

AKADÉMIAI KIADÓ

Journal of Behavioral Addictions

12 (2023) 4, 920–937

DOI:
10.1556/2006.2023.00054
© 2023 The Author(s)

FULL-LENGTH REPORT



The vicious cycle of family dysfunction and problematic gaming and the mediating role of self-concept clarity among early adolescents: A within-person analysis using random intercept cross-lagged panel modeling

JIANHUA ZHOU* , HAIYAN ZHAO* , LI'AN WANG and DANDAN ZHU

School of Psychology, Northwest Normal University, Lanzhou, China

Received: February 23, 2023 • Revised manuscript received: June 28, 2023; August 21, 2023 • Accepted: September 10, 2023

Published online: October 18, 2023

ABSTRACT

Backgrounds and aims: Family dysfunction is a significant risk factor for adolescent problematic gaming, yet few studies have investigated the bidirectional relations between changes in family dysfunction and adolescent problematic gaming and potential mediating mechanisms. This study thus examined the bidirectional relations between family dysfunction and adolescent problematic gaming and the mediating role of self-concept clarity within this relation. **Methods:** Participants included 4,731 Chinese early adolescents (44.9% girls; M age = 10.91 years, SD = 0.72) who were surveyed at four time points 6 months apart. **Results:** Random intercept cross-lagged panel modeling found (a) family dysfunction directly predicts increased problematic gaming, (b) adolescent problematic gaming directly predicts increased experience of family dysfunction, (c) family dysfunction indirectly predicts problematic gaming via self-concept clarity, and (d) adolescent problematic gaming indirectly predicts family dysfunction via self-concept clarity. **Discussion and conclusions:** The present study suggests that adolescents may be trapped in a vicious cycle between family dysfunction and problematic gaming either directly or indirectly through impairing their self-concept clarity. Findings indicate fostering youth self-concept clarity is essential to break the vicious circle between dysfunctional experiences in the family and problematic gaming among adolescents.

KEYWORDS

family dysfunction, problematic gaming, self-concept clarity, random intercept cross-lagged panel model, early adolescents

INTRODUCTION

Problematic gaming has emerged as a widespread public health concern, especially among adolescents, in different areas of the world, including China (Liao et al., 2020), Europe (Colasante et al., 2022) and the United States (Nagata et al., 2022). Problematic gaming in its most severe form has been recognized as *Internet gaming disorder* (IGD), defined as the uncontrollable, excessive, and compulsive use of online games, resulting in significant impairment or distress in daily life (Young & de Abreu, 2011). The Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR) has included IGD as a tentative disorder requiring additional research (APA, 2022). The WHO (2019) officially classified Gaming Disorder as an addictive behavior disorder in the International Classification of Diseases (ICD-11). Descriptions in both classifications in DSM-5-TR and ICD-11 emphasize persistent and recurrent use of the internet to engage in gaming and impaired gaming control affecting

*Corresponding authors.
E-mail: zjhyuming@163.com,
zhywmdg@foxmail.com

social and personal functioning, leading to clinically significant deterioration or discomfort during a period of 12 months. However, there is an ongoing debate over the prognostic validity and clinical utility of IGD, with some researchers suggesting IGD is not an independent psychopathological disorder since excessive use of internet games occurs mainly in adolescence, and a high rate of spontaneous remission has been observed (Karlsen, 2013; Scharnow, Festl, & Quandt, 2014). Furthermore, researchers also found that some (e.g., tolerance, deception) diagnosis criteria (especially in DSM-5-TR) had low diagnostic validity, clinical utility and prognostic value, and some criteria (e.g., escapism/mood regulation, tolerance) were regarded as incapable of distinguishing between problematic and non-problematic gaming (e.g., Castro-Calvo et al., 2021). Such a diagnosis may pathologize healthy gaming and may lead to unnecessary policies and interventions. In this study, the less restrictive term *problematic gaming* was used, since the self-report measure used here was not specifically developed on the basis of the symptoms identified for the disorder in the main diagnostic manuals (APA, 2022; WHO, 2019). This terminology allows for broader inclusivity, encompassing a range of gaming issues from mild to severe, and avoids the potential pathologizing of healthy gaming behavior. It also offers flexibility and practicality in defining and measuring problematic gaming according to the specific purpose and context of the study, free from the constraints of existing diagnostic criteria.

Early adolescence is a critical phase of development, involving substantial cognitive, physical, emotional, and social changes, during which young people are at increased risk of developing problematic gaming behavior (Richard et al., 2022). In China, more than 183 million of young individuals engage in internet gaming as part of their online activities (CNNIC, 2021), and problematic gaming is prevalent, with one study reporting a rate of over 17% (Liao et al., 2020). Extensive research has found adolescent problematic gaming significantly predicts many subsequent negative psychosocial outcomes, including cognitive impairment, poor academic achievement, internalizing and externalizing problems, and even suicidality (e.g., Choi et al., 2021; Erevik et al., 2022; Mihara et al., 2017; Rosendo-Rios, Trott, & Shukla, 2022; Toker & Baturay, 2016; Wartberg, Kriston, Zieglermeier, Lincoln, & Kammerl, 2019). Considering the clinical significance of problematic gaming and its high prevalence among Chinese adolescents, investigating its etiologic risk factors is key to promoting effective interventions and prevention strategies.

Previous studies have highlighted family context as a significant external environmental factor for understanding the development of IGD among adolescents (e.g., Paulus, Ohmann, Von Gontard, & Popow, 2018; Sugaya, Shirasaka, Takahashi, & Kanda, 2019; Zhu, Zhang, Yu, & Bao, 2015). With the greater salience of an identity and sense of self, youths may become more sensitive to parents' infringements upon their independence as they enter adolescence (Keijsers & Poulin, 2013). Parents may also legitimately employ overcontrolling strategies more frequently in the home when

they perceive that they are gradually losing their ability to directly control and regulate adolescent behaviors (Rogers, Padilla-Walker, McLean, & Hurst, 2020). These conflicting dynamics may result in frequent parent-children conflict and temporarily increased family dysfunction (e.g., De Goede, Branje, & Meeus, 2009). Numerous studies have established that family dysfunction is a potent influence on problematic gaming among adolescents (see Gao, Wang, & Dong, 2022, for a meta-analysis; Coşa, Doborean, Georgescu, & Păsărelu, 2022, for a meta-analysis; Sugaya et al., 2019, for a systematic review). Inversely, an adolescent's high levels of problematic gaming may provoke negative parental reactions such as overcontrol and rejective behaviors (Koning, Peeters, Finkenauer, & Van Den Eijnden, 2018; Lin et al., 2020), thus leading to increased family dysfunction. Therefore, family dysfunction and youths' problematic gaming may be intertwined through a reciprocal influence process. However, most of the relevant previous studies have examined the associations between family dysfunction and problematic gaming using cross-sectional data. Few studies to date have examined whether family dysfunction and problematic gaming among adolescents are bidirectionally related (see Gao et al., 2022; Coşa et al., 2022, for meta-analyses).

In addition, little is known about possible mediating mechanisms that explain the bidirectional relation between family dysfunction and adolescent problematic gaming. The cognitive-behavioral model of pathological internet use (Davis, 2001; King & Delfabbro, 2018) posits that self-related cognition, such as self-concept clarity, can account for the linkage between family dysfunction and adolescent problematic gaming. Self-concept clarity represents an essential facet of the self, which refers to "the extent to which the contents of an individual's self-concept are clearly and confidently defined, internally consistent, and temporally stable" (Campbell et al., 1996, p. 141). Empirical research has revealed significant associations between self-concept clarity and family dysfunction (e.g., Van Dijk et al., 2014; Xiang et al., 2020), as well as between self-concept clarity and problematic gaming (e.g., Green, Delfabbro, & King, 2020; Zhang, Cao, & Tian, 2022). Therefore, this study examines the longitudinal relation between family dysfunction and problematic gaming among Chinese early adolescents and investigates the mediating role of self-concept clarity in the bidirectional association.

The bidirectional relations between family dysfunction and problematic gaming

The McMaster Model of Family Functioning (MMFF, Epstein, Bishop, & Levin, 1978) postulates that healthy family functioning is a primary determinant of positive psychosocial development among children. The MMFF proposes that the family system involves six key dimensions of functioning (i.e., problem-solving, communication, roles, affective responsiveness, affective involvement, and behavior control) which represent essential components of family members' healthy physical, psychological, and social



development (Epstein, Baldwin, & Bishop, 1985). Family dysfunction, referred to a negative dynamic family state that does not foster optimal functioning in one or more of these six dimensions, has been shown to be significantly associated with higher levels of psychopathology, including aggressive behaviors, delinquency, depressive and anxiety symptoms, and lower levels of well-being among young people (e.g., Lawrence, Merrin, & Mcfield, 2022; Liu, Yang, Hu, Zhang, & Nie, 2020; Nie, Tian, & Huebner, 2020; Wang, Tian, Guo, & Huebner, 2020; Yusuf, Daud, & Arshat, 2021).

Family dysfunction also has a prominent role in the development of problematic gaming among adolescents. Research suggests that unfavorable external environmental stimuli (such as a dysfunctional family environment) lead to negative emotional and cognitive responses, which in turn results in stronger problematic gaming in an attempt to cope with and compensate for these negative changes (Brand, Young, Laier, Wölfling, & Potenza, 2016; Dong & Potenza, 2014). Numerous empirical studies have documented the significant relation between family dysfunction and adolescent problematic gaming (e.g., Coşa et al., 2022; Gao et al., 2022; Sugaya et al., 2019). A recent cross-sectional study among 1,255 Chinese adolescents found a significant positive correlation between family dysfunction and adolescent problematic gaming (Gan, Xiang, Jin, Zhu, & Yu, 2022). Similarly, other cross-sectional studies shown that youths who experience parental rejection and overcontrol are more likely to develop higher levels of problematic gaming (e.g., Chen, Lee, Dong, Gamble, & Feng, 2020; Yang et al., 2020). One cross-sectional study of 946 Spanish adolescents found supportive family functioning was negatively related to adolescent problematic gaming (Fumero, Marrero, Bethencourt, & Peñate, 2020). Moreover, a recent meta-analysis of adolescents ($N = 407,620$, $k = 155$) showed family dysfunction is an important risk factor for problematic gaming ($OR = 1.60$) (Gao et al., 2022). Other meta-analysis studies of children and adolescents ($N = 47,362$, $k = 38$) found that family communication and positive family relationships can decrease the risk of problematic gaming, whereas negative family environments and poor parent-child interactions are associated with high levels of problematic gaming (Coşa et al., 2022). Hence, we assumed that family dysfunction could significantly predict increased problematic gaming among youths.

Furthermore, adolescent problematic behaviors such as problematic gaming can also have an effect on the changes in the family environment, particularly in the areas of parenting, relationship quality, and communication with family members. For instance, one longitudinal study among Dutch adolescents, using cross-lagged panel models (CLPM), found that problematic gaming significantly predicted poor quality communication about internet use between adolescents and their parents one year later, but not vice versa (Koning et al., 2018). Another longitudinal study using CLPM showed that problematic gaming significantly negatively predicted parent-adolescent attachment six months later, but not vice versa (Teng, Griffiths, Nie, Xiang, & Guo, 2020). A third longitudinal study using CLPM also

showed that a positive parent-child relationship significantly negatively predicted adolescent problematic gaming six months later, and vice versa (Su et al., 2018). Another longitudinal study found that parental psychological control significantly positively predicted adolescent problematic gaming over time and vice versa (Lin et al., 2020). Although no studies have directly examined the longitudinal relation between family dysfunction and youths' problematic gaming, based on the preceding evidence, it is reasonable to expect that family dysfunction would display a reciprocal relation with adolescent problematic gaming over time.

Self-concept clarity: explaining the two-way relation

An important task during adolescence is the formation of a well-developed self and identity (Erikson, 1963). Self-concept clarity gauges the stability of the self-concept; it involves the consistency of an individual's self-perception, which represents the structure rather than the content of the self-concept (i.e., the knowledge and evaluative components of the self-concept, such as self-esteem) (Campbell et al., 1996). Mounting research has established that, apart from the influence of self-esteem, self-concept clarity is significantly related to higher levels of physical health and psychological well-being, including happiness, life satisfaction, and purpose and meaning in life (see Light, 2017, for a review), and lower levels of psychiatric disorders such as depression, anxiety, and autism (see Cicero, 2017, for a review).

