

The Impact of Family Functioning on Rural Children's Internet Addiction: Based on A Two-Wave Longitudinal Survey

Yuntian Xie, Sisi Tan, Siyi Luo

Department of Applied Psychology, Changsha Normal University, China

ABSTRACT: *The issue of internet addiction among rural children is increasingly conspicuous. This study endeavors to scrutinize the influence of family functioning on internet addiction among rural children by investigating the nexus between family functioning and the configuration of this network, predicated on the establishment of a network delineating symptoms of internet addiction among rural children. A longitudinal study was conducted on 1029 rural children, employing convenience sampling at two distinct time points. The findings reveal a statistically significant negative correlation between family functioning and internet addiction among rural children. Furthermore, rural male children exhibit notably higher scores of internet addiction compared to their female counterparts. Within the network depicting the association between family functioning and internet addiction, symptoms of internet addiction such as 'withdrawal' emerge as salient features. Consequently, while attending to the ramifications of family functioning on internet addiction among rural children, it is imperative not only to consider gender disparities but also to prioritize the recognition and mitigation of symptoms of internet addiction such as "withdrawal" among rural children.*

KEYWORDS— *Family functioning; Internet addiction; Rural children; Network analysis*

I. INTRODUCTION

As we all acknowledge, the Internet is a double-edged sword, bringing convenience to people's lives while also introducing problems such as Internet addiction. Presently, children's Internet addiction has emerged as an increasingly severe social issue (Chen & Gau, 2016; Putra et al., 2023; Sun et al., 2022). Internet addiction not only impacts children's academic performance (Hao et al., 2022) and interpersonal relationships (Islam et al., 2020) but also negatively affects their physical and mental health (Zhou et al., 2022). With China's rapid economic development and the increasing penetration of the Internet, even individuals in rural areas have easy access to it. However, many rural children's parents are frequently absent, leading to a lack of proper family education for these children, exacerbating the problem of Internet addiction. This issue has garnered widespread concern (Cai et al., 2021; Guo et al., 2012; Yujia et al., 2017).

A study conducted in European countries discovered that the prevalence of internet addiction among adolescents ranges from 1.2% to 11.8% (Durkee et al., 2012). In contrast, the detection rate of Internet addiction risk among Chinese children is as high as 10% (Mak et al., 2014). Gur et al. (2015) found in their study on internet addiction among rural children in Turkey that these children exhibited a moderate level of internet addiction, while Kim (2011) observed that rural children in South Korea showed a significantly higher propensity for internet addiction compared to urban children. Furthermore, research employing semi-structured interviews revealed a growing problem of digital addiction among rural Chinese adolescents (Gao et al., 2023).

Family factors play a crucial role in the development and progression of children's internet addiction (Li et al., 2014). According to ecological risk/protection theory, psychosocial variables either facilitate or hinder child development, with individual and family factors being particularly significant (Eimani et al., 2015). On the other hand, the theory of compensatory internet use focuses on the predictive effect of family functioning on children's internet addiction (Wang et al., 2023). According to the McMaster model of family functioning, the fundamental function of the family is to provide suitable environmental conditions for the physical, psychological, and social development of its members (Dai & Wang, 2015). Family functioning emerges as a significant predictor of internet addiction (Hsieh et al., 2018). A cross-sectional study involving 2,059 middle school students revealed that individuals from dysfunctional families, particularly those with poorer communication and more family conflict, tended to report higher levels of Internet addiction (Chi et al., 2020). Furthermore, low family functioning increases the vulnerability of children to Internet addiction (Bogensneider, 1996). Additionally, family functioning has been found to significantly predict adolescents' levels of Internet addiction two years later (Yu & Shek, 2013; Gong et al., 2021).

In summary, although previous studies have investigated the relationship between family functioning and internet addiction, most of them are cross-sectional studies, making it challenging to ascertain the causal relationship and specific characteristics of the association between the two. Hence, the present study aims to utilize a longitudinal research design and a network analysis approach to thoroughly analyze the impact of family functioning on Internet addiction among rural children by exploring the patterns of association and key factors between family functioning and Internet addiction among rural children.

