The Relationship Between Children's Problematic Internet-related Behaviors and Psychological Distress During the Onset of the COVID-19 Pandemic: A Longitudinal Study

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Background: The outbreak of the coronavirus disease 2019 (COVID-19) pandemic has generated negative effects on psychological well-being worldwide, including in schoolchildren. Government requirements to stay at home and avoid social and school settings may impact psychological well-being by modifying various behaviors such as problematic phone and Internet use, yet there is a paucity of research on this issue. This study examined whether the COVID-19 outbreak may have impacted problematic smartphone use (PSU), problematic gaming (PG), and psychological distress, specifically the pattern of relationships between PSU, PG, and psychological distress in schoolchildren.

Methods: Longitudinal data on psychological distress, PSU, and PG were collected from 575 children in primary schools in 3 waves: Waves 1 and 2 were conducted before the COVID-19 outbreak and Wave 3 during the outbreak. Cross-lagged panel models were used to examine relationships between factors across the 3 waves.

Results: Cross-lagged models found that higher levels of PSU were not significantly related prospectively to greater psychological distress before the COVID-19 outbreak, but this prospective relationship became significant during the COVID-19 outbreak. Whereas PG was associated prospectively with psychological distress before the COVID-19 outbreak (ie, between Waves 1 and 2), this association became nonsignificant during the COVID-19 lockdown (ie, between Waves 2 and 3).

Conclusions: The COVID-19 outbreak has seemed to change prospective relationships between PSU and psychological distress and PG and psychological distress in schoolchildren. Future research should examine whether restrictions on or information provided to schoolchildren may exacerbate PSUs effects on psychological distress.

Key Words: addictive behaviors, COVID-19, Internet, pandemic, psychological distress, social media, video games

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T he outbreak of coronavirus disease 2019 (COVID-19) has impacted public health globally, including psychological health.[1–4] The underlying mechanisms of the negative repercussions of the COVID-19 pandemic on psychological

health are complex, and they may be partly explained by lifestyle changes, financial burdens, and worries about becoming infected.[5–8] Moreover, the pandemic may have augmented the influence of potential risk factors that contribute to psychological distress unrelated to the pandemic. A population of considerable vulnerability is schoolchildren due to significant reductions in social interactions with peers and outdoor physical activities during school suspension. Meanwhile, many parents have increased care-taking roles for children while managing their work or in the setting of job loss, which may increase psychological distress in parents (and possibly children) to negatively influence parent-child relations.[9] In these situations, some children even experienced domestic violence and maltreatment.[10] These factors may compromise psychological well-being in schoolchildren, especially for those who already have existing mental health concerns.[9–12]

During the current outbreak of COVID-19, concerns about the use of digital technologies in children have been raised given fewer in-person social opportunities and activities and school responsibilities.[13] Research has repeatedly documented that problematic smartphone use (PSU) and problematic gaming (PG) may impact psychological functioning, such as by increasing depression, anxiety, and stress.[14–16] People who use the Internet or game frequently are likely to gain rewards from online activities and may find it hard to detach themselves from online activities.[17] Thus, those with Internet gaming disorder (IGD) often use the Internet for substantial periods of time, and consequently sacrifice other daily life activities (eg, physical gatherings with friends), and this may lead to psychological distress.[18] Moreover, problematic Internet-related behaviors may lead to preoccupation with online activities and disconnection from people who use the Internet or game frequently in the non-virtual world. This may also lead to impaired psychological distress.[18–20]

School closure during the COVID-19 outbreak has resulted in children spending more time using the Internet.[21] This situation raises concerns about how the pandemic may generate more problematic-Internet-use-related behaviors, and in turn may result in increased psychological distress in children. Increased psychological distress in children after prolonged school closure due to the COVID-19 pandemic raises the question of how problematic-Internet-use-related behaviors may affect psychological well-being. Therefore, the present study utilized a longitudinal design to investigate prospective relationships between problematic-Internet-use-related behaviors (PSU and PG) and psychological distress before and during the COVID-19 outbreak. We hypothesized that psychological distress would increase during the onset of the COVID-19 pandemic. Given cross-sectional relationships, we also hypothesized that PSU and PG would each be positively associated prospectively with psychological distress both before and during the onset of the COVID-19 pandemic.