The cognitive-behavioral model of pathological internet use (Davis, 2001; King & Delfabbro, 2018) generally posits that distal negative situational cues such as family dysfunction reinforce maladaptive cognitions and beliefs about the self (i.e., lower self-concept clarity), which can lead to overuse of specific internet functions such as online gaming. On the basis of hypothesis that the self is relational in nature and can be shaped by feedback from significant others, adolescents' social interactions with family members may thus influence their formation of a firmly integrated self in multiple domains (e.g., Chen, Boucher, & Tapias, 2006). Supportive and healthy family function, exemplified by greater family cohesion, high relationship quality, and open communication, helps adolescents identify who they think they are and how they present themselves to others, thus resulting in higher levels of self-concept clarity (e.g., McLean, Pasupathi, & Pals, 2007). Conversely, a dysfunctional family climate is less likely to provide adolescents with opportunities and confidence to explore diverse facets of the self and may discourage adolescents from discussing issues related to the self with family members, thereby hindering the formation of clear self-views (e.g., Li, Ma, Feng, & Wang, 2022; Wong, Dirghangi, & Hart, 2019). A cross-sectional study showed that the experience of high family cohesion is significantly related to high self-concept clarity among Chinese adolescents (Xiang et al., 2020). A longitudinal study among Dutch youths showed that open parent-child communication can significantly predict higher self-concept clarity in children one year later



(Van Dijk et al., 2014). Becht et al.'s (2017) longitudinal study similarly found that better parent-child relationships significantly predict higher self-concept clarity one year later. Vartanian et al.'s (2016) cross-sectional study among Australian youths showed that family dysfunction was significantly correlated with lower self-concept clarity. Another cross-sectional study also found that higher parental psychological control was positively associated with lower self-concept clarity among Chinese adolescents (Li et al., 2022). Based on the available evidence, it is plausible to expect family dysfunction to serve as a risk factor for youths' self-concept clarity and that family dysfunction would negatively predict self-concept clarity over time.

Low self-concept clarity can be expected to increase youths' risk of engaging in problematic gaming. Uncertainty about the self may generate a state of discomfort, eliciting negative emotional and cognitive responses that predispose individuals to seek compensation to reduce, control, or avoid the negative experience (Hogg et al., 2013). As youths invest more and more time and energy in online activities, adolescents with low self-concept clarity are likely to seek "safe havens" in the online environment and might see internet gaming as the most reliable means of gaining positive social feedback and recognition (Wang, Tang, Cao, & Li, 2022), thus increasing the likelihood of their engaging in problematic gaming. For instance, previous studies suggested that youths with poor self-concept clarity might experience unsatisfied basic psychological needs and greater emotional distress, including depression, social anxiety (Russo, Barni, Zagrean, & Danioni, 2021; Van Dijk et al., 2014; Wong et al., 2019), which might, in turn, make young people more inclined to seek compensation. Online games with high attractiveness and high feedback may become an avenue to compensate for unmet psychological needs and relieve negative emotions (Kardefelt-Winther, 2014; Liu, Fang, Wan, & Zhou, 2016). Zhang et al.'s (2022) cross-sectional study showed that self-concept clarity was a significant predictor of problematic online gaming among Chinese adolescents. Moreover, some cross-sectional studies among adolescents have shown that higher self-concept clarity significantly predicts lower compulsive internet use, problematic smartphone use, and internet addiction (Quinones & Kakabadse, 2015; Servidio, Sinatra, Griffiths, & Monacis, 2021; Wang et al., 2022). Although most relevant studies have used cross-sectional designs and no studies have examined the prospective effects of self-concept clarity on adolescent problematic gaming, based on the above literature, we hypothesized that high self-concept clarity would negatively predict adolescent problematic gaming over time, and that self-concept clarity plays a mediating role in a youth's pathway from experiencing family dysfunction to problematic gaming.

In addition, self-concept clarity may also function as a gateway in the pathway from adolescent problematic gaming to experiences of family dysfunction. The self-concept fragmentation hypothesis (Valkenburg & Peter, 2011) posits that pathological internet use such as problematic gaming may undermine adolescents' self-concept

clarity by allowing them to easily explore and experience various virtual identities through online communication activities like playing different online games, which might further fragment their already fragile personalities. Although to date, no studies have examined the role of problematic gaming on adolescent self-concept clarity (i.e., the structure of the self-concept), studies on the relation between the content of self-concept (such as self-esteem) and problematic gaming can provide some indirect evidence for this mechanism. For instance, Teng, Pontes, Nie, et al.'s (2020) longitudinal study using three-wave data found that problematic gaming negatively predicted self-esteem six months later among Chinese older adolescents. Empirical research shown the correlation between self-concept clarity and self-esteem is typically moderate to large, with some studies reporting extremely strong correlations of $r = 0.70$ or more (see DeMarree & Bobrowski, 2017, for a review); it is reasonable to hypothesize that young people's problematic gaming significantly predicts decreased self-concept clarity over time.

Low self-concept clarity may also affect adolescents' experience of family dysfunction. Youths with a more coherent sense of self may be more capable of developing high-quality relationships with others, including their family members (Erikson, 1968). However, when adolescents have an unclear self-concept, they may feel inferior and unsure of themselves when interacting with family members, which can lead to submissiveness and high levels of dependence in their relationships (Becht et al., 2017). Parents may thus feel excessive parenting stress, which can lead to more frequent parent-child conflicts and, in turn, to adolescents experiencing more family dysfunction. In contrast, adolescents with high self-concept clarity are able to clearly articulate the kind of relationship they want to have with family members by adopting more positive communication strategies and being more affective in their involvement (Crocetti, Branje, Rubini, Koot, & Meeus, 2017), thus generating more adaptive, healthier family functioning. Accordingly, self-concept clarity may also mediate the relation between adolescent problematic gaming and family dysfunction. In this study, we thus expect self-concept clarity to act as a key gateway in the bidirectional relation between family dysfunction and problematic gaming among adolescents.

An important limitation of previous relevant longitudinal studies is the use of the traditional CLPM approach. While CLPM is the most widely utilized longitudinal analytical approach for determining the direction of effects between constructs over time (e.g., Hamaker, Kuiper, & Grasman, 2015), it has been criticized for making no distinction between variance at the between-person level and variance at the within-person level (e.g., Hamaker et al., 2015; Usami, Murayama, & Hamaker, 2019). Researchers have raised concerns that CLPM estimates a "conflated" combination of within- and between-person variance (e.g., Berry & Willoughby, 2017) and thus cannot accurately describe dynamic processes occurring at the level of a specific person over time (e.g., Bainter & Howard, 2016;



Hamaker et al., 2015). Consequently, results based on the CLPM that infer within-person processes may provide inaccurate information regarding focal associations. The current study, therefore, employed a longitudinal design and used random intercept cross-lagged panel model (RI-CLPM) to further the existing understanding of the bidirectional relation between family dysfunction, self-concept clarity, and adolescent problematic gaming at the within-person level.

The current study

Research to date suggests a reciprocal relation exists between family dysfunction and adolescent problematic gaming. However, knowledge of the mechanism by which family dysfunction and adolescent problematic gaming are interrelated over time and the potential mediating mechanisms underlying this interaction at the within-person level remain limited. Our study aimed to examine the bidirectional relation between family dysfunction and problematic gaming among adolescents and to explore whether self-concept clarity functions as a mediator underlying this relation. For this purpose, a longitudinal design combined with RI-CLPM was employed with a sample of Chinese youths. This study addressed two major hypotheses. First, guided by the existing empirical evidence, the first hypothesis posited that family dysfunction would be reciprocally associated with adolescent problematic gaming over time at the within-person level. Second, relevant theories suggest self-concept clarity may be a key mechanism in the reciprocal relation between family dysfunction and problematic gaming, and previous studies have found significant associations between self-concept clarity and both family dysfunction and problematic gaming. Thus, the second hypothesis was that self-concept clarity would function as a mediator in the bidirectional relations between family dysfunction and problematic gaming at the within-person level. Specifically, this study expected family dysfunction to have an indirect effect on adolescent problematic gaming through self-concept clarity, and also that adolescent problematic gaming would have an indirect effect on family dysfunction through self-concept clarity.

In our longitudinal study, we used a six-month measurement interval, a decision informed by careful consideration of various factors. Early adolescence is a period characterized by significant psychological, cognitive, and emotional changes. Adolescents often undergo swift transitions in parent-child relationship (e.g., Seiffge-Krenke, Overbeek, & Vermulst, 2010), self-awareness (e.g., Young & Mroczek, 2003), and internet-related behaviors (e.g., Huang et al., 2023). These changes can occur within relatively short time frames and exhibit strong fluctuations in family functioning, self-concept clarity, and problematic gaming. By measuring these variables at multiple time points within a relatively shorter timeframe, we can gain insights into their dynamic nature and examine potential associations more accurately. A six-

month measurement interval also strikes a balance between capturing short-term fluctuations and maintaining participant engagement and retention throughout the study duration. Longer measurement intervals, such as one or two years, may lead to participant attrition or recall bias, potentially compromising the validity and reliability of the study findings.

This study controlled for some demographic variables, including sex, age, and family socioeconomic status (SES), as previous studies have found that these demographic variables were significantly related to family dysfunction, self-concept clarity, and problematic gaming (e.g., Becht et al., 2017; Crocetti, Rubini, Branje, Koot, & Meeus, 2015; Zhao, Li, Zhou, Nie, & Zhou, 2020).

METHODS

Participants

The data for the present study were derived from the Project for the Longitudinal Development of Chinese Adolescents' Mental Health (also see Zhou et al., 2022). Students from eight public elementary schools in a mid-size city in northwestern China participated in this project. The researcher randomly selected these eight schools from a pool of anonymous schools provided by the local education authorities, and all schools that were contacted agreed to participate. Participation was open to all students in Grades 4 and 5 at these schools. The overall participation rate across these schools was 98%. Students participated in measurements at four time points with a six-month interval over a period of 18 months. Participants included 4,731 students at the first assessment (T1) with a mean age of 10.91 years old ($SD = 0.72$, age ranged from 10 to 13 years old, 44.9% girls). The students' parents reported the demographic information (i.e., SES) using an online questionnaire. Parent-reported information indicated that almost all families were of middle-income (relative to overall income levels in the local province), a majority of fathers (92.5%) and mothers (81.6%) reported having at least a middle school education, and 28.1% of families had only one child.

Tracking of individual participants across time was made possible by the assignment of a specific code to each student to protect her or his identity. Participant numbers for the subsequent three time points of the study were as follows: 4,450 students at Time 2 (T2), 4,306 students at Time 3 (T3), and 4,441 students at Time 4 (T4). The participant retention rates were 94.06% at T2, 91.02% at T3, and 93.87% at T4. Little's Missing Completely at Random (MCAR) test was conducted based on all of the data across the four measurement occasions to evaluate the missing data mechanisms in this study. Little's MCAR test produced a normed χ^2 (χ^2/df) of 1.01, indicating that the data were likely missing at random (Nicholson, Deboeck, & Howard, 2017). The full information maximum likelihood method (FIML) was used to handle missing values (Little & Rubin, 2002).



Measures

The questionnaires were all in Chinese. All scales used in the present study were originally in English and have been translated from English to Chinese in previous research. These Chinese version scales have been validated and demonstrated good reliability and validity with Chinese adolescents, as reported below.