II. Methods

2.1 Participants

Whole cluster sampling was employed to select rural students from a southern region of China. At time point 1, a total of 1139 students participated in the survey. At time point 2, the effective number of subjects was 1029, comprising 527 (51.21%) males and 502 (48.79%) females. The age of the participants ranged from 9 to 16 years, with a mean age of 12.22 years ($SD=1.66$).

2.2 Measures

2.2.1 Family functioning

The general functioning subscale of the Family Assessment Device (Epstein et al., 1983) was utilized. This subscale consists of 12 items rated on a four-point Likert scale. For this study, positively scored questions were reverse scored, and vice versa. Higher scores indicate better family functioning. The alpha coefficient for this scale was found to be 0.76.

2.2.2 Internet addiction

The Internet Addiction Scale (Young, 1998) was administered, comprising 8 items rated on a two-point scale. A higher total score indicates a greater degree of Internet addiction. The alpha coefficient for this scale was 0.76.

2.3 Procedure

The completion of the paper questionnaire was facilitated with the consent of both school teachers and pupils, utilizing a concentrated period for the pupils to complete the questionnaire. Family functioning was primarily measured at time point 1, whereas Internet addiction was assessed at time point 2, with a three-month interval between the two assessments. The researchers strictly adhered to ethical standards outlined in the 1964 Declaration of Helsinki and its subsequent amendments.

2.4 Data Analysis

Upon collecting the questionnaires, the data underwent collation and analysis. Frequency analysis, descriptive analysis, t-tests, and regression analysis were conducted using SPSS 26.0. Network analysis was performed using JASP 0.17.2.1, and Raincloud plots were generated. Core characteristics of the network were evaluated using centrality indicators, including Betweenness (Bet), Closeness (Clo), and Strength (Str).

III. Results

3.1 Descriptive statistics and correlation analysis of key variables

The Pearson's product-moment correlation analyses results (Figure 1) indicated that the correlation between gender (0=Girls, 1=Boys) and family functioning did not reach the level of significance. However, gender demonstrated a significant correlation with Internet addiction, with boys exhibiting a higher association with Internet addiction compared to girls. Moreover, family functioning exhibited a significant negative correlation with Internet addiction.

Regarding the results of the two independent samples t-test (Figure 2), the disparity between boys' perceived family functioning scores (36.16 ± 5.54) and girls' perceived family functioning scores (36.55 ± 5.49) did not reach the level of significance at $p > 0.05$. Conversely, concerning internet addiction (Figure 3), boys' scores (1.95 ± 2.10) were significantly higher than those of girls (1.52 ± 1.78), $t = 3.51$, $p < 0.001$.

Table 1. Correlation matrix of key variables

	<i>M</i> ± <i>SD</i>	1	2	3
1.Gender	—	1		
2.Family functioning	36.35±5.51	-0.04	1	
3.Internet addiction	1.74±1.96	0.11**	-0.24***	1

Note. ** $p < 0.01$, *** $p < 0.001$.

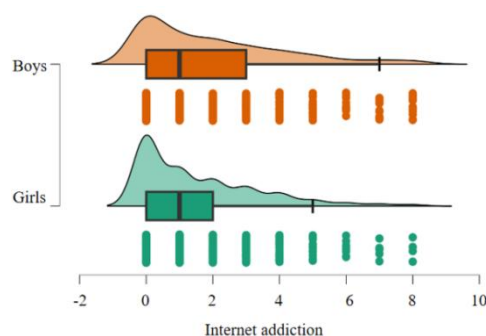
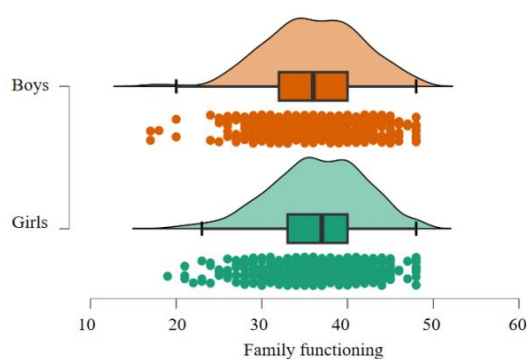


Fig. 1. Gender differences in family functioning.

Fig. 2. Gender differences in internet addiction.

