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## Autistic traits and internet gaming addiction in Chinese children: The mediating effect of emotion regulation and school connectedness



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### ABSTRACT

This report details an 18-month longitudinal study designed to investigate the influence of autistic traits' on internet gaming addiction (IGA) in children. A total of 420 Chinese children (220 boys, *Mean* age = 9.74 ± 0.45) participated in the research. Autistic traits were measured in the 4th grade and emotion regulation, school connectedness and IGA measured in both the 4th and 5th grades. After controlling for age, sex, and sensation seeking, results showed that autistic traits were related to decreased emotion regulation, which in turn was related to lower school connectedness, which was related to increased IGA. The results suggest that improving emotion regulation and school connectedness could reduce the risk of IGA. As a result, these findings may inform intervention and prevention programs targeting children with IGA, especially among those with high levels of autistic traits.

Internet gaming addiction (IGA), described in the DSM-5 (American Psychiatric Association, 2013) as having 9 symptoms, including: preoccupation, withdrawal symptoms, tolerance and lack of control (Petry & O'Brien, 2013; Petry et al., 2014), is an emerging problem among children and adolescents worldwide, especially in China and other Asian countries (Griffiths, Király, Pontes, & Demetrovics, 2015; Kuss & Griffiths, 2012; Tao et al., 2010). According to a national survey in China, the prevalence of IGA is 4.3% among young adults and adults (age > 18 years old) and 3.6% among children and adolescents (age < 18 years old; Zuo & Ma, 2010). One concern when studying IGA is the impact of spending excessive amounts of time playing online games during critical developmental stages on the normal developmental course of cognition, behavior, and emotion (Gentile et al., 2011; Kuss & Griffiths, 2012; Wolfe et al., 2014). For example, research has demonstrated that IGA in childhood predicts a higher risk of internalizing and externalizing symptoms in adolescence and adulthood (Brunborg, Mentzoni, & Frøyland, 2014; Eitchells, Gage, Rutherford, & Munafò, 2016; Ferguson, 2015). Thus, it is important to increase our understanding of the mechanisms that predict IGA so we can improve intervention and prevention strategies aimed to reduce childhood IGA.

### 1. Autistic traits and child IGA

An individual with autistic traits was first identified by Baron-Cohen, Wheelwright, Skinner, Martin, and Clubley (2001) as one

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with average intelligence who has traits identified as being on the autistic spectrum. Similarly, Constantino and Todd (2003) referred to autistic traits as social deficits, communication deficits and repetitive behaviors demonstrated in the general population that fall below the threshold for a diagnosis of autism spectrum disorder. A large body of research has identified autistic traits as risk factors of youth externalizing and internalizing symptoms (De Alwis et al., 2014; Kanne, Christ & Reiersen, 2009; Losh, Childress, Lam, & Piven, 2008). Specifically, evidence has suggested that autistic traits are positively related to depression and anxiety symptoms among adolescents and young adults (Jones, Thapar, Lewis, & Zammit, 2012; Lundström et al., 2011; Rosbrook & Whittingham, 2010). For instance, Rosbrook and Whittingham (2010) reported a positive link between autistic traits and depressive and anxious symptomatology in a college student sample. Lundström et al. (2011) showed that higher levels of autistic traits were associated with more mental health problems (i.e., depression, anxiety).

Depression and anxiety symptoms that are associated with autistic traits have been widely identified as precursors of IGA (Caplan, Williams, & Yee, 2009; Kim, LaRose & Peng, 2009; Lee & Stapinski, 2012; Romano, Osborne, & Truzoli, 2013). For instance, Caplan et al. (2009) found that depression was a significant predictor of the development of problematic internet use. Similarly, Lee and Stapinski (2012) found that higher anxiety was associated with more problematic internet use. Furthermore, researchers have pointed out that internet gaming provides an environment with a reduced complexity of social interaction that promotes connection between likeminded people with secrecy, which could be a great relief for individuals with autism who have deficits in social skills (Burke, Kraut, & Williams, 2010; Kuss & Griffiths, 2012). Taken together, it is reasonable then to assume that there is an association between autistic traits and IGA.