METHODS

Participants and Procedure

The longitudinal study is an ongoing project that assesses various factors, including psychological distress and problematic-Internet-use-related behaviors among schoolchildren. Participants were enrolled in 3 primary schools in Sichuan province, mainland China. Sichuan Province, an inland province in China, has been developing very fast in recent years due to the policy support from the Chinese government. In the context of significant economic improvement, Information Communication Technology devices are quite common among primary school students in the province. The possible problematic Internet-related behavior and corresponding psychological distress related to the use of Information Communication Technology devices among primary school students are of concern, and therefore a long-term project was implemented. The 3 participating schools are located in rural areas near a city in Sichuan province. The majority of parents in these schools have high-school degrees (85%) and a small number have bachelor's degrees (5%). The annual income of each family is 50,000 to 180,000 CNY, with an average of approximately 80,000 CNY. Generally, the sample in this study was a homogeneous group. The COVID-19 outbreak occurred during the middle of this longitudinal project. Specifically, the project commenced in October, 2019; Wave 1 data were collected between October and November, 2019 (a period before the COVID-19 outbreak); and Wave 2 data were collected between January 6 and 9, 2020 (the COVID-19 endemic period). The schoolchildren then ended their autumn semester and began their winter vacation on January 16, 2020 before the COVID-19 outbreak. From the end of January to early February, the COVID-19 outbreak occurred in mainland China. Therefore, the schoolchildren in this study had their winter vacation extended (the original end date for the winter vacation was on February 17, 2020) and were housebound. The Sichuan province's education bureau implemented a policy regarding online teaching on March 5, 2020 for schoolchildren. Wave 3 data were collected between March 4 and 16, 2020 (the COVID-19 pandemic period). Specifically, the World Health Organization declared the COVID-19 situation as a pandemic on March 11, 2020 because of the following figure: Over 118,000 cases of coronavirus illness across more than 110 countries and territories worldwide had been reported then, with a sustained risk of further global spread.

Data from Waves 1 and 2 were collected using a paper-based survey. Specifically, teachers of 3 primary schools in Sichuan province assisted in distributing the study information to eligible participants. If an eligible participant and 1 of his/her parents agreed to participate, the teachers asked the child to complete a series of questionnaires (described in the *Measures* section) in class. Children and their parents provided written informed consent for participation in the study for Waves 1 and 2. Wave 3 survey data were collected using an online platform, distributed by the same teachers from the 3 primary schools. Therefore, online consent was obtained for participation in Wave 3. Teachers sent the link of the online survey to the parents, who gave their children access to the survey.

Inclusion criteria included children who (i) had sufficient cognitive ability to understand the survey questions, which were written in Mandarin; (ii) had 1 or more smartphones with Internet access and used it in the past month

across the study period (ie, from Waves 1 to 3); and (iii) were in grades 3 to 6. Finally, 575 schoolchildren (retention rate = 46%) between 8 and 12 years completed the assessments in all 3 waves.

Measures

Depression, Anxiety, Stress Scale-21 (DASS-21)

With the use of 21 items in the DASS-21 after a 4-point Likert scale (0 = never; 1 = sometimes; 2 = often; and 3 = almost always), we assessed the level of psychological distress. The DASS-21 developed by Lovibond and Lovibond[22] assesses psychological distress in 2 types of stress (7 items), anxiety (7 items), and depression (7 items). The present study used the mean item score for all DASS-21 items instead of its subscale scores to assess overall psychological distress. An example item for the DASS-21 stress subscale is "I found it hard to wind down," for the DASS-21 anxiety subscale is "I was aware of dryness of my mouth," and for the DASS-21 depression subscale is "I could not seem to experience any positive feeling at all." A higher score on the DASS-21 indicates a higher level of psychological distress. The DASS-21, including its Chinese version, has demonstrated good psychometric properties.[23,24] The Chinese DASS-21 had good internal consistency in the present study ($\alpha = 0.92$ in Wave 1; 0.92 in Wave 2; and 0.92 in Wave 3).