Family dysfunction. The General Function subscale (GF) of the McMaster family assessment device (Byles, Byrne, Boyle, & Offord, 1988; Epstein et al., 1985) was used to measure adolescents' perceived family dysfunction. The GF subscale is composed of 12 items (e.g., "We don't get along well together"; "We cannot talk to each other about the sadness we feel"), including six reverse-coded items (e.g., "We can express our feelings to each other;" "We feel accepted for what we are"). It uses a four-point Likert scale (1 = *strongly disagree* to 4 = *strongly agree*). The mean scores of these 12 items were calculated, with higher scores indicating higher levels of perceived family dysfunction. The GF has demonstrated good reliability and validity among Chinese adolescents (e.g., Su & Duan, 2008). In this study, the Cronbach's α coefficients for the GF from T1 through T4 were 0.80 (95% CI = 0.76–0.83), 0.79 (95% CI = 0.75–0.84), 0.82 (95% CI = 0.77–0.85) and 0.83 (95% CI = 0.76–0.88), respectively. In this study, the MacDonald ω coefficients for the GF ranged from 0.68 to 0.74 across T1 to T4.

Self-concept clarity. The Self-Concept Clarity scale (SCC, Campbell et al., 1996) was used to assess youths' self-concept clarity. The SCC consists of 12 items using a four-point Likert scale (1 = *complete disagreement* to 4 = *complete agreement*). The mean scores of these 12 items were calculated, with higher scores indicating a higher level of self-concept clarity. Previous studies have demonstrated good reliability and validity for the SCC among Chinese adolescents (e.g., Niu et al., 2016). In this study, the Cronbach's α coefficients for the SCC from T1 through T4 were 0.86 (95% CI = 0.79–0.91), 0.87 (95% CI = 0.80–0.93), 0.86 (95% CI = 0.79–0.94) and 0.88 (95% CI = 0.81–0.95), respectively. In this study, the MacDonald ω coefficients for the SCC ranged from 0.80 to 0.84 across T1 to T4.

Problematic gaming. The measurement of symptoms of problematic gaming was adjusted on the basis of Pathologic Online Game Use (POGU; Gentile, 2009), which includes 11 items (e.g., "Do you become restless or irritable when attempting to cut down or stop playing internet games?" and "Have you played internet games as a way of escaping from problems or bad feelings?"). Participants were allowed to respond "no = 0", "sometimes = 1" or "yes = 2", to each symptom, with a higher mean score representing more severe problematic gaming. Previous studies have demonstrated good reliability and validity for this scale among Chinese youths (e.g., Wei et al., 2014; Zhao et al., 2020). In this study, the Cronbach's α coefficients for the POGU from T1 through T4 were 0.91 (95% CI = 0.88–0.94), 0.92 (95% CI = 0.88–0.95), 0.93 (95% CI = 0.89–0.95) and 0.94 (95%

CI = 0.91–0.96), respectively. In this study, the MacDonald ω coefficients for the SCC ranged from 0.90 to 0.93 across T1 to T4.

Covariates. Student age, sex, and family socioeconomic status (SES) were collected at T1. Students reported their sex (0 = male, 1 = female) and age. Students' fathers or mothers reported parental education levels and family monthly income. Parental education levels ranged from 0 (*never been to school*) to 7 (*doctorate*). Family monthly income levels ranged from 1 (*less than ¥ 1,000 Chinese Yuan $\approx$ \$143 USD*) to 9 (*more than ¥ 80,000 Chinese Yuan $\approx$ \$11,435 USD*). We standardized parental education levels and income scores by converting them into z-scores and then calculated the average of these z-scores to create an index for SES.

Procedure

The questionnaire was administered to students by a trained graduate assistant in the students' classrooms during regular school hours. The assistant gave both verbal and written instructions to all students. Students took about thirty to forty minutes to fill in the questionnaire of the Project for the Longitudinal Development of Chinese Adolescents' Mental Health. This project used the school number, class number, and student number to generate a unique code for each student to match data across measurement time points. Participants could withdraw from the measurement at any time. The parents filled out demographic information (i.e., SES) questionnaires online, following the instructions of each class's head teacher. Researchers affirmed the collected data would remain confidential and that only research staff would be allowed access to the completed questionnaires for analysis purposes.

Data analysis

Preliminary analysis. Mplus version 8.3 was used to perform all analyses. After FIML-estimated missing data, descriptive statistics of the study variables including means and standard deviations were analyzed, and the bivariate correlations between study variables were examined. Intra-class correlations (ICCs) were then calculated for all variables across the four waves to obtain a preliminary understanding of how much variance stemmed from between-person differences versus within-person fluctuations.

Random intercept cross-lagged panel model (RI-CLPM). The mean scores of all variables (i.e., observed variables) were used to construct the RI-CLPM. The RI-CLPM extracted trait factors—random intercept factors—accounting for stable between-person differences in the constructs (Hamaker et al., 2015). The autoregressive, cross-lagged effects in the RI-CLPM were estimated using residual scores following extraction of the trait factors rather than the observed scores, indicating whether a within-person departure from the trait level of one construct influenced changes in another construct's within-person deviation from



the trait level (e.g., Hamaker et al., 2015). Following the procedures proposed by Mulder and Hamaker (2021), each variable was regressed on its own latent factor, and the factor loadings were all fixed to one. Then, random intercepts of each variable were created by regressing on the latent variables at each time point, with factor loadings fixed to one. After separating out the between-person components (i.e., random intercepts), the remaining variation in the latent variables represented the within-person fluctuations, and the cross-lagged effects between the within-person fluctuations of each variable were estimated. All of the variances of each latent variable were then constrained to zero. The covariance between within-person components at T1 was freely estimated. All covariances between residuals of within-person components at the same time point (i.e., at T2, T3, and T4, respectively) were freely estimated (Orth, Clark, Donnellan, & Robins, 2021). The covariances between the random intercepts of the main variables were estimated, and other default covariances were set to zero by using the command “MODEL = NOCOV.” The maximum likelihood robust (MLR) estimator was employed to test the RI-CLPM. Sex, age, and SES were controlled on all observed variables at T1 and the random intercepts. The model fit was evaluated by the chi-square statistic, the Tucker-Lewis Index (TLI), Comparative Fit Indexes (CFI), and the root-mean-square error of approximation (RMSEA). CFI and TLI >0.90 and RMSEA <0.08 were regarded as indicative of a good model fit (Marsh, Hau, & Wen, 2004).

Following the suggestion of Orth et al. (2021) and considering the parsimony of the model and the absence of specific assumptions about the non-stationarity of the underlying relations among the main variables in this study, four models were tested: (1) an unconstrained model in which all autoregressive effects of each variable and cross-lagged effects between each one of two variables were freely estimated (Model 1), (2) a constrained model in which all autoregressive effects of each variable were fixed to be equal (Model 2), (3) a constrained model in which all cross-lagged effects between each one of two variables were fixed to be equal (Model 3), and (4) a constrained model in which all autoregressive paths of each variable and all cross-lagged effects between each one of two variables were fixed to be equal (Model 4). The Yuan-Bentler scaled chi-square ($Y-B\chi^2$) difference test was used to compare the model fit of these four models (Yuan & Bentler, 2000). A more parsimonious model was chosen when the model fit of constrained models did not show a significant difference from the unconstrained model (Orth et al., 2021). We further tested the significance of mediating effects by using percentile bootstrapping with 1,000 iterations. Statistical significance was determined to be present when the 95% confidence interval for the indirect effect did not include zero (Hayes, 2013).

Ethics

Study procedures were carried out in accordance with the Declaration of Helsinki. The present study was approved by School of Psychology Research Ethics Committee,

Northwest Normal University. The cognizant education authorities, school boards, and teachers at each of the participating schools also approved the implementation of this study. In addition, all parents signed a written informed consent form to allow the participation of their student, and students provided their assent before any data was collected. All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee.

RESULTS

Descriptive statistics and correlations

Table 1 presents the results of the descriptive statistics (i.e., means and standard deviations) and correlation analysis of the study variables at each time point. The ICCs were 0.42 for family dysfunction, 0.53 for self-concept clarity, and 0.46 for problematic gaming. This indicates that 42%–53% of the variance in the main study variables was explained by differences between persons, and the remaining 47%–58% of the variances in these variables were explained by fluctuations within persons. These results suggest sufficient within-person variance to use RI-CLPMs to investigate within-person changes over time.

Random intercept cross-lagged panel models (RI-CLPM)

The model fit and the results of the $Y-B\chi^2$ difference tests for constrained and unconstrained RI-CLPMs are reported in Table 2. The fit of the freely estimated baseline models was good ($S-B\chi^2$ ($df = 39$) = 208.781, $p < 0.001$, CFI = 0.99, TLI = 0.97, RMSEA = 0.03 [90% CI = 0.026–0.034]). Moreover, the model fits with the autoregressive effects (i.e., Model 2) and the autoregressive and cross-lagged effects (i.e., Model 4) fixed to be equal over time were significantly worse than the fit of the unconstrained model. When the cross-lagged effects (i.e., Model 3) were fixed to be equal over time, the model fit was not significantly different from the fit of the unconstrained model (i.e., Model 1). Hence, based on parsimony, the RI-CLPM with equal cross-lagged effects was selected as the final RI-CLPM.

Figure 1 displays the standardized path coefficients of the final RI-CLPM. At the between-person level, the random intercepts of family dysfunction, self-concept clarity, and problematic gaming were significantly correlated (see Fig. 1), indicating that there were significant between-person effects linking the stable variances between them. Furthermore, the RI-CLPM showed that the paths from family dysfunction at T (i.e., a given time point) to problematic gaming at T + 1 (i.e., the subsequent time point) were statistically significant ($\beta = 0.06$ to 0.07 , $p < 0.001$) and vice versa ($\beta = 0.10$ to 0.12 , $p < 0.001$), and that the paths from family dysfunction at time T to self-concept clarity at T + 1 were also statistically significant ($\beta = -0.07$ to -0.08 , $p < 0.001$) and vice versa ($\beta = -0.09$ to -0.10 , $p < 0.001$). Moreover, the paths from



Table 1. Pearson correlations and descriptive statistics for the main variables

Variables	M	SD	Range	Skewness	Kurtosis	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Sex	–	–		0.21	–1.96	–													
2. Age	10.91	0.72	10.00–13.00	0.26	–0.66		–												
3. SES	0.00	0.61	–2.47–2.73	0.15	–0.38			–											
4. FD_T1	2.05	0.22	1.00–3.83	0.32	0.02	–0.10***	0.01	–0.18***	–										
5. FD_T2	2.05	0.26	1.00–4.00	0.31	–0.02	–0.10***	0.04*	–0.20***	0.57***	–									
6. FD_T3	2.02	0.27	1.00–4.00	0.28	–0.22	–0.09***	0.03	–0.19***	0.52***	0.61***	–								
7. FD_T4	2.03	0.29	1.00–4.00	0.24	–0.26	–0.09***	0.03	–0.16***	0.48***	0.57***	0.67***	–							
8. SCC_T1	3.12	0.31	1.00–4.00	–0.35	–0.36	0.07***	0.01	0.24***	–0.47***	–0.43***	–0.40***	–0.37***	–						
9. SCC_T2	3.17	0.32	1.00–4.00	–0.45	–0.08	0.09***	–0.004	0.22***	–0.42***	–0.52***	–0.46***	–0.42***	0.62***	–					
10. SCC_T3	3.20	0.31	1.00–4.00	0.41	–0.20	0.08***	0.02	0.21***	–0.40***	–0.43***	–0.53***	–0.47***	0.56***	0.64***	–				
11. SCC_T4	3.22	0.31	1.00–4.00	–0.42	–0.22	0.07***	0.02	0.20***	–0.38***	–0.42***	–0.48***	–0.54***	0.51***	0.60***	0.68***	–			
12. PG_T1	0.29	0.16	0.00–2.00	1.77	2.98	–0.07***	–0.02	–0.07***	0.32***	0.31***	0.31***	0.28***	–0.37***	–0.33***	–0.30***	–0.29***	–		
13. PG_T2	0.26	0.16	0.00–2.00	1.96	3.86	–0.04*	0.03	–0.05**	0.29***	0.37***	0.34***	0.32***	–0.30***	–0.42***	–0.35***	–0.34***	0.50***	–	
14. PG_T3	0.24	0.16	0.00–2.00	2.09	4.22	–0.03*	0.03*	–0.05*	0.25***	0.30***	0.39***	0.36***	–0.23***	–0.31***	–0.41***	–0.36***	0.41***	0.56***	–
15. PG_T4	0.25	0.17	0.00–2.00	2.09	4.13	–0.07***	0.003	–0.03*	0.20***	0.22***	0.30***	0.37***	–0.18***	–0.24***	–0.30***	–0.40***	0.36***	0.48***	0.58***

Note. FD = Family Dysfunction; SCC = Self-Concept Clarity; PG = Problematic Gaming.