Consistent with this assumption, one study examined the longitudinal influence of autistic traits on internet addiction in a sample of Taiwanese children (Chen, Chen & Gau, 2015), and two additional studies tested the direct link between autistic traits and internet addiction in adult samples (Finkenauer, Pollmann, Begeer, & Kerkhof, 2012; Romano et al., 2013). However, none of those studies investigated the underlying mediating mechanisms that may account for the association between autistic traits and internet addiction. In the current study, we proposed that emotion regulation and school connectedness are two potential mediators in the association.

## 2. School connectedness

School connectedness, defined as a student's feeling of belongingness to their school and emotional closeness with teachers and classmates (Fredricks, Blumenfeld, & Paris, 2004), has repeatedly been identified as a protective factor against involvement in problem behaviors (Chapman, Buckley, Sheehan, Shochet, & Romaniuk, 2011; Li & Lerner, 2011; Wang & Fredricks, 2014). According to the social control theory (Hirschi, 1969), children who feel a strong emotional connectedness to schoolteachers and classmates are more likely to feel safe and cared for, which may function to prevent them from engaging in deviant activities. While few studies have looked at links between these variables and IGA, several empirical studies have investigated the relation between school connectedness and youth's addiction to internet use more broadly (Li et al., 2013; Yu, Li, & Zhang, 2015; Zhu, Zhang, Yu, & Bao, 2015). For instance, Li et al. (2013) reported that school connectedness was negatively associated with problematic internet use in a Chinese middle school student sample. More convincing evidence has been found in a subsequent longitudinal study, in which Zhu et al. (2015) found that diminished school connectedness significantly predicted increased risk of adolescent Internet gaming addiction.

Furthermore, autistic traits may have a direct impact on children's school connectedness. Multiple empirical studies have reported that children with higher levels of autistic traits have more difficulty establishing emotional connectedness with teachers and classmates (Hisao et al., 2013; Trevisan, 2006; Trevisan, & Birmingham, 2016). For instance, Trevisan (2006) found that autistic traits were negatively related to school adjustment, resulting in poor social relationships in school. Similarly, Hsiao, Tseng, Huang, and Gau (2013) found that students with higher levels of autistic traits reported more negative attitudes towards teachers and exhibited more negative interactions with classmates. Given the protective role of school connectedness in decreasing IGA (Li et al., 2013; Zhu et al., 2015), it was hypothesized that school connectedness would mediate the association between autistic traits and children's IGA in the study reported herein.

## 3. Emotion regulation

Gross and John's process model (2003) posits that emotion regulation, which refers to the processes by which an individual determines which emotions they are experiencing, when they are having them, and how they express them (Gross, 1998), is influential on intrapersonal functioning and social consequences (i.e. school connectedness). A large body of research has provided support for the relation between emotion regulation and school connectedness (Denham, 2006; Eisenberg, Valiente, & Eggum, 2010; Shields et al., 2001; Ursache, Blair, & Raver, 2012). For instance, Eisenberg et al. (2010) reported that the ability to regulate emotions was related to the relationships with teachers and peers. Likewise, Ursache et al. (2012) found that promoting children's emotion regulation was helpful in facilitating positive interactions with teachers and peers. Zhao and Zhao (2015) demonstrated that deficits in emotion regulation significantly predicted decreased school connectedness, which was in turn significantly related to increased depressive symptoms. Therefore, an association between emotion regulation and school connectedness was postulated in the current study.

In addition, autistic traits may have a negative impact on emotion regulation. Theory of Mind (ToM) is an important precursor to developing emotion regulation (Epa & Dudek, 2015; Sharp et al., 2011), however, the presence of autistic traits is predictive of deficits in ToM (Baron-Cohen, 1989; Happé, 1994; Ronald, Viding, Happé, & Plomin, 2006; Best, Moffat, Power, Owens, & Johnstone, 2008). Evidence has demonstrated a relation between autistic traits and poor emotion regulation (Jones et al., 2009; Pisula, Kawa,

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