Smartphone Application-Based Addiction Scale (SABAS)

The SABAS developed by Csibi et al.[25] is 6-item measure that assesses the level of PSU. Although the SABAS examines 6 criteria based on the addiction component model,[26,27] psychometric testing suggests a unidimensional (single factor) structure.[25,28] Participants respond to items such as "During the past week, my smartphone is the most important thing in my life" using a 6-point Likert scale (1 = strongly disagree to 6 = strongly agree). A higher score in the SABAS indicates a higher level of PSU and/or addiction risk. The SABAS has demonstrated good psychometric properties.[8,25,28–30] Moreover, the Chinese SABAS has sound psychometric properties, including the confirmed single-factor structure (comparative fit index = 1.00; root mean square error of approximation (RMSEA) = 0.032; and standardized root mean squared residual = 0.023) and concurrent validity ($r = 0.55$ with problematic social media use).[31] Here, the SABAS had good internal consistency ($\alpha = 0.81$ in Wave 1; 0.83 in Wave 2; and 0.87 in Wave 3).

Internet Gaming Disorder Scale-Short Form (IGDS9-SF)

The 9-item IGDS9-SF developed by Pontes and Griffiths[32] assesses the level of PG by examining 9 diagnostic criteria for Internet gaming disorder listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*.[33,34] Participants respond to items such as "During last week, do you feel more irritability, anxiety or even sadness when you try to either reduce or stop your gaming activity?" using a 5-point Likert scale (1 = never to 5 = very often). Higher

IGDS9-SF scores indicate higher levels of PG. The IGDS9-SF has good psychometric properties.[30,32,35–38] Moreover, the Chinese IGDS9-SF has sound psychometric properties, including the confirmed single-factor structure (comparative fit index = 0.98; RMSEA = 0.076; standardized root mean squared residual = 0.067) and concurrent validity ($r = 0.69$ with PSU).[31] Cronbach alpha in the present study were good ($\alpha = 0.85$ in Wave 1; 0.86 in Wave 2; and 0.92 in Wave 3).

Data Analysis

Descriptive statistics were computed to examine participants' psychological distress, PSU, and PG across Waves 1 to 3. Repeated-measures analyses of variance (ANOVAs) with Bonferroni adjustment for multiple comparisons were used to examine whether participants had different levels of psychological distress, PSU, and PG across the 3 waves.

Pearson correlations were then used to examine associations between these variables across the 3 waves, and we examined bivariate relationships between changes in psychological distress and changes in problematic-Internet-use-related behaviors (including smartphone use and gaming). Moreover, Fisher r-to-z transformations were conducted to examine whether associations found in the changes between Waves 3 and 1 and those between Waves 3 and 2 (ie, after the COVID-19 outbreak) significantly differed from those found in changes between Waves 2 and 1 (ie, before the COVID-19 outbreak). Changes from Waves 1 to 3 were calculated using the scores at Waves 3 minus those at Wave 1; changes from Waves 2 to 3 were calculated using the scores at Waves 3 minus those at Wave 2; and changes from Waves 1 to 2 were calculated using the scores at Waves 2 minus those at Wave 1.

A cross-lagged panel model using structural equation modeling (SEM)[39,40] was then constructed to understand the relationships we hypothesized for the problematic-Internet-use-related behaviors and psychological distress across the 3 waves. The cross-lagged panel model was used to account for the interdependence of the collected data across the 3 waves.[41] In addition, with the use of SEM, the issue of type 1 error inflation can be minimized. In the cross-lagged panel model, we proposed that earlier waves of psychological distress and problematic-Internet-use-related behaviors may have an impact on later waves of psychological distress and problematic-Internet-use-related behaviors (see Fig. 1 for detailed information in the tested prospective relationships). Furthermore, a maximum likelihood estimator was used.