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

Table 2. Model fit and model comparisons for RI-CLPM

Model	Y-B χ^2	df	Scaling Correction Factor for MLR	RMSEA	CFI	TLI	Y-B $\Delta\chi^2$	Δdf	Comparison model	p
M1: Baseline model (unconstrained model)	208.78	39	1.086	0.030	0.991	0.977				
M2: Model with autoregressive paths fixed to be time-invariant	320.66	45	1.126	0.036	0.986	0.968	96.92	6	M2 VS M1	<0.001
M3: Model with cross-lagged paths fixed to be time-invariant	219.50	51	1.132	0.026	0.991	0.983	16.96	12	M3VS M1	= 0.151
M4: Model with autoregressive and cross-lagged paths fixed to be time-invariant	323.76	57	1.162	0.031	0.986	0.976	112.67	18	M4 VS M1	<0.001

Note. Bold indicates final selected model.



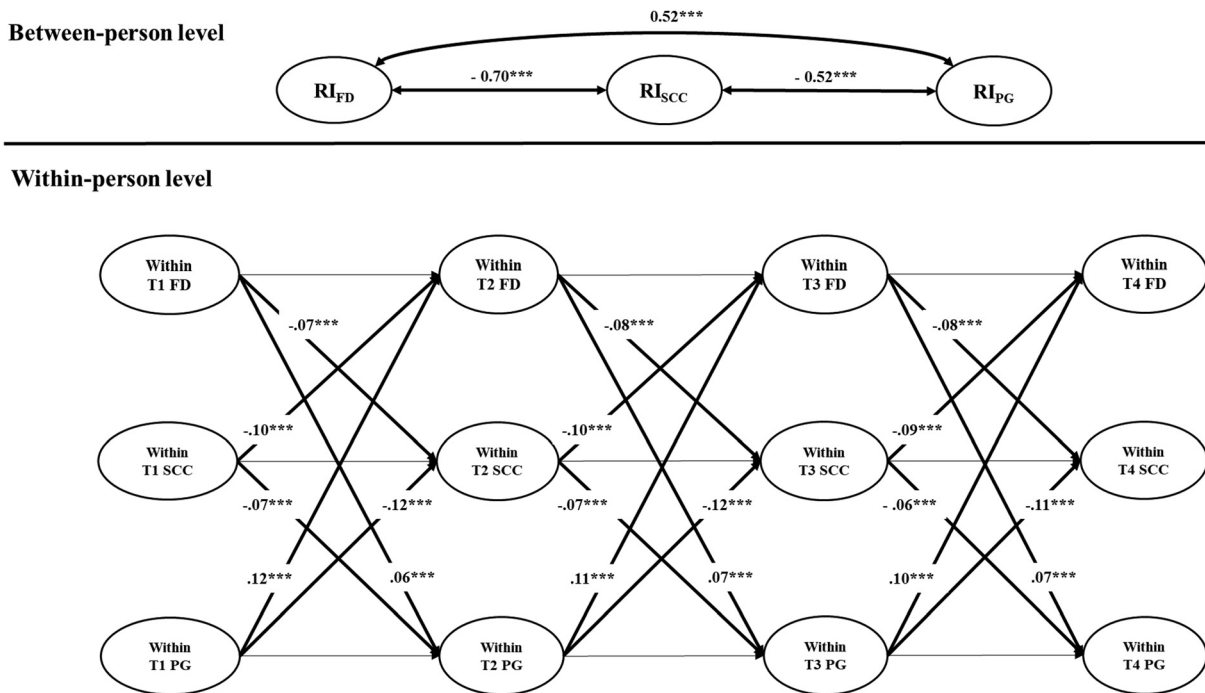


Fig. 1. Standardized path coefficients of the final RI-CLPM for family dysfunction, self-concept clarity and problematic gaming

Note. For simplicity, autoregressive coefficients, within-person concurrent associations and control variables are not presented in the figure. Standardized autoregressive coefficients and within-person concurrent associations are presented in Table 3, and the effects of control variables are presented in Table 4. RI = Random Intercept, FD = Family Dysfunction, SCC = Self-Concept Clarity, PG = Problematic Gaming. *** $p < 0.001$

self-concept clarity at time T to problematic gaming at T + 1 were statistically significant ($\beta = -0.06$ to -0.07 , $p < 0.001$) and vice versa ($\beta = -0.11$ to -0.12 , $p < 0.001$).

Mediation analysis

The percentile bootstrapping analysis found that the mediating effect of self-concept clarity at T2 was statistically significant in the link from family dysfunction at T1 to problematic gaming at T3 ($\beta = 0.004$, $p < 0.01$, 95% CI [0.001, 0.007]) and that the mediating effect of self-concept clarity at T3 was statistically significant in the link from family dysfunction at T2 to problematic gaming at T4 ($\beta = 0.005$, $p < 0.01$, 95% CI [0.002, 0.009]). The converse also held; the mediating effect of self-concept clarity at T2 was statistically significant in the link from problematic gaming at T1 to family dysfunction at T3 ($\beta = 0.011$, $p < 0.001$, 95% CI [0.006, 0.018]), and the mediating effect of self-concept clarity at T3 was also statistically significant in the link from problematic gaming at T2 to family dysfunction at T4 ($\beta = 0.010$, $p < 0.001$, 95% CI [0.006, 0.016]). The results of the within-person concurrent associations and the autoregressive effects for the final RI-CLPM are reported in Table 3. The roles of sex, age, and SES are reported in Table 4.

Sensitivity analyses

A series of sensitivity analyses were performed to assess the robustness of the main RI-CLPM results. The problematic gaming scale (i.e., POGU, Gentile, 2009), comprising 11 items with responses of “yes,” “no,” or “sometimes,” however, it was unclear whether a “sometimes” response

should be considered equivalent to a “yes” response, or equivalent to a “no” response, or something in between. To address this, two versions of checklist scores were computed, following Gentile’s (2009) practices. In Version A, “sometimes” was treated as equivalent to “yes,” while Version B adopted a more conservative approach, equating “sometimes” to “no.” Specifically, Version A assigned a value of 1 to both “sometime” and “yes,” and 0 to “no”; conversely, Version B assigned 0 to both “sometime” and “no,” and 1 to “yes.” The mean scores of the 11 items on the problematic gaming scale were subsequently calculated for both versions, followed by further RI-CLPM analysis. The analyses revealed that the RI-CLPM results, using these two distinct scoring methods, were largely congruent with the original study findings, with only minor variations in the coefficients. The RI-CLPM outcomes for Version A and Version B scoring are presented in Fig. S1 and Fig. S2 of the online supplementary materials, respectively.

Then, guided by Gentile’s (2009) recommendation, an individual was identified as displaying pathologic online game use if at least 6 of the 11 criteria on the symptom checklist were met. In alignment with Gentile’s (2009) methodology, we assigned values of “yes” = 1, “sometimes” = 0.5, “no” = 0, and subsequently computed the cumulative scores of the problematic gaming scale across time points T1–T4. Participants were classified into either the IGD group (total scores ≥ 6) or the non-IGD group (total scores < 6). The classification rates for the IGD group across T1–T4 were 8.0%, 7.3%, 7.3%, and 7.6%, respectively, closely mirroring the detection rates reported by Gentile (2009) (i.e., 8.5%). Thereafter, the IGD group was coded as 1, and the non-IGD

Table 3. Standardized autoregressive and within-person concurrent associations coefficients for final RI-CLPM

Autoregressive paths												
	T1→T2			T2→T3			T3→T4					
	β	SE	p	β	SE	p	β	SE	p			
FD→FD	0.10	0.03	<0.001	0.20	0.03	<0.001	0.33	0.02	<0.001			
SCC→SCC	0.14	0.03	<0.001	0.15	0.03	<0.001	0.26	0.03	<0.001			
PG→PG	0.17	0.03	<0.001	0.25	0.04	<0.001	0.31	0.03	<0.001			
Within-person concurrent associations												
	T1			T2			T3			T4		
	β	SE	p	β	SE	p	β	SE	p	β	SE	p
FD ↔ SCC	−0.19	0.02	<0.001	−0.30	0.02	<0.001	−0.29	0.02	<0.001	−0.28	0.02	<0.001
FD ↔ PG	0.11	0.03	<0.001	0.20	0.02	<0.001	0.23	0.02	<0.001	0.20	0.02	<0.001
SCC ↔ PG	−0.23	0.02	<0.001	−0.30	0.03	<0.001	−0.29	0.02	<0.001	−0.27	0.02	<0.001

Note. FD = Family Dysfunction; SCC = Self-Concept Clarity; PG = Problematic Gaming.

Table 4. The results of the roles of control variables for final RI-CLPM

	Sex		Age		SES	
	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>
RI-FD	−0.14	<0.001	0.05	0.051	−0.27	<0.001
RI-SCC	0.11	<0.001	0.01	0.494	0.29	<0.001
RI-PG	0.03	0.189	0.04	0.096	−0.07	<0.001
FD_T1	0.01	0.493	−0.03	0.026	0.03	0.019
SCC_T1	−0.01	0.417	0.004	0.717	0.02	0.067
PG_T1	−0.07	<0.001	−0.05	0.002	−0.03	0.065

Note. FD = Family Dysfunction; SCC = Self-Concept Clarity; PG = Problematic Gaming.

group as 0. In this context, problematic gaming was treated as a categorical variable, necessitating the application of the WLSMV estimator for RI-CLPM testing. The RI-CLPM outcomes, employing problematic gaming as a categorical variable, are depicted in Fig. S3 of the online supplementary materials, and are fundamentally in accordance with the original study's findings.

Lastly, the RI-CLPM analysis was conducted exclusively with participants who scored POGU scale ≥ 6 at T1, incorporating a total of 380 adolescents (8.0% of the full sample at T1). The mean score for the POGU scale was utilized, thereby treating problematic gaming as a continuous variable. The RI-CLPM outcomes, derived solely from the IGD group, are delineated in Fig. S4 of the online supplementary materials. As shown in Fig. S4, most of the cross-lagged effects were found to be statistically significant, except for the effects from self-concept clarity to problematic gaming, which were only marginally significant. These results above underscore the robustness of the findings.

DISCUSSION

A dysfunctional family environment has been documented to be significantly associated with adolescent problematic gaming (e.g., Sugaya et al., 2019), while problematic gaming may also be significantly related to adolescents experiencing increased family dysfunction (e.g., Koning et al., 2018;

Su et al., 2018; Teng, Griffiths, et al., 2020). However, the existing literature did not definitively address the bidirectional nature of the associations between family dysfunction and young people's problematic gaming at the within-person level or the mediating mechanisms that explain this bidirectional relation. Our study used a four-wave longitudinal design and a within-person analytical approach (RI-CLPM) to fill this significant research gap by examining whether family dysfunction and young people's problematic gaming have reciprocal effects and exploring the potential mediating role of self-concept clarity in this relation among Chinese early adolescents. The findings revealed that Chinese youths' family dysfunction and problematic gaming are interrelated in a dynamic bidirectional manner over time, thus forming a vicious cycle. Self-concept clarity was shown to be a mediator in the vicious cycle between family dysfunction and problematic gaming. Specifically, the experience of family dysfunction indirectly predicted increased problematic gaming through self-concept clarity, and adolescent problematic gaming also indirectly predicted increased experience of family dysfunction through self-concept clarity. The results of this study are discussed in detail below.