3.2 The impact of family functioning on internet addiction in rural children

The outcomes of the linear regression analysis (Figure 3) revealed that even after adjusting for the influences of gender and age, the impact of family functioning on internet addiction remained significant, with an F -value of 54.77 ($p < 0.001$). Specifically, the regression coefficient (B) was -0.07 , and the corresponding t -value was -7.32 ($p < 0.001$).

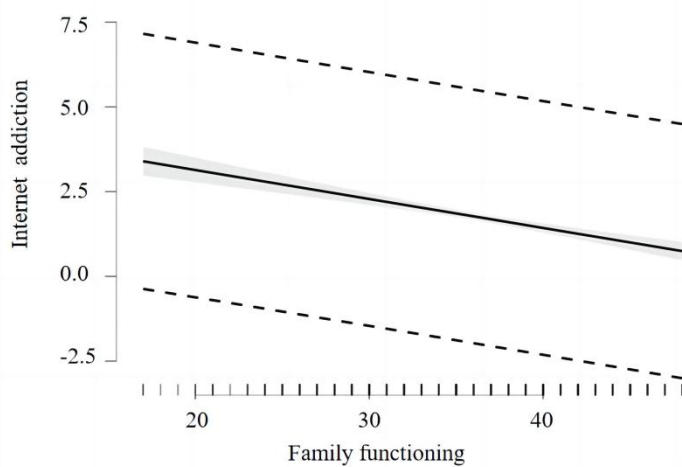


Fig. 2. Regression analysis of Internet addiction on family functioning.

3.3 Network Analysis of family functioning and internet addiction

In this study, item scores were standardized due to the varying scoring methods of the scales (e.g., ZSI). As illustrated in Figure 4, a significant interaction was observed between family functioning and Internet addiction among rural children. Notably, ZIA 4 and ZIA 7 occupied central positions within the network. Additionally, ZIA 4 exhibited the highest expected influence (0.665). Moreover, the two pairs with the highest connectedness were ZIA 1 and ZIA 2 (0.268), as well as ZIA 3 and ZIA 5 (0.263).

Analyzing the centrality index of each feature (Figure 5), the key features in the network of associations between family functioning and Internet addiction among rural children predominantly included ZIA 4 (Bet=1.556, Clo=1.011, Str=1.052), ZIA 2 (Bet=1.556, Clo=0.944, Str=0.972), ZIA 1 (Bet=0.222, Clo=0.640, Str=0.568), and ZIA 7 (Bet=0.222, Clo=0.337, Str=0.561).

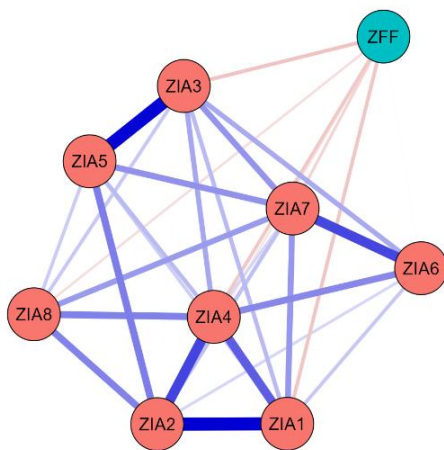


Fig.4. GLASSO network structure.

Notes: To emphasize the network structure, this study utilized a “spring” distribution.

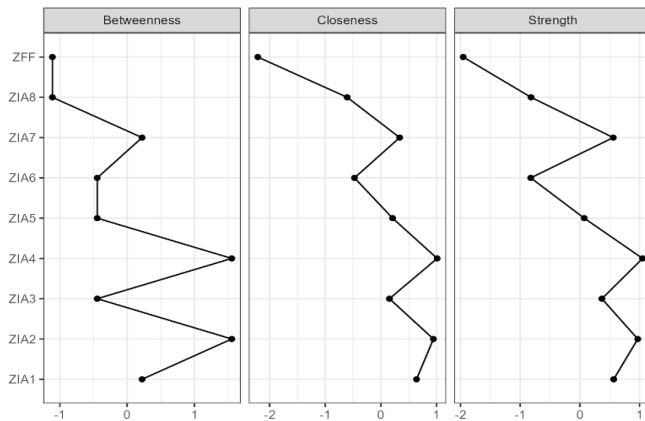


Fig. 5. Indicators of the centrality of the networks.

