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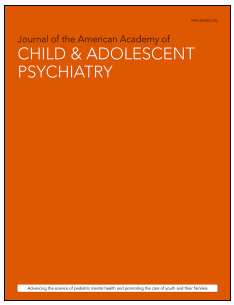


Internet-Related Behaviors and Psychological Distress Among Schoolchildren During COVID-19 School Suspension

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# Internet-Related Behaviors and Psychological Distress Among Schoolchildren During COVID-19 School Suspension

RH = Letter to the Editor

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To the Editor:

The novel coronavirus disease 2019 (COVID-19) infection has rapidly grown worldwide,[1] and many governments have implemented policies to control the infection rate. For example, school suspension, self-quarantine, requirement of citizens to stay at home,[2] travel and border controls, and discouragement of outdoor activities[3] have been used. Although these actions emphasize the importance of "spatial distancing" are based on the perspective of public health, they may result in health problems other than COVID-19 infection, such as psychological distress and fear.[4] Therefore, the present authors examined the potential predictors for psychological distress among schoolchildren during COVID-19 school suspension.

Using of an ongoing longitudinal project approved by the Hong Kong Polytechnic University's ethics committee (Ref: HSEARS20190718001), data from two waves of the project (ie, baseline [Time 1] and five-month after baseline [Time 2]) were analyzed. The first wave data (Time 1) were collected from October 22, 2019 to November 1, 2019 and the COVID-19 outbreak in mainland China occurred around February 2020. Chinese primary school students ended their Autumn semester on January 16, 2020 and had a winter vacation during the Chinese New Year (from January 17 to February 17, 2020). The students were then housebound from February 18, 2020, and received online teaching beginning from March 5, 2020 (ie, a policy implemented by the Sichuan Province's education bureau). Online teaching included recorded video clips and homework designed according to the content of the video clip. Teachers sent out the homework using *WeChat*. The second wave data (Time 2) were collected from March 4 to 16, 2020; on average, 130.8 days after the data collection in the first wave (SD=5.42). In March 2020, mainland Chinese primary schoolchildren were still suspended from school due to the government's COVID-19 policy restrictions.

Data collections were performed with the assistance from teachers of three primary

schools in Sichuan province. More specifically, the three primary schools were public schools and located in the suburban area of Qionglai city (population size: 0.65 million; approximately 60 kilometers [37 miles] from downtown Chengdu city), which is a country-level city in the Sichuan province. Regarding the schoolchildren's parents in the three schools, approximately 85% of them had completed high school education and 5% of them had a college degree or above. The parents' annual income was between 50,000 and 180,000 Renminbi (RMB; 1 USD ≈ 7.05 RMB) with an average of 80,000 RMB.

In the baseline assessment (Time 1), teachers first distributed the study information to schoolchildren and their parents. Their willingness to participate in the first wave was verified by written informed consent (signed by the children and one of their parents). For consent in the second wave, the survey was sent to parents' smartphone with the instruction that one of the parents was requested to accompany the children to complete the survey if they agreed to participate. Only those parents and children who agreed to participate in the second wave's survey could continue and complete the scales after providing online informed consent (ie, on the first page prior to the survey). If the parents or children did not hit the 'agree' button on the first page, the survey ended directly. Several psychometric scales together with a background information sheet were then given to the students to complete in the classroom under the supervision of the schoolteachers. In the assessment during the COVID-19 outbreak (Time 2), an online survey using the same psychometric scales and background information sheet as those at Time 1 was generated by the researchers. Because schoolteachers were unable to have physical contact with the children in schools, the hyperlink of the online survey was sent to the students by their teachers. The study objectives and participants' rights (eg, withdrawal from the survey at any time without any consequence) were clearly stated on the survey's first page. Eligible schoolchildren fulfilled the following inclusion criteria: (i) having the ability to read and understand written Chinese that enabled them to complete the online survey without

difficulties, and (ii) their family possessing at least one smartphone with internet access.