In the model, psychological distress and problematic-Internet-use-related behaviors were constructed as latent concepts. Specifically, psychological distress was constructed using the 3 subscales from the DASS-21; PSU was constructed using the 6 items from the SABAS; and PG was constructed using the 9 items from the IGDS9-SF. Moreover, age and gender were controlled in the cross-lagged panel model. Fit indices were used to examine whether the cross-lagged panel model is supported: comparative fit index > 0.9; Tucker-Lewis index > 0.9;[42] RMSEA < 0.08; and standardized root mean square residual < 0.08.[43]

All analyses were performed using IBM SPSS version 24.0,[44] except for the cross-lagged panel model, which was analyzed using LISREL 8.7.[40]
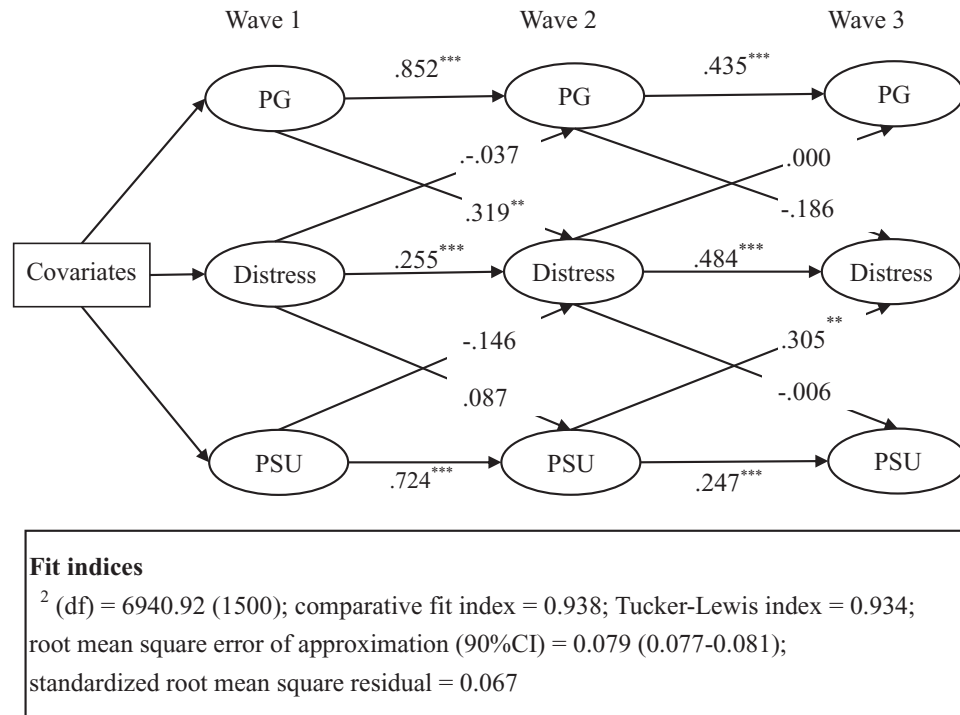
FIGURE 1. Results of cross-lagged panel model using structural equation modeling. Covariates include age and gender. Distress, psychological distress including depression, anxiety, and stress; PG; and PSU. Waves 1 and 2 were assessed before the COVID-19 outbreak period and Wave 3 was assessed during the COVID-19 outbreak period. $^*P < 0.05$; $^{**}P < 0.01$; $^{***}P < 0.001$. PG, problematic gaming; PSU, problematic smartphone use.

Ethics

The study was approved by the Ethics Committee of the research team's university (The Hong Kong Polytechnic University with IRB reference of HSEARS20190718001). Before data collection, all ethical considerations including the description of the study, privacy and confidentiality of data, anonymity, and freedom of participation (or withdrawal) were fully explained. All participants signed written informed consent when they enrolled in the Wave 1 survey. Then, they signed another written informed consent for Wave 2 and completed online consent for Wave 3.