Furthermore, this study conducted a comparison of the mental networks of children from different genders. As depicted in Figure 6, the connection weights of ZIA 1 and ZIA 2 were found to be the largest for both male and female children. Analyzing the centrality index for each feature (Figure 7), the core features of the mental networks among male children included ZIA 4 (Bet= 1.899, Clo= 1.185, Str= 0.933), ZIA 2 (Bet= 1.449, Clo= 0.991, Str= 1.097), ZIA 7 (Bet= 0.100, Clo= 0.492, Str= 0.498), and ZIA 3 (Bet= -0.350, Clo= -0.002, Str= 0.478). On the other hand, the core features of the mental networks among female children were ZIA 1 (Bet= 1.978, Clo= 1.002, Str= 0.749), ZIA 7 (Bet= 1.169, Clo= 0.815, Str= 0.576), ZIA 4 (Bet= -0.449, Clo= 0.885, Str= 1.100), and ZIA 5 (Bet= 0.360, Clo= 0.497, Str= 0.500).

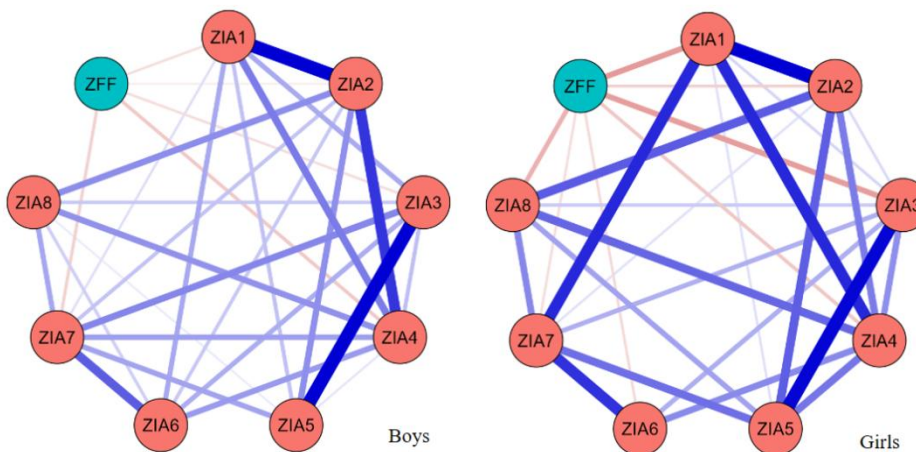


Fig. 6. GLASSO network structure of different genders.
 Note: A “circle” distribution was utilized to compare the different genders.

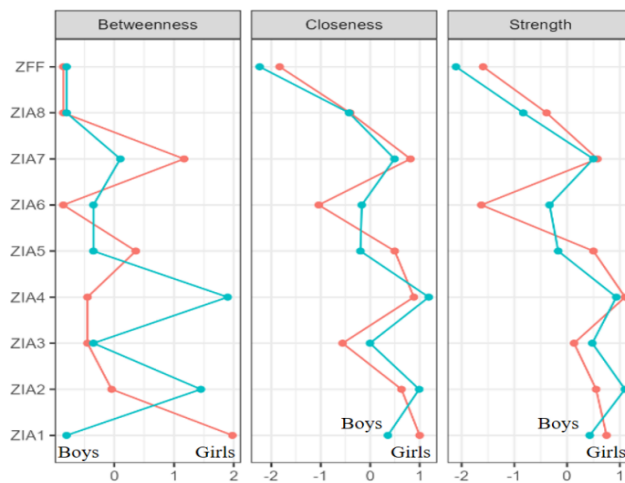


Fig. 7. Indicators of the centrality of the networks of different genders.

IV. Discussion

4.1 The impact of family functioning on internet addiction

This study revealed a significant negative association between family functioning and internet addiction among rural children. Moreover, even after adjusting for the effects of gender and age, family functioning continued to significantly predict internet addiction negatively. In essence, superior family functioning was linked to lower levels of Internet addiction. This finding aligns with previous research outcomes (Eimani & Shirali, 2015; Harsej et al., 2021; Shi et al., 2017). Additionally, rural male children exhibited significantly higher internet addiction scores compared to female children, indicating that they have a heightened susceptibility to internet addiction. This observation corresponds with the tendency for males to engage in activities more predictive of internet addiction disorders compared to females, who primarily use the internet for social interactions (Mari et al., 2023).