The vicious cycle of family dysfunction and problematic gaming

Our study suggests that that youths' experience of family dysfunction may be associated with an increase in



problematic gaming. This result can be interpreted in the light of self-determination theory (Ryan & Deci, 2017) and compensatory internet use theory (Kardefelt-Winther, 2014). Self-determination theory (Ryan & Deci, 2017) suggests that experiences of family dysfunction are more likely to undermine the development of youths' basic need satisfaction, namely autonomy, relatedness, and competence. Compensatory internet use theory (Kardefelt-Winther, 2014) argues that online activities such as gaming can provide attractive compensation for young people who have difficulty satisfying their basic needs in real life. Thus, family dysfunction may lead to adolescents' developing problematic gaming patterns to escape the pressures of reality while satisfying their basic needs. This result is congruent with existing research that has consistently suggested family dysfunction may be a key risk predictor for adolescent problematic gaming (e.g., Coşa et al., 2022; Gao et al., 2022; Sugaya et al., 2019) and other relevant addictive behaviors such as internet addiction (Sela, Zach, Amichay-Hamburger, Mishali, & Omer, 2020) and mobile phone addiction (Liu et al., 2020).

The findings of our study also indicated that when adolescents exhibit higher levels of problematic gaming, they may experience more family dysfunction. Adolescents with high levels of problematic gaming may experience more internalizing problems, including anxiety, social withdrawal, and depressive symptoms (Jeong et al., 2019; Wartberg et al., 2019; Wichstrøm, Stenseng, Belsky, von Soest, & Hygen, 2019), which may lead to more conflict in relationships with family members and eventually to higher levels of family dysfunction (e.g., Thornberry et al., 2014). Furthermore, overuse of online games may lead to a significant reduction in the time and energy that is devoted to learning, resulting in academic failure (e.g., Hawi, Samaha, & Griffiths, 2018). Especially in the context of Chinese Confucian culture, which places a high value on children's academic achievement (Yu, Chen, Levesque-Bristol, & Vansteenkiste, 2018), young people's problematic gaming may prompt greater parental use of controlling or punitive practices to reduce the amount of time adolescents spend playing games. These maladaptive parenting practices may exacerbate parent-child conflict and undermine parental affective involvement and parent-child communication quality, ultimately leading to more severe family dysfunction. Our findings echo those of Lin et al.'s (2020) longitudinal study among Chinese adolescents, which showed that adolescent problematic gaming significantly predicted the increase of parental psychological control one-year later. Similarly, Koning et al.'s (2018) longitudinal study showed that youths' problematic gaming may induce ineffective parental responses, thus undermining parent-child communication.

Self-concept clarity as a gateway in the vicious cycle

The results indicated family dysfunction significantly predicted a decrease in adolescent self-concept clarity, which is consistent with several cross-sectional and longitudinal studies (Becht et al., 2017; Van Dijk et al., 2014; Vartanian,

Froneich, & Smyth, 2016; Xiang et al., 2020). Previous research suggests that positive family interactions may help adolescents develop a strong, integrated self in various domains (Chen et al., 2006), and that living in a family that permits adolescents the open expression of thoughts and opinions about their self-concept and shows acceptance of their self-views can help boost self-concept clarity (McLean et al., 2007). Conversely, in dysfunctional families, family members may not be able to engage in active listening and promote quality communication about the adolescent's self-perceptions or provide effective feedback on confusion about their self-concept, which is detrimental to the development of self-concept clarity over time (Smetana, Campione-Barr, & Metzger, 2006).

Our study further revealed that self-concept clarity significantly predicted adolescent problematic gaming over time, which aligns with previous cross-sectional studies (e.g., Zhang et al., 2022; Šporčić & Glavak-Tkalić, 2018). Youths with low self-concept clarity may lack a sense of certainty, identity, and stability, as well as have deficits in well-organized self-knowledge regarding their abilities, aptitudes, and traits (Campbell et al., 1996; Šporčić & Glavak-Tkalić, 2018). As a result, they have difficulty dealing with challenges they encounter in the real world, which may undermine their self-efficacy and lead to greater psychological pain (Campbell et al., 1996; Zhang et al., 2022). Internet gaming provides tempting opportunities for anonymous social interaction and success experiences (Young, 2009). In online games, youths with poorer self-concepts can create an avatar as a proxy of their ideal selves (Servidio, 2023) to obtain clearer concepts of themselves, including the perception of control, consistency, and competence (Quinones & Kakabadse, 2015; Šporčić & Glavak-Tkalić, 2018). However, as suggested by the self-concept fragmentation hypothesis (Valkenburg & Peter, 2011), the use of internet gaming as compensation for a lack of self-concept clarity is not only temporary but may result in youths becoming engrossed in the various personas presented in the game, thereby increasing the probability of excessive gaming in the future. Considering these factors, overall, family dysfunction could be indirectly linked with adolescent problematic gaming through self-concept clarity.

Self-concept clarity also serves as a mediating variable in the pathway of adolescent problematic gaming predicting family dysfunction. Higher adolescent problematic gaming negatively predicted self-concept clarity. Online games offer a large number of potential interaction partners and a variety of ways to demonstrate identity. Adolescents who engage in severe problematic gaming may have difficulty synthesizing all their choices within a coherent and unified self due to their exposure to a broad range of game roles and values, particularly when this exploration is arbitrary rather than driven by curiosity (Yang & Brown, 2016). In this case, young people may doubt their true identities and, thus, fail to develop a stable self-concept structure (i.e., self-concept clarity) (Valkenburg & Peter, 2008). Our study is the first to demonstrate the deteriorative role of problematic gaming on adolescent self-concept clarity, paralleling the findings of



Appel et al.'s (2018) longitudinal study that revealed Facebook overuse predicted a decrease in self-concept clarity.

Adolescent self-concept clarity can further significantly predict family dysfunction over time. As children reach adolescence, they strive for greater autonomy and individualization and expect a more equal relationship with adults (Koepeke & Denissen, 2012). Adolescents with a high level of self-concept clarity are positioned to clearly articulate the kinds of relationships they want to have with their family members, critically evaluate their relationships, and commit to these relationships without having to fear ego loss (Becht et al., 2017). However, adolescents with unclear self-concepts may exhibit rather submissive attitudes toward their parents and a high dependence on family relationships and interact with their family members in a more passive manner (Swann, Chang-Schneider, & Larsen McClarty, 2007), undermining the development of high-quality family functioning. Our findings echo those of Becht et al. (2017), whose longitudinal study found that higher self-concept clarity in adolescents predicted a decrease in negative parent-child interactions and fostered an increase in parental support. In sum, the results of this study facilitate a greater understanding of the longitudinal relations and mediating mechanisms between family dysfunction and problematic gaming in Chinese youths.

Moreover, the significant correlations between the random intercepts of family dysfunction, self-concept clarity, and problematic gaming indicate a medium degree of between-person effects among them (e.g., Mulder & Hamaker, 2021). The between- and within-person effects are all theoretically significant because they depict fundamentally different relations between variables. The most important in the context of the between-person effects is the interpersonal comparison with a reference group of others (vs. oneself) (Orth et al., 2021). Theoretically, the between-person effect can inform, for instance, whether youth who have lower self-concept clarity in comparison to their peer group are at higher risk of problematic gaming compared to their peers (Orth et al., 2021). The within-person effect represents that the link between family dysfunction, self-concept clarity, and problematic gaming is driven by processes linked to intrapersonal changes. In other words, if an adolescent experiences more family dysfunction than usual, this adolescent may have a subsequent decrease in self-concept clarity and an increase in problematic gaming. Since between-person effects involve the comparison of self to others, some of the time-invariant factors such as personality stability and SES may contribute to greater individual differences in the study variables of interest, ultimately resulting in greater between-person effects than within-person effects. For example, previous studies have found that personality traits (e.g., neuroticism) are significantly associated with both family functioning (e.g., de Haan, Deković, & Prinzie, 2012; Zhou, Zhu, & Zhao, 2023) and problematic gaming (e.g., Gervasi et al., 2017; Liao et al., 2020). Aside from underlying personality stabilities, tremendous stability of contextual influences, such as family socioeconomic characteristics, may also serve as the underlying influences

that contribute to the observed correlations between family dysfunction, self-concept clarity, and problematic gaming at the between-person level. Specifically, it has found that children hailing from socioeconomically advantaged families may be more likely to experience family dysfunction (e.g., Nie et al., 2020), manifest reduced clarity in self-concept (e.g., Easterbrook, Kuppens, & Manstead, 2020; Orr, 2013), and exhibit problematic gaming symptoms (e.g., Schneider, King, & Delfabbro, 2017).

Furthermore, because many psychological constructs are highly stable over time at the within-person level, the degree of change at the within-person level will be small, and adjusting for stability effects (i.e., previous levels of the constructs) tends to eliminate a considerable percentage of variance in the outcome that is shared with other predictors (Adachi & Willoughby, 2015). Excluding between-person variance from the RI-CLPM can also eliminate some of the variances in the result. When confounders such as these were controlled, our study revealed small-to moderate-size cross-lagged effects at the within-person level. The relatively small within-person effects suggest that short-term variations in family dysfunction and self-concept clarity may have less impact on immediate changes in problematic gaming behavior. Even small within-person effects are noteworthy as they capture the temporal dynamics and fluctuations within individuals over time. Findings based on small effect sizes should be considered as possible contributions for optimizing interventions.

The roles of SES and sex

Our results indicated a negative association between family SES and the random intercept of family dysfunction in RI-CLPM. Families with greater SES can better meet family members' basic needs, reducing conflicts related to financial hardships (e.g., Santiago, Wadsworth, & Stump, 2011). Additionally, higher SES families tend to have access to resources such as high-quality education, healthcare, and social support systems, which further allow families to invest more time and energy in maintaining healthy relationships between family members (e.g., Masarik & Conger, 2017). Moreover, in line with previous literature (e.g., Schneider et al., 2017), our findings demonstrated a negative association between family SES and the random intercept of problematic gaming in RI-CLPM. This could be because adolescents from more affluent families may have access to a broader range of extracurricular activities, hobbies, and social opportunities. The availability of alternative leisure activities, along with increased parental involvement and guidance, may contribute to a lower likelihood of excessive gaming. Furthermore, higher SES families may prioritize aspects such as academic achievement and future prospects, which might discourage excessive online gaming and promote a healthier balance between various activities. Our study also revealed a positive association between family SES and the random intercept of self-concept clarity in RI-CLPM. We infer that this finding may be a consequence of adolescents from higher SES families experiencing fewer



financial insecurities, leading to a clearer sense of self within their social context. These families often provide greater access to educational opportunities, cultural resources, and extracurricular activities, which may also foster personal growth and facilitate the development of a more defined self-concept.

This study showed a negative association between sex and the random intercept of family dysfunction in RI-CLPM, indicating boys may report more family dysfunction over time than girls. From an early age, boys and girls are socialized differently, leading to distinct expectations and behaviors within the family unit. Boys may be encouraged to adopt assertive and dominant roles, which can result in heightened conflict and strained familial relationships during adolescence (Noller & Callan, 1991). These societal expectations may impede effective communication and emotional expression, contributing to the reported gender discrepancy in family dysfunction. Moreover, this study found a positive association between sex and the random intercept of self-concept clarity in RI-CLPM. Traditional gender norms often encourage boys to adopt stereotypically masculine traits such as independence, stoicism, and self-reliance (Exner-Cortens et al., 2021). These expectations may discourage boys from engaging in introspection and exploring their own emotions and identities, leading to a less clear and coherent self-concept. In contrast, girls may receive more societal support and encouragement for introspection, emotional expression, and the development of a coherent self-identity, thereby contributing to their higher levels of self-concept clarity.

Strengths, limitations, and further research

This study has several strengths. It was the first study to comprehensively examine the dynamic processes and mediating mechanisms affecting the relation between family dysfunction and problematic gaming, thus shedding light on the longitudinal interaction between the family and internet-gaming domains. This study included a large sample of Chinese adolescents and used a multi-wave longitudinal design. Furthermore, this study used a within-person analysis approach (i.e., RI-CLPM) that allowed for disentangling between-person effects and within-person effects, thus providing more convincing results at the within-person level.