RESULTS

The response rate of the first wave was high (99%): 1238 of 1250 schoolchildren participated in the study. Among the 1238 schoolchildren, 855 (retention rate = 69%) completed the assessments in both first and second waves; 608 (retention rate = 49%) completed the assessments in both first and third waves; 575 schoolchildren completed the assessments in all 3 waves. All the children had the access to 1 or more smartphones and gaming devices throughout the study period from Waves 1 to 3. No significant differences were found in gender ($\chi^2 = 0.04$; $P = 0.84$) and weight status ($\chi^2 = 2.26$; $P = 0.13$) between the 575 schoolchildren and those who did not complete 3 waves of assessments. The 575 schoolchildren were slightly (0.15 years) older (Mean [SD] age = 10.83 [0.75] years) than those who did not

complete all 3 waves' assessments (Mean [SD] age = 10.98 [1.01] years; $t = 2.89$; $P = 0.004$). Table 1 reports the participants' characteristics. Repeated-measures analyses of variance suggested a significant difference between waves in mean psychological distress, PSU, and PG (Table 2). Specifically, higher levels of psychological distress and PSU were found in Wave 3 as compared with those in Wave 1.

TABLE 1. Participants' Characteristics ($N = 575$)

	M (SD)		
	Wave 1	Wave 2	Wave 3
–	285 (49.6%)	—	—
Age (year)	10.83 (0.75)	—	—
Ethnicity (Han)*	561 (97.6%)	—	—
Psychological distress	21.85 (22.94)	19.15 (22.13)	51.25 (13.24)
Depression	5.86 (7.89)	5.08 (7.38)	16.71 (4.78)
Anxiety	7.98 (7.93)	7.01 (7.43)	16.59 (4.26)
Stress	7.96 (8.48)	6.96 (7.90)	17.95 (5.33)
Problematic smartphone use	1.85 (0.94)	1.72 (0.59)	1.85 (0.93)
Problematic gaming	1.48 (0.59)	1.39 (0.56)	1.33 (0.53)

*Presented using n (%).

Note. Waves 1 and 2 were assessed before the lockdown in mainland China (Wave 1 was before the COVID-19 outbreak and Wave 2 was during the endemic period) and Wave 3 was assessed during the onset of the COVID-19 pandemic period.

The World Health Organization declare the COVID-19 as a pandemic on March 11, 2020 because of the following figure: Over 118,000 cases of the coronavirus illness across more than 110 countries and territories worldwide with the sustained risk of further global spread.

TABLE 2. Repeated Measures Analysis of Variance Results on Psychological Distress, Problematic Smartphone Use, and Problematic Gaming Among Three Waves ($N = 575$)

Dependent Variable Variance Source	Sum of Square	df	Mean Square	F-Value	P Value	η_p^2	Bonferroni Comparison
Psychological distress							
Wave	206.67	2	103.34	726.87	<0.001	0.56	W3 > W1 > W2
Error	163.21	1148	0.14				
PSU							
Wave	6.12	2	3.06	6.07	<0.01	0.01	W3, W1 > W2
Error	578.71	1148	0.50				
PG							
Wave	6.51	2	3.26	16.40	<0.001	0.03	W1 > W2 > W3
Error	227.98	1148	0.20				

Psychological distress includes mean item scores for depression, anxiety, and stress scales; PG, problematic gaming; PSU, problematic smartphone use; W1, wave 1; W2, wave 2; W3, wave 3. Waves 1 and 2 were assessed before the COVID-19 pandemic; Wave 3 was assessed during the onset of the COVID-19 pandemic.

Table 3 shows the results of Pearson correlations between psychological distress, PSU, and PG across 3 waves. All correlations were significant at the level of $P < 0.001$. Moreover, changes in psychological distress from Waves 1 to 2 were significantly associated with the following changes from Waves 1 to 2: PSU ($r = 0.26$; $P < 0.001$) and PG ($r = 0.33$; $P < 0.001$). Changes in psychological distress from Waves 1 to 3 were also significantly associated with changes from Waves 1 to 3 in PSU ($r = 0.40$; $P < 0.001$) and PG ($r = 0.47$; $P < 0.001$). Similarly, changes in psychological distress from Waves 2 to 3 were also associated with changes from Waves 2 to 3 in PSU ($r = 0.37$; $P < 0.001$) and PG ($r = 0.44$; $P < 0.001$). Fisher r-to-z transformations indicated that associations found in the changes from Waves 1 to 3 were significantly stronger than those found in the changes from Waves 1 to 2 ($P = 0.007$ for PSU and $P = 0.005$ for PG). The changes from Waves 2 to 3 were also significantly stronger than those found in the changes from Waves 1 to 2 ($P = 0.04$ for PSU and $P = 0.03$ for PG).