All the self-report measures were assessed using a past-week timeframe. More specifically, schoolchildren's time spent on internet-related activities, problematic use of internet-related activities, and psychological distress were asked with the item stem of "in the past week". Participants' demographics and characteristics were collected including their date of birth, grade, ethnicity, gender, health condition (using an dichotomous item "In the past week, were you ill [e.g., having diarrhea or catching a cold]?"), perceived academic performance (using a question of "How do you perceive your academic performance in the past week?" with five-point Likert scale [1=very good; 5=very poor]), and (using open-ended questions) time spent on gaming ("In the past week, how much time did you spent gaming per day?"), social media use ("In the past week, how much time did you spent on social media per day?"), and smartphone ("In the past week, how much time did you spent on smartphone per day?"). In addition, *Smartphone Application-Based Addiction Scale (SABAS)*[5-7], *Bergen Social Media Addiction Scale (BSMAS)*[5-7] and *Internet Gaming Disorder Scale-Short Form (IGDS-SF9)*[5-7] were used to understand the problematic internet-related behaviors among the schoolchildren. The *Depression, Anxiety, Stress Scale-21 (DASS-21)*[8] was used to evaluate the psychological distress of the schoolchildren. The SABAS contains six items answered on a 6-point Likert scale; the BSMAS contains six items with a 5-point Likert scale; the IGDS-SF9 contains nine items with a 5-point Likert scale; the DASS-21 contains 21 items with a 4-point Likert scale. Higher scores in the SABAS, BSMAS, IGDS-SF9, and DASS-21 indicate greater problematic smartphone-application use, problematic social media use, problematic gaming, and psychological distress, respectively.

Descriptive statistics were first used to report mean and 95% CI to understand the time spent engaging in internet-related behavior, problematic internet-related behavior use, and psychological distress for the participants. Paired *t*-tests were then carried out to compare the

differences in time spent engaging in internet-related behavior, problematic internet-related behavior use, and psychological distress between baseline and follow-up assessments. Three regression models were constructed to understand the factors associated with psychological distress during the COVID-19 outbreak period. The first regression model predicted the outcome of baseline psychological distress by age, gender, and baseline information on current illness status, perceived academic performance, time spent on internet-related behaviors (time spent on smartphone, social media use, and gaming) and problematic internet-related behaviors (problematic smartphone-application use, problematic social media use, and problematic gaming). The second regression model predicted the outcome of follow-up psychological distress by age, gender, and follow-up information on current illness status, perceived academic performance, time spent on internet-related behaviors, and problematic internet-related behaviors. The third regression model predicted the outcome of psychological distress at follow-up by age, gender, and both baseline and follow-up information on current illness status, perceived academic performance, time spent on internet-related behaviors, and problematic internet-related behaviors.

Participants' characteristics for schoolchildren who completed baseline survey, those who completed follow-up survey, and those who completed both baseline and follow-up surveys are presented in Table 1. More specifically, the participation rates were 26% for baseline assessment, 48% for follow-up assessment, and 13% for baseline and follow-up assessments. The participation rate was higher in the follow-up assessment than in the baseline assessment because additional schoolchildren were invited to participate in the follow-up assessment. The gender distributions of the present samples were not significantly different from that of the entire sample of schoolchildren in the three schools ($\chi^2[1]=0.49$ and $p=0.48$ for baseline; $\chi^2[1]=0.25$ and $p=0.62$ for follow-up). The present samples were significantly older than the entire schoolchildren sample (mean age=10.0 years [entire

schoolchildren] vs. 10.65 years [present baseline data] and 10.71 years [present follow-up data]; $t$=12.96 and $p$<0.001 for baseline; $t$=29.87 and $p$<0.001 for follow-up). Therefore, the present samples represented more senior primary schoolchildren. Moreover, Individualized Education Program Plans (IEPs) were implemented in the three schools (0.81%, 0.22%, and 0.38%, respectively). During the school suspension period, schoolteachers visited the homes of those who required IEPs to provide additional support according to the Education Bureau's guidance.