There are also several key limitations in our study. First, self-reported data were used for this study. It was not possible in this study to determine whether or to what extent the association between problematic gaming, self-concept clarity, and family dysfunction is due to the perception tendency of young people with different levels of self-concept clarity vs. due to the influence of family dysfunction on self-concept clarity and problematic gaming. Collecting data from different sources, such as using dyadic data from youth and parents, may better address the research questions (e.g., De Los Reyes et al., 2015; Pivetta et al., 2023). Second, this study only focused on the construct of self-concept and omitted the potential effect of the content of self-concept (such as self-awareness and self-esteem). Future studies could include

measures of the content of self-concept to gain a greater understanding of the similarities and differences between the roles of the construct and content of self-concept in the longitudinal relations between family dysfunction and problematic gaming. Third, the participants were all from elementary schools in China; more research is needed in the future to replicate these findings in different cultural contexts.

CONCLUSION

The major findings of our study were that adolescent experiences of family dysfunction and problematic gaming reciprocally influenced each other, and that this bidirectional relation was mediated by self-concept clarity at the within-person level. Our study reveals that family dysfunction is a significant predictor of increased adolescent problematic gaming. In turn, adolescent problematic gaming also predicts changes in adolescents' experience of family dysfunction, thus forming a vicious cycle. Furthermore, our study demonstrates that family dysfunction and adolescent problematic gaming influence each other in part by undermining adolescents' self-concept clarity, thus highlighting the key role of self-concept clarity and suggesting that fostering youths' self-concept clarity should be considered a key approach to prevent youth from becoming locked into a vicious cycle of family dysfunction and problematic gaming. Overall, the linkages between family dysfunction, self-concept clarity, and adolescent problematic gaming can be better understood through the within-person approach, which may provide important support for causal inferences. From a practical perspective, the findings suggest that comprehensive interventions addressing family dysfunction, problematic gaming, and self-concept clarity are warranted to prevent a vicious cycle of negativity in the family and internet gaming misuse.

Funding sources: This research was supported by grants from the Ministry of Science and Technology of China (No. 2021ZD0203804), and Funds for National Natural Science Youth Foundation of China (No. 32300898), and Funds for Humanities and Social Sciences Youth Foundation, Ministry of Education of the People's Republic of China (No. 22YJC190031), and Funds for Young Doctor of Institutions of Higher Learning of Gansu Province (No. 2022QB-036), and Funds for General Project of Social Science Planning of Gansu Province (No. 2022YB057), and Funds for Youth Science and Technology of Gansu Province (No. 22JR5RA170).

Authors' contribution: Jianhua Zhou: Conceptualization, Methodology, Formal Analysis, Writing-Original Draft, Writing-Review & Editing, Visualization, Supervision, Funding acquisition. Haiyan Zhao: Methodology, Formal Analysis, Writing-Original Draft, Project administration. Li'an Wang: Methodology, Writing-Original Draft. Dandan Zhu: Methodology, Writing-Review & Editing.



Conflict of interest: The authors declare no conflict of interest.

SUPPLEMENTARY MATERIAL

Supplementary data to this article can be found online at <https://doi.org/10.1556/2006.2023.00054>.

REFERENCES

- Adachi, P., & Willoughby, T. (2015). Interpreting effect sizes when controlling for stability effects in longitudinal autoregressive models: Implications for psychological science. *European Journal of Developmental Psychology*, 12(1), 116–128. <https://doi.org/10.1080/17405629.2014.963549>.
- American Psychiatric Association [APA]. (2022). *Diagnostic and statistical manual of mental disorders*, 5th ed., Text revision (DSM-5-TR). Washington: American Psychiatric Association.
- Appel, M., Schreiner, C., Weber, S., Mara, M., & Gnams, T. (2018). Intensity of Facebook use is associated with lower self-concept clarity: Cross-sectional and longitudinal evidence. *Journal of Media Psychology*, 30(3), 160–172. <https://doi.org/10.1027/1864-1105/a000192>.
- Bainter, S. A., & Howard, A. L. (2016). Comparing within-person effects from multivariate longitudinal models. *Developmental Psychology*, 52(12), 1955–1968. <https://doi.org/10.1037/dev0000215>.
- Becht, A. I., Nelemans, S. A., Van Dijk, M. P., Branje, S. J., Van Lier, P. A., Denissen, J. J., & Meeus, W. H. (2017). Clear self, better relationships: Adolescents' self-concept clarity and relationship quality with parents and peers across 5 years. *Child Development*, 88(6), 1823–1833. <https://doi.org/10.1111/cdev.12921>.
- Berry, D., & Willoughby, M. T. (2017). On the practical interpretability of cross-lagged panel models: Rethinking a developmental workhorse. *Child Development*, 88(4), 1186–1206. <https://doi.org/10.1111/cdev.12660>.
- Brand, M., Young, K. S., Laier, C., Wölfling, K., & Potenza, M. N. (2016). Integrating psychological and neurobiological considerations regarding the development and maintenance of specific Internet-use disorders: An Interaction of Person-Affect-Cognition-Execution (I-PACE) model. *Neuroscience and Biobehavioral Reviews*, 71, 252–266. <https://doi.org/10.1016/j.neubiorev.2016.08.033>.
- Byles, J., Byrne, C., Boyle, M. H., & Offord, D. R. (1988). Ontario child health study: Reliability and validity of the general functioning subscale of the McMaster family assessment device. *Family Process*, 27(1), 97–104. <https://doi.org/10.1111/j.1545-5300.1988.00097.x>.
- Campbell, J. D., Trapnell, P. D., Heine, S. J., Katz, I. M., Lavalley, L. F., & Lehman, D. R. (1996). Self-concept clarity: Measurement, personality correlates, and cultural boundaries. *Journal of Personality and Social Psychology*, 70(1), 141–156. <http://dx.doi.org/10.1037/0022-3514.70.1.141>.
- Castro-Calvo, J., King, D. L., Stein, D. J., Brand, M., Carmi, L., Chamberlain, S. R., ... Billieux, J. (2021). Expert appraisal of criteria for assessing gaming disorder: An international Delphi study. *Addiction*, 116(9), 2463–2475. <https://doi.org/10.1111/add.15411>.
- Chen, S., Boucher, H. C., & Tapias, M. P. (2006). The relational self revealed: Integrative conceptualization and implications for interpersonal life. *Psychological Bulletin*, 132(2), 151–179. <https://doi.org/10.1037/0033-2909.132.2.151>.
- Chen, I. H., Lee, Z. H., Dong, X. Y., Gamble, J. H., & Feng, H. W. (2020). The influence of parenting style and time management tendency on internet gaming disorder among adolescents. *International Journal of Environmental Research and Public Health*, 17(23), Article 9120. <https://doi.org/10.3390/ijerph17239120>.
- Choi, E., Shin, S. H., Ryu, J. K., Jung, K. I., Hyun, Y., Kim, J., & Park, M. H. (2021). Association of extensive video gaming and cognitive function changes in brain-imaging studies of pro gamers and individuals with gaming disorder: Systematic literature review. *JMIR Serious Games*, 9(3), e25793. <https://doi.org/10.2196/25793>.
- Cicero, D. C. (2017). Self-concept clarity and psychopathology. In J. Lodi-Smith, & K. G. Demarree (Eds.), *Self-concept clarity: Perspectives on assessment, research, and applications* (pp. 219–242). Springer International Publishing.
- CNNIC. (2021). National study on internet use by minors in 2020. Available at: <http://www.cnnic.cn/hlwfzyj/hlwxbzg/qsngb/202107/P020210720571098696248.pdf>.
- Colasante, E., Pivetta, E., Canale, N., Vieno, A., Marino, C., Lenzi, M., ... Molinaro, S. (2022). Problematic gaming risk among European adolescents: A cross-national evaluation of individual and socio-economic factors. *Addiction*, 117(8), 2273–2282. <https://doi.org/10.1111/add.15843>.
- Coşa, I. M., Dobrea, A., Georgescu, R. D., & Păşărelu, C. R. (2022). Parental behaviors associated with internet gaming disorder in children and adolescents: A quantitative meta-analysis. *Current Psychology*. Advance online publication. <https://doi.org/10.1007/s12144-022-04018-6>.
- Crocetti, E., Branje, S., Rubini, M., Koot, H. M., & Meeus, W. (2017). Identity processes and parent-child and sibling relationships in adolescence: A five-wave multi-informant longitudinal study. *Child Development*, 88(1), 210–228. <https://doi.org/10.1111/cdev.12547>.
- Crocetti, E., Rubini, M., Branje, S., Koot, H. M., & Meeus, W. (2015). Self-concept clarity in adolescents and parents: A six-wave longitudinal and multi-informant study on development and intergenerational transmission. *Journal of Personality*, 84(5), 580–593. <https://doi.org/10.1111/jopy.12181>.
- Davis, R. A. (2001). A cognitive-behavioral model of pathological Internet use. *Computers in Human Behavior*, 17(2), 187–195. [https://doi.org/10.1016/S0747-5632\(00\)00041-8](https://doi.org/10.1016/S0747-5632(00)00041-8).
- De Goede, I. H. A., Branje, S. J. T., & Meeus, W. H. J. (2009). Developmental changes in adolescents' perceptions of relationships with their parents. *Journal of Youth and Adolescence*, 38(1), 75–88. <https://doi.org/10.1007/s10964-008-9286-7>.
- de Haan, A. D., Deković, M., & Prinzie, P. (2012). Longitudinal impact of parental and adolescent personality on parenting. *Journal of Personality and Social Psychology*, 102(1), 189–199. <https://doi.org/10.1037/a0025254>.
- De Los Reyes, A., Augenstein, T. M., Wang, M., Thomas, S. A., Drabick, D. A., Burgers, D. E., & Rabinowitz, J. (2015). The