Fit statistics for cross-lagged panel models were acceptable (comparative fit index $= 0.938$; Tucker-Lewis index $= 0.934$; RMSEA $= 0.079$; and standardized root mean square residual $= 0.067$). In addition, psychological distress did not show any significant impact prospectively on PSU or PG across the 3 waves. PSU had no significant impact prospectively on psychological distress between Waves 1 and 2; however, PSU in Wave 2 significantly worsened psychological distress in Wave 3 (standardized coefficient $= 0.305$; $P < 0.01$). PG in Wave 1 led to significantly higher levels of psychological distress in Wave 2; however, PG had no significant impact on psychological distress between Waves 2 and 3 (Fig. 1).

DISCUSSION

Using a longitudinal design, our research suggests that the COVID-19 pandemic may have worsened psychological health and impacted prospective relationships between problematic-Internet-use-related behaviors and psychological distress among a relatively large sample of schoolchildren. Our hypotheses were partially supported. Specifically, the present study demonstrated schoolchildren's psychological well-being deteriorated from before the COVID-19 pandemic to its onset, when psychological distress and PSU became more severe. Moreover, the average DASS-21 scores during the COVID-19 pandemic period suggest a moderate level of depression (average score of 16.71 in the present findings, with scores ranging from 14 to 20 suggesting moderate depression), severe anxiety (average score of 16.59 in the present findings, with scores ranging from 15 to 19 suggesting severe anxiety), and mild stress (average score of 17.95 in the present findings, with scores ranging from 15 to 18 suggesting mild stress).[22] Associations between PG and psychological distress prospectively were significant before the COVID-19 outbreak but not

TABLE 3. Pearson Correlation Matrix Among Psychological Distress, Problematic Smartphone Use, and Problematic Gaming ($N = 575$)

	r (P)								
	1	2	3	4	5	6	7	8	9
1. Psychological Distress_W1	1								
2. Psychological Distress_W2	0.520	1							
3. Psychological Distress_W3	0.253	0.268	1						
4. PSU_W1	0.487	0.366	0.163	1					
5. PSU_W2	0.406	0.512	0.225	0.608	1				
6. PSU_W3	0.193	0.235	0.493	0.282	0.349	1			
7. PG_W1	0.589	0.404	0.165	0.735	0.552	0.258	1		
8. PG_W2	0.425	0.546	0.172	0.487	0.730	0.313	0.544	1	
9. PG_W3	0.201	0.197	0.457	0.255	0.304	0.692	0.262	0.307	1

All $P < 0.001$.
Psychological distress includes mean item scores for depression, anxiety, and stress scales; PG, problematic gaming; PSU, problematic smartphone use.
W1, wave 1; W2, wave 2; W3, wave 3. Waves 1 and 2 were assessed before the COVID-19 pandemic; Wave 3 was assessed during the onset of the COVID-19 pandemic.

during the onset of the COVID-19 outbreak. However, a new significant prospective association emerged during the COVID-19 outbreak that was not significant before the outbreak: a relationship between PSU and prospective psychological distress.

