physiological experiment and completed a questionnaire package assessing parental marital conflict and internet addiction. Participants were recruited by advertisements and flyers and compensated with 25 renminbi (RMB) (approximately \$3.7) for their participation. The study protocol was approved by an ethics committee.

### 2.2. Laboratory procedure

All participants were instructed to refrain from performing physical exercise, or consuming any caffeine, alcohol, nicotine as well as non-prescription drugs for 2 h before the start of the experiment. Women were asked to arrange their participation in the study during days in which they were free from menses. Upon arrival of participants, the study was explained and informed consent was obtained. Participants

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