The results of the network analyses highlighted withdrawal, tolerance, salience, and conflict as pivotal features of the network of associations between family functioning and internet addiction. These findings suggest that these symptoms play crucial roles in the relationship between family functioning and internet addiction. Firstly, withdrawal symptoms, such as distraction, depression, or irritability upon reduced or discontinued internet use, are noteworthy (Kurniasanti et al., 2019). Secondly, tolerance symptoms, characterized by the need for increased internet use to attain satisfaction, may lead to severe withdrawal symptoms if not addressed (Gunuc, 2015). Thirdly, salience symptoms, indicating an excessive focus on internet usage, are linked with increased internet use each week (Widyanto & McMurrin, 2004). Children experiencing high levels of Internet salience may become preoccupied with online activities. Fourthly, conflict symptoms arising from damaged interpersonal relationships due to internet addiction underscore the importance of addressing this issue (Okada et al., 2010).

Moreover, in terms of gender differences in associative networks, the central feature of male children's networks is withdrawal symptoms (ZIA 4), while for female children, it is salience symptoms (ZIA 1). This suggests that tailored approaches should be provided to children of different genders to enhance family functioning and address Internet addiction effectively.

4.2 Research implications

Drawing from the McMaster model of family functioning, this study embarked on an exploration of the causal relationship between family functioning and internet addiction through a longitudinal study at two points in time. Additionally, it delved into the patterns of associations and key factors between family functioning and internet addiction among rural children through network analysis, with the aim of offering insights into coping

with internet addiction among rural children.

Firstly, there is a crucial need to enhance parent-child communication in rural families. Given the challenges of busy work schedules and limited transportation in rural areas, communication between parents and children may be compromised. To foster stronger parent-child relationships, parents can actively create opportunities for communication in their daily lives. For instance, designating dinner time as a family gathering moment where parents share their day and inquire about their children's school experiences and emotions can prove beneficial. Additionally, engaging in simple outdoor activities such as fieldwork and visiting friends and relatives can deepen the bond between parents and children.

Secondly, cultivating a healthy atmosphere and lifestyle within rural families is imperative. Given the abundance of natural resources in rural environments, families can engage more in outdoor activities. Parents can organize their children to partake in farm work, planting, and animal husbandry to develop practical skills and deter excessive engagement in the virtual realm. Furthermore, parents should set positive examples of learning and lifestyle within the family and encourage their children to participate in constructive leisure activities like reading rural stories and practicing traditional handicrafts to enrich their lives.

Thirdly, offering positive support and education to rural families is essential. Rural families often encounter a scarcity of educational resources, necessitating parents to take a proactive approach in monitoring their children's academic and mental well-being. Regular communication with children enables parents to comprehend their learning progress and life stressors, enabling them to provide necessary support and assistance. Furthermore, forming support networks with other rural families can facilitate the exchange of educational experiences and resources. Concurrently, parents should continually enhance their internet literacy, recognize the perils of internet addiction, and guide their children in the correct usage of the internet.

4.3 Limitations

The present study faced several limitations that warrant acknowledgment. Firstly, there exists a multitude of tools for assessing internet addiction. Future research could incorporate different measures to enhance the robustness and generalizability of the findings obtained in this study. Secondly, it's important to recognize that Internet addiction may reciprocally influence family functioning. To delve deeper into this dynamic relationship, future studies could employ cross-lagged models to explore the bidirectional association between family functioning and Internet addiction over time. Thirdly, the factors contributing to internet addiction among rural children encompass both family and school-related variables. Integrating these factors into a comprehensive psychological network could provide a more holistic understanding of the phenomenon and inform more targeted interventions.

V. Conclusion

The influence of family functioning on rural children's internet addiction is a significant factor to consider. When examining this impact, it is crucial to take into account gender differences and address symptoms such as "withdrawal" among rural children with Internet addiction.

COMPETING INTERESTS

All authors declare no conflicts of interest.

DATA AVAILABILITY

Data will be made available from the corresponding author on reasonable request.

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