- validity of the multi-informant approach to assessing child and adolescent mental health. *Psychological Bulletin*, 141(4), 858–900. <https://doi.org/10.1037/a0038498>.
- DeMarree, K. G., & Bobrowski, M. E. (2017). Structure and validity of self-concept clarity measures. In J. Lodi-Smith, & K. G. Demarree (Eds.), *Self-concept clarity: Perspectives on assessment, research, and applications* (pp. 177–193). Springer International Publishing.
- Dong, G., & Potenza, M. N. (2014). A cognitive-behavioral model of Internet gaming disorder: Theoretical underpinnings and clinical implications. *Journal of Psychiatric Research*, 58, 7–11. <https://doi.org/10.1016/j.jpsychires.2014.07.005>.
- Easterbrook, M. J., Kuppens, T., & Manstead, A. S. (2020). Socio-economic status and the structure of the self-concept. *British Journal of Social Psychology*, 59(1), 66–86. <https://doi.org/10.1111/bjso.12334>.
- Epstein, N. B., Baldwin, L. M., & Bishop, D. S. (1985). The McMaster family assessment device. *Journal of Marital and Family Therapy*, 11(4), 345–356. <http://doi.org/10.1111/j.1752-0606.1985.tb00028.x>.
- Epstein, N. B., Bishop, D. S., & Levin, S. (1978). The McMaster model of family functioning. *Journal of Marital and Family Therapy*, 4(4), 19–31. <https://doi.org/10.1111/j.1752-0606.1978.tb00537.x>.
- Erevik, E. K., Landrø, H., Mattson, Å. L., Kristensen, J. H., Kaur, P., & Pallesen, S. (2022). Problem gaming and suicidality: A systematic literature review. *Addictive Behaviors Reports*, 15, Article 100419. <https://doi.org/10.1016/j.abrep.2022.100419>.
- Erikson, E. H. (1963). *Childhood and society*. New York: W. W. Norton & Company.
- Erikson, E. H. (1968). *Identity youth and crisis* (No. 7). WW Norton & company.
- Exner-Cortens, D., Wright, A., Claussen, C., & Truscott, E. (2021). A systematic review of adolescent masculinities and associations with internalizing behavior problems and social support. *American Journal of Community Psychology*, 68(1–2), 215–231. <https://doi.org/10.1002/ajcp.12492>.
- Fumero, A., Marrero, R. J., Bethencourt, J. M., & Peñate, W. (2020). Risk factors of internet gaming disorder symptoms in Spanish adolescents. *Computers in Human Behavior*, 111, Article 106416. <https://doi.org/10.1016/j.chb.2020.106416>.
- Gan, X., Xiang, G. X., Jin, X., Zhu, C. S., & Yu, C. F. (2022). How does family dysfunction influence internet gaming disorder? Testing a moderated serial mediation model among Chinese adolescents. *International Journal of Mental Health and Addiction*. Advance online publication. <https://doi.org/10.1007/s11469-022-00895-x>.
- Gao, Y. X., Wang, J. Y., & Dong, G. H. (2022). The prevalence and possible risk factors of internet gaming disorder among adolescents and young adults: Systematic reviews and meta-analyses. *Journal of Psychiatric Research*, 154, 35–43. <https://doi.org/10.1016/j.jpsychires.2022.06.049>.
- Gentile, D. (2009). Pathological video-game use among youth ages 8 to 18: A national study. *Psychological Science*, 20(5), 594–602. <https://doi.org/10.1111/j.1467-9280.2009.02340.x>.
- Gervasi, A. M., La Marca, L., Costanzo, A., Pace, U., Guglielmucci, F., & Schimmenti, A. (2017). Personality and internet gaming disorder: A systematic review of recent literature. *Current Addiction Reports*, 4, 293–307. <https://doi.org/10.1007/s40429-017-0159-6>.
- Green, R., Delfabbro, P. H., & King, D. L. (2020). Avatar-and self-related processes and problematic gaming: A systematic review. *Addictive Behaviors*, 108, Article 106461. <https://doi.org/10.1016/j.addbeh.2020.106461>.
- Hamaker, E. L., Kuiper, R. M., & Grasman, R. P. P. P. (2015). A critique of the cross-lagged panel model. *Psychological Methods*, 20(1), 102–116. <https://doi.org/10.1037/a0038889>.
- Hawi, N. S., Samaha, M., & Griffiths, M. D. (2018). Internet gaming disorder in Lebanon: Relationships with age, sleep habits, and academic achievement. *Journal of Behavioral Addictions*, 7(1), 70–78. <https://doi.org/10.1556/2006.7.2018.16>.
- Hayes, A. F., & Scharkow, M. (2013). The relative trustworthiness of inferential tests of the indirect effect in statistical mediation analysis: Does method really matter? *Psychological Science*, 24(10), 1918–1927. <https://doi.org/10.1177/0956797613480187>.
- Hogg, M. A., & Adelman, J. (2013). Uncertainty–identity theory: Extreme groups, radical behavior, and authoritarian leadership. *Journal of Social Issues*, 69(3), 436–454. <https://doi.org/10.1111/josi.12023>.
- Huang, P., Zhou, Y., Li, D., Jia, J., Xiao, J., Liu, Y., & Zhang, H. (2023). Developmental trajectories of adolescent internet addiction: Interpersonal predictors and adjustment outcomes. *Research on Child and Adolescent Psychopathology*, 51(3), 355–367. <https://doi.org/10.1007/s10802-022-00987-1>.
- Jeong, H., Yim, H. W., Lee, S. Y., Lee, H. K., Potenza, M. N., Jo, S. J., & Son, H. J. (2019). Reciprocal relationship between depression and internet gaming disorder in children: A 12-month follow-up of the iCURE study using cross-lagged path analysis. *Journal of Behavioral Addictions*, 8(4), 725–732. <https://doi.org/10.1556/2006.8.2019.74>.
- Kardefelt-Winther, D. (2014). A conceptual and methodological critique of internet addiction research: Towards a model of compensatory internet use. *Computers in Human Behavior*, 31, 351–354. <https://doi.org/10.1016/j.chb.2013.10.059>.
- Karlsen, F. (2013). *A world of excesses: Online games and excessive playing*. London: Routledge.
- Keijsers, L., & Poulin, F. (2013). Developmental changes in parent–child communication throughout adolescence. *Developmental Psychology*, 49(12), 2301–2308. <https://doi.org/10.1037/a0032217>.
- King, D. L., & Delfabbro, P. H. (2018). *Internet gaming disorder: Theory, assessment, treatment and prevention*. New York: Academic Press.
- Koepke, S., & Denissen, J. J. (2012). Dynamics of identity development and separation–individuation in parent–child relationships during adolescence and emerging adulthood—A conceptual integration. *Developmental Review*, 32(1), 67–88. <https://doi.org/10.1016/j.dr.2012.01.001>.
- Koning, I. M., Peeters, M., Finkenauer, C., & Van Den Eijnden, R. J. (2018). Bidirectional effects of Internet-specific parenting practices and compulsive social media and Internet game use. *Journal of Behavioral Addictions*, 7(3), 624–632. <https://doi.org/10.1556/2006.7.2018.68>.
- Lawrence, T. I., Merrin, G. J., & Mcfield, A. A. (2022). Family violence and adolescent aggressive behavior: The direct and indirect effects of depression and substance use. *International*



- Journal of Mental Health and Addiction*. Advance online publication. <https://doi.org/10.1007/s11469-022-00971-2>.
- Li, Y., Ma, X., Feng, C., & Wang, Y. (2022). Parental psychological control and adolescents depression during the COVID-19 pandemic: The mediating and moderating effect of self-concept clarity and mindfulness. *Current Psychology*. Advance online publication. <https://doi.org/10.1007/s12144-022-03445-9>.
- Liao, Z., Huang, Q., Huang, S., Tan, L., Shao, T., Fang, T., ... Shen, H. (2020). Prevalence of internet gaming disorder and its association with personality traits and gaming characteristics among Chinese adolescent gamers. *Frontiers in Psychiatry*, 11, Article 598585. <https://doi.org/10.3389/fpsy.2020.598585>.
- Light, A. E. (2017). Self-concept clarity, self-regulation, and psychological well-being. In J. Lodi-Smith, & K. G. Demarree (Eds.), *Self-concept clarity: Perspectives on assessment, research, and applications* (pp. 177–193). Springer International Publishing.
- Lin, S., Yu, C., Chen, J., Sheng, J., Hu, Y., & Zhong, L. (2020). The association between parental psychological control, deviant peer affiliation, and internet gaming disorder among Chinese adolescents: A two-year longitudinal study. *International Journal of Environmental Research and Public Health*, 17(21), Article 8197. <https://doi.org/10.3390/ijerph17218197>.
- Little, R. J., & Rubin, D. B. (2002). *Statistical analysis with missing data*. New Jersey: Wiley. <https://doi.org/10.1002/9781119013563>.
- Liu, Q. X., Fang, X. Y., Wan, J. J., & Zhou, Z. K. (2016). Need satisfaction and adolescent pathological internet use: Comparison of satisfaction perceived online and offline. *Computers in Human Behavior*, 55, 695–700. <https://doi.org/10.1016/j.chb.2015.09.048>.
- Liu, Q. Q., Yang, X. J., Hu, Y. T., Zhang, C. Y., & Nie, Y. G. (2020). How and when is family dysfunction associated with adolescent mobile phone addiction? Testing a moderated mediation model. *Children and Youth Services Review*, 111, Article 104827. <https://doi.org/10.1016/j.childyouth.2020.104827>.
- Marsh, H. W., Hau, K. T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling: A Multidisciplinary Journal*, 11(3), 320–341. https://doi.org/10.1207/s15328007sem1103_2.
- Masarik, A. S., & Conger, R. D. (2017). Stress and child development: A review of the family stress model. *Current Opinion in Psychology*, 13, 85–90. <https://doi.org/10.1016/j.copsyc.2016.05.008>.
- McLean, K. C., Pasupathi, M., & Pals, J. L. (2007). Selves creating stories creating selves: A process model of self-development. *Personality and Social Psychology Review*, 11(3), 262–278. <https://doi.org/10.1177/1088868307301034>.
- Mihara, S., & Higuchi, S. (2017). Cross-sectional and longitudinal epidemiological studies of internet gaming disorder: A systematic review of the literature. *Psychiatry and Clinical Neurosciences*, 71(7), 425–444. <https://doi.org/10.1111/pcn.12532>.
- Mulder, J. D., & Hamaker, E. L. (2021). Three extensions of the random intercept cross-lagged panel model. *Structural Equation Modeling: A Multidisciplinary Journal*, 28(4), 638–648. <https://doi.org/10.1080/10705511.2020.1784738>.
- Nagata, J. M., Singh, G., Sajjad, O. M., Ganson, K. T., Testa, A., Jackson, D. B., ... Baker, F. C. (2022). Social epidemiology of early adolescent problematic screen use in the United States. *Pediatric Research*, 92(5), 1443–1449. <https://doi.org/10.1038/s41390-022-02176-8>.
- Nicholson, J. S., Deboeck, P. R., & Howard, W. (2017). Attrition in developmental psychology: A review of modern missing data reporting and practices. *International Journal of Behavioral Development*, 41(1), 143–153. <https://doi.org/10.1177/01650254156182>.
- Nie, Q., Tian, L., & Huebner, E. S. (2020). Relations among family dysfunction, loneliness and life satisfaction in Chinese children: A longitudinal mediation model. *Child Indicators Research*, 13, 839–862. <https://doi.org/10.1007/s12187-019-09650-6>.
- Niu, G. F., Sun, X. J., Zhou, Z. K., Tian, Y., Liu, Q. Q., & Lian, S. L. (2016). The effect of social network site use on adolescents' self-concept clarity: The mediation effect of social comparison. *Journal of Psychological Science*, 39(1), 97–102. <http://www.psycsci.org/EN/abstract/abstract9606.shtml>.
- Noller, P., & Callan, V. (1991). *The adolescent in the family*. London: Routledge.
- Orr, P. M. (2013). *Gender and SES effects on multidimensional self-concept development during adolescence* [Doctoral dissertation, Dublin Institute of Technology].
- Orth, U., Clark, D. A., Donnellan, M. B., & Robins, R. W. (2021). Testing prospective effects in longitudinal research: Comparing seven competing cross-lagged models. *Journal of Personality and Social Psychology*, 120(4), 1013–1034. <https://doi.org/10.1037/pspp0000358>.
- Paulus, F. W., Ohmann, S., Von Gontard, A., & Popow, C. (2018). Internet gaming disorder in children and adolescents: A systematic review. *Developmental Medicine and Child Neurology*, 60(7), 645–659. <https://doi.org/10.1111/dmcn.13754>.
- Pivetta, E., Costa, S., Antonietti, J. P., Marino, C., Billieux, J., & Canale, N. (2023). Adolescent problematic gaming and its association with maternal behaviors: A dyadic study focusing on the relational-emotional correlates. *Addictive Behaviors*, 140, Article 107602. <https://doi.org/10.1016/j.addbeh.2022.107602>.
- Quinones, C., & Kakabadse, N. K. (2015). Self-concept clarity and compulsive Internet use: The role of preference for virtual interactions and employment status in British and North-American samples. *Journal of Behavioral Addictions*, 4(4), 289–298. <https://doi.org/10.1556/2006.4.2015.038>.
- Richard, J., Temcheff, C., Fletcher, É., Lemieux, A., Derevensky, J., & Déry, M. (2022). An empirical investigation of the externalizing and internalizing pathways to disordered gaming behavior: A longitudinal study across childhood and adolescence. *Computers in Human Behavior*, 128, Article 107096. <https://doi.org/10.1016/j.chb.2021.107096>.
- Rogers, A. A., Padilla-Walker, L. M., McLean, R. D., & Hurst, J. L. (2020). Trajectories of perceived parental psychological control across adolescence and implications for the development of depressive and anxiety symptoms. *Journal of Youth and Adolescence*, 49(1), 136–149. <https://doi.org/10.1007/s10964-019-01070-7>.
- Rosendo-Rios, V., Trott, S., & Shukla, P. (2022). Systematic literature review online gaming addiction among children and young adults: A framework and research agenda. *Addictive Behaviors*, 129, Article 107238. <https://doi.org/10.1016/j.addbeh.2022.107238>.