PSU explained a significant proportion of the variance in prospective psychological distress among schoolchildren during the onset of the COVID-19 outbreak. An augmented association was found between PSU and prospective psychological distress during the onset of the COVID-19 outbreak. Speculatively, this magnified association may be explained by the prolonged time engaging in smartphone use during the COVID-19 outbreak. That is, schoolchildren during the COVID-19 outbreak in the present study may have been allowed to use screens for longer times than during a normal semester given shifts towards online learning and possibly other factors (eg, entertainment of children while at home). With increased smartphone use, schoolchildren's psychological distress may be increased, as prior evidence has shown a positive association between PSU and psychological distress.[45,46] During the COVID-19 pandemic, in particular, schoolchildren may have received frightening information or misinformation (eg, news or rumors) from smartphone applications (eg, Wechat), which may have generated psychological distress.[47]

However, a different pattern was found in the present study's associations between PG and prospective psychological distress. The association between PG and prospective psychological distress was significant before the COVID-19 outbreak but became nonsignificant during the onset of the COVID-19 outbreak. The association found before the COVID-19 outbreak concurs with prior research on the longitudinal and cross-sectional associations between PG and psychological distress.[45,46,48] A possible explanation for the diminished association between PG and psychological distress during the COVID-19 outbreak is that schoolchildren may have focused more on smartphone use and less on gaming. This possibility is somewhat supported by our results of the changes in PSU and PG. From Wave 2 (right before the COVID-19 outbreak) to Wave 3 (during the COVID-19 outbreak), our participants had significantly increased levels of PSU and significantly decreased levels of PG (Table 2). Another potential explanation is that the source of negative psychological impact may have shifted from PG to PSU. We speculate that during the pandemic, smartphone use may have facilitated access to distressing information about actual current events, whereas gaming may have provided a mental escape for some children during a time of world upheaval. In addition, under normal circumstances, PG might generate distress partly because it may impair in-person social functioning and the development of healthy peer relationships, but in-person social contact was likely more limited during the onset of the COVID-19 pandemic, and this may diminish the potential impact of PG. Children with PG may also experience less impact on their social support compared to their peers who before COVID-19 may have had healthier interpersonal relationships. However, additional research is needed to further explore these hypotheses and to confirm and further understand the present findings.

To date, Internet-related activities have been associated with the poorer psychological well-being of children during school suspension, suggesting a need for implementing appropriate monitoring plans regarding their Internet or smartphone use.[5,45,49] Based on the findings of the present study, engaging schoolchildren in other activities in which they are interested, in addition to overseeing their Internet-use behaviors, may provide additional protective effects on their mental health. Moreover, our findings support opinions that there is an urgent need to develop programs preventing children from developing problematic use of digital technology.[50] Specifically, given that we observed amplified associations between PSU and psychological distress during the COVID-19 pandemic, preventive programs targeting PSU among children become increasingly important for children's psychological health.

Several study limitations exist. First, 2 different modes of data collection were used during the 3 Waves. Specifically, Waves 1 and 2 used a paper-based survey, whereas Wave 3 used an online survey, necessitated by COVID-19-related spatial-distancing policies. Different survey modes may have biased results because of their different features.[51] For example, a paper-based survey may more easily enable a supervisor to assist in answering respondents' questions. However, given that prior evidence shows that online and paper-based surveys are measurement invariant,[52] it seems unlikely that this difference would have substantially influenced our findings. Second, we did not collect information about whether schoolchildren had any relatives or friends infected by COVID-19. Knowing an acquaintance infected by COVID-19 may increase a schoolchild's psychological distress and might be an important confound for the present study. Future studies on related topics may consider adding such assessments. Third, surveys were conducted based on self-report. Thus, several biases, such as recall bias, single-rater bias, and social desirability bias, may have had an impact on the present findings. Fourth, psychological distress assessed in the present study is not specific for COVID-19. Future studies are recommended using validated questionnaires, such as the Fear of COVID-19 Scale,[1,53,54] to examine this topic.

CONCLUSIONS

In conclusion, the present study used a longitudinal design to examine problematic Internet-related behaviors and psychological distress among 575 primary schoolchildren in mainland China across 3 time periods: 2 periods before the COVID-19 outbreak and another period during the COVID-19 outbreak. Our findings revealed that PG was a significant factor explaining prospective psychological distress among schoolchildren before the COVID-19 outbreak. PSU significantly related to prospective psychological distress among schoolchildren during the COVID-19 outbreak but not before the COVID-19 outbreak. These findings should be examined further to help prevent PSU, PG, and psychological distress among schoolchildren.

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