- Russo, C., Barni, D., Zagrean, I., & Danioni, F. (2021). Value consistency across relational roles and basic psychological needs satisfaction: The mediating role of self-concept clarity. *Social Sciences*, 10(8), Article 291. <https://doi.org/10.3390/socsci10080291>.
- Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. New York: Guilford.
- Santiago, C. D., Wadsworth, M. E., & Stump, J. (2011). Socio-economic status, neighborhood disadvantage, and poverty-related stress: Prospective effects on psychological syndromes among diverse low-income families. *Journal of Economic Psychology*, 32(2), 218–230. <https://doi.org/10.1016/j.joep.2009.10.008>.
- Scharkow, M., Festl, R., & Quandt, T. (2014). Longitudinal patterns of problematic computer game use among adolescents and adults—A 2-year panel study. *Addiction*, 109(11), 1910–1917. <https://doi.org/10.1111/add.12662>.
- Schneider, L. A., King, D. L., & Delfabbro, P. H. (2017). Family factors in adolescent problematic internet gaming: A systematic review. *Journal of Behavioral Addictions*, 6(3), 321–333. <https://doi.org/10.1556/2006.6.2017.035>.
- Seiffge-Krenke, I., Overbeek, G., & Vermulst, A. (2010). Parent-child relationship trajectories during adolescence: Longitudinal associations with romantic outcomes in emerging adulthood. *Journal of Adolescence*, 33(1), 159–171. <https://doi.org/10.1016/j.adolescence.2009.04.001>.
- Sela, Y., Zach, M., Amichay-Hamburger, Y., Mishali, M., & Omer, H. (2020). Family environment and problematic internet use among adolescents: The mediating roles of depression and fear of missing out. *Computers in Human Behavior*, 106, Article 106226. <https://doi.org/10.1016/j.chb.2019.106226>.
- Servidio, R. (2023). Fear of missing out and self-esteem as mediators of the relationship between maximization and problematic smartphone use. *Current Psychology*, 42(1), 232–242. <https://doi.org/10.1007/s12144-020-01341-8>.
- Servidio, R., Sinatra, M., Griffiths, M. D., & Monacis, L. (2021). Social comparison orientation and fear of missing out as mediators between self-concept clarity and problematic smartphone use. *Addictive Behaviors*, 122, Article 107014. <https://doi.org/10.1016/j.addbeh.2021.107014>.
- Smetana, J. G., Campione-Barr, N., & Metzger, A. (2006). Adolescent development in interpersonal and societal contexts. *Annual Review of Psychology*, 57, 255–284. <https://doi.org/10.1146/annurev.psych.57.102904.190124>.
- Šporčić, B., & Glavak-Tkalić, R. (2018). The relationship between online gaming motivation, self-concept clarity and tendency toward problematic gaming. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, 12(1), Article 4. <https://doi.org/10.5817/CP2018-1-4>.
- Su, Y., & Duan, G. (2008). Family assessment device and its clinical application progress. *Chinese Nursing Research*, 22(20), 1794–1796.
- Su, B., Yu, C., Zhang, W., Su, Q., Zhu, J., & Jiang, Y. (2018). Father-child longitudinal relationship: Parental monitoring and Internet gaming disorder in Chinese adolescents. *Frontiers in Psychology*, 9, Article 95. <https://doi.org/10.3389/fpsyg.2018.00095>.
- Sugaya, N., Shirasaka, T., Takahashi, K., & Kanda, H. (2019). Bio-psychosocial factors of children and adolescents with internet gaming disorder: A systematic review. *BioPsychoSocial Medicine*, 13(1), 1–16. <https://doi.org/10.1186/s13030-019-0144-5>.
- Swann, W. B., Jr., Chang-Schneider, C., & Larsen McClarty, K. (2007). Do people's self-views matter? Self-Concept and self-esteem in everyday life. *American Psychologist*, 62(2), 84–94. <https://doi.org/10.1037/0003-066X362.2.84>.
- Teng, Z., Griffiths, M. D., Nie, Q., Xiang, G., & Guo, C. (2020). Parent-adolescent attachment and peer attachment associated with internet gaming disorder: A longitudinal study of first-year undergraduate students. *Journal of Behavioral Addictions*, 9(1), 116–128. <https://doi.org/10.1556/2006.2020.00011>.
- Teng, Z., Pontes, H. M., Nie, Q., Xiang, G., Griffiths, M. D., & Guo, C. (2020). Internet gaming disorder and psychosocial well-being: A longitudinal study of older-aged adolescents and emerging adults. *Addictive Behaviors*, 110, Article 106530. <https://doi.org/10.1016/j.addbeh.2020.106530>.
- Thornberry, T. P., Matsuda, M., Greenman, S. J., Augustyn, M. B., Henry, K. L., Smith, C. A., & Ireland, T. O. (2014). Adolescent risk factors for child maltreatment. *Child Abuse & Neglect*, 38(4), 706–722. <https://doi.org/10.1016/j.chiabu.2013.08.009>.
- Toker, S., & Baturay, M. H. (2016). Antecedents and consequences of game addiction. *Computers in Human Behavior*, 55, 668–679. <https://doi.org/10.1016/j.chb.2015.10.002>.
- Usami, S., Murayama, K., & Hamaker, E. L. (2019). A unified framework of longitudinal models to examine reciprocal relations. *Psychological Methods*, 24(5), 637–657. <https://doi.org/10.1037/met0000210>.
- Valkenburg, P. M., & Peter, J. (2008). Adolescents' identity experiments on the Internet: Consequences for social competence and self-concept unity. *Communication Research*, 35(2), 208–231. <https://doi.org/10.1177/0093650207313164>.
- Valkenburg, P. M., & Peter, J. (2011). Online communication among adolescents: An integrated model of its attraction, opportunities, and risks. *Journal of Adolescent Health*, 48(2), 121–127. <https://doi.org/10.1016/j.jadohealth.2010.08.020>.
- Van Dijk, M., Branje, S., Keijsers, L., Hawk, S. T., Hale, W. W., & Meeus, W. (2014). Self-concept clarity across adolescence: Longitudinal associations with open communication with parents and internalizing symptoms. *Journal of Youth and Adolescence*, 43, 1861–1876. <https://doi.org/10.1007/s10964-013-0055-x>.
- Vartanian, L. R., Froreich, F. V., & Smyth, J. M. (2016). A serial mediation model testing early adversity, self-concept clarity, and thin-ideal internalization as predictors of body dissatisfaction. *Body Image*, 19, 98–103. <https://doi.org/10.1016/j.bodyim.2016.08.013>.
- Wang, Y., Tang, W., Cao, L., & Li, Y. (2022). Self-concept clarity and internet addiction among junior high school students: A moderate mediation model. *Frontiers in Psychiatry*, 13, Article 989128. <https://doi.org/10.3389/fpsyg.2022.989128>.
- Wang, Y., Tian, L., Guo, L., & Huebner, E. S. (2020). Family dysfunction and adolescents' anxiety and depression: A multiple mediation model. *Journal of Applied Developmental Psychology*, 66, Article 101090. <https://doi.org/10.1016/j.appdev.2019.101090>.
- Wartberg, L., Kriston, L., Zieglermeier, M., Lincoln, T., & Kammerl, R. (2019). A longitudinal study on psychosocial causes and



- consequences of Internet gaming disorder in adolescence. *Psychological Medicine*, 49(2), 287–294. <https://doi.org/10.1017/S003329171800082X>.
- Wei, C., Xu, Q., Sun, G., Yu, C., Lu, H., & Zhang W. (2014). The relationship between gratitude, coping styles and online gaming addiction among left behind adolescents. *Chinese Journal of Clinical Psychology*, 22(5), 804–807. <https://doi.org/10.16128/j.cnki.1005-3611.2014.05.055>.
- Wichstrøm, L., Stenseng, F., Belsky, J., von Soest, T., & Hygen, B. W. (2019). Symptoms of internet gaming disorder in youth: Predictors and comorbidity. *Journal of Abnormal Child Psychology*, 47, 71–83. <https://doi.org/10.1007/s10802-018-0422-x>.
- Wong, A. E., Dirghangi, S. R., & Hart, S. R. (2019). Self-concept clarity mediates the effects of adverse childhood experiences on adult suicide behavior, depression, loneliness, perceived stress, and life distress. *Self and Identity*, 18(3), 247–266. <https://doi.org/10.1080/15298868.2018.1439096>.
- World Health Organization (WHO). (2019). ICD-11 mortality and morbidity statistics. Mental, behavioural or neuro-developmental disorders. Available at: <https://icd.who.int/browse11/l-m/en>.
- Xiang, G., Li, Q., Du, X., Liu, X., Xiao, M., & Chen, H. (2020). Links between family cohesion and subjective well-being in adolescents and early adults: The mediating role of self-concept clarity and hope. *Current Psychology*, 41, 76–85. <https://doi.org/10.1007/s12144-020-00795-0>.
- Yang, C., & Brown, B. B. (2016). Online self-presentation on Facebook and self development during the college transition. *Journal of Youth and Adolescence*, 45, 402–416. <https://doi.org/10.1007/s10964-015-0385-y>.
- Yang, X., Jiang, X., Mo, P. K., Cai, Y., Ma, L., & Lau, J. T. (2020). Prevalence and interpersonal correlates of internet gaming disorders among Chinese adolescents. *International Journal of Environmental Research and Public Health*, 17(2), Article 579. <https://doi.org/10.3390/ijerph17020579>.
- Young, K. (2009). Internet addiction: Diagnosis and treatment considerations. *Journal of Contemporary Psychotherapy*, 39, 241–246. <https://doi.org/10.1007/s10879-009-9120-x>.
- Young, J. F., & Mroczek, D. K. (2003). Predicting intraindividual self-concept trajectories during adolescence. *Journal of Adolescence*, 26(5), 586–600. [https://doi.org/10.1016/S0140-1971\(03\)00058-7](https://doi.org/10.1016/S0140-1971(03)00058-7).
- Young, K. S., & Nabuco de Abreu, C. (2011). *Internet addiction: A handbook and guide to evaluation and treatment*. New York: Wiley.
- Yuan, K.-H., & Bentler, P. M. (2000). Three likelihood-based methods for mean and covariance structure analysis with nonnormal missing data. *Sociological Methodology*, 30(1), 165–200. <https://doi.org/10.1111/0081-1750.00078>.
- Yu, S., Chen, B., Levesque-Bristol, C., & Vansteenkiste, M. (2018). Chinese education examined via the lens of self-determination. *Educational Psychology Review*, 30, 177–214. <https://doi.org/10.1007/s10648-016-9395-x>.
- Yusuf, S. A., Daud, M. N., & Arshat, Z. (2021). Perception on the role of parenting style on juvenile delinquency among adolescents in the government remand homes, Lagos State Nigeria. *International Journal of Academic Research in Business and Social Sciences*, 11(6), 1425–1441. <http://dx.doi.org/10.6007/IJARBS/v11-i6/10042>.
- Zhang, D., Cao, M., & Tian, Y. (2022). Avatar identification and internet gaming disorder among Chinese middle school students: The serial mediating roles of flow and self-concept clarity. *International Journal of Mental Health and Addiction*. Advance online publication. <https://doi.org/10.1007/s11469-022-00923-w>.
- Zhao, H., Li, X., Zhou, J., Nie, Q., & Zhou, J. (2020). The relationship between bullying victimization and online game addiction among Chinese early adolescents: The potential role of meaning in life and gender differences. *Children and Youth Services Review*, 116, Article 105261. <https://doi.org/10.1016/j.childyouth.2020.105261>.
- Zhou, J., Gong, X., Lu, G., Xu, X., Zhao, H., & Yang, X. (2022). Bidirectional spillover between maladaptive parenting and peer victimization and the mediating roles of internalizing and externalizing problems: A within-person analysis among Chinese early adolescents. *Development and Psychopathology*. Advance online publication. <https://doi.org/10.1017/S0954579422000682>.
- Zhou, J., Zhu, D., & Zhao, H. (2023). Transactional links between parenting and big two personality traits across early adolescence: Between-and within-family effects. *Journal of Youth and Adolescence*, 52, 1685–1704. <https://doi.org/10.1007/s10964-023-01795-6>.
- Zhu, J., Zhang, W., Yu, C., & Bao, Z. (2015). Early adolescent Internet game addiction in context: How parents, school, and peers impact youth. *Computers in Human Behavior*, 50, 159–168. <https://doi.org/10.1016/j.chb.2015.03.079>.