The schoolchildren reported more time engaging in smartphone use and social media use. They further reported lower levels of problematic social media use and problematic gaming at follow-up assessment than at baseline assessment. However, the psychological distress was greater for the schoolchildren at follow-up assessment than at baseline assessment (Table 2). Table S1, available online, additionally shows that problematic internet-related behaviors were significant predictors for psychological distress at both baseline (standardized coefficient [β]=0.093 for problematic smartphone-application use; 0.081 for problematic social media use; 0.437 for problematic gaming; N=1108) and follow-up assessments (β=0.181 for problematic smartphone-application use; 0.152 for problematic social media use; 0.232 for problematic gaming; N=2026). Follow-up illness status (reference group being healthy status; β=0.071) and perceived academic performance (β=0.099) were significant predictors for distress in the follow-up. Moreover, the regression on data from schoolchildren who completed both baseline and follow-up assessments (n=543) showed that problematic smartphone-application use at follow-up (β=0.304) and problematic gaming at follow-up (β=0.308) significantly predicted psychological distress at follow-up.

The higher association found between illness status and psychological distress during the COVID-19 outbreak period than before the COVID-19 outbreak may be explained by the fear of COVID-19 transmission and mortality rates.[1,4] The associations between

psychological distress and different types of problematic internet-related behaviors found in the present study concur with prior research.[5,6,9,10] Special attention should be paid to the greater associations between problematic smartphone-application use, problematic social media use, and psychological distress during COVID-19 outbreak than before. Therefore, parents of primary school children are encouraged to understand and monitor their children's smartphone and social media use during COVID-19 outbreak. Subsequently, their children's psychological distress may not become as elevated during the period.

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- All statements expressed in this column are those of the authors and do not reflect the opinions of the Journal of the American Academy of Child and Adolescent Psychiatry. See the Instructions for Authors for information about the preparation and submission of Letters to the Editor.

Table 1 Participants' Characteristics Among Schoolchildren Who Attended Baseline Assessment, Those Who Attended Follow-up Assessment, and Those Who Attended Both Baseline and Follow-up Assessments

| | Cross-sectional data | | Longitudinal data[a] |
|---|---|---|---|
| | Baseline (N=1108) | Follow-up (N=2026) | Baseline and follow-up (n=543) |
| Participation rate[b] | 0.26 | 0.48 | 0.13 |
| Age in year; mean (SD) | 10.65 (0.90) | 10.71 (1.07) | 10.88 (0.72) |
| Grade; n (%) | | | |
| First | 0 | 0 | 0 |
| Second | 0 | 46 (2%) | 0 |
| Third | 0 | 175 (9%) | 0 |
| Fourth | 351 (31%) | 553 (27%) | 164 (30%) |
| Fifth | 398 (35%) | 832 (41%) | 321 (59%) |
| Sixth | 359 (32%) | 420 (21%) | 58 (11%) |
| Ethnicity; n (%) | | | |
| Han | 1098 (99%) | 1999 (99%) | 535 (99%) |
| Others | 10 (1%) | 27 (1%) | 8 (1%) |
| Gender; n (%) | | | |
| Male | 545 (49%) | 1015 (50%) | 265 (49%) |
| Female | 558 (51%) | 1011(50%) | 273 (51%) |
| Currently ill; n (%) | | | |
| Yes | 301 (27%) | 32 (2%) | 145 (27%) $^{\text{Baseline}}$; 9 (2%) $^{\text{Follow-up}}$ |
| No | 793 (72%) | 1994 (98%) | 384 (71%) $^{\text{Baseline}}$; 534 (98%) $^{\text{Follow-up}}$ |
| Perceived academic performance; mean (SD)[c] | 1.57 (0.79) | 1.56 (0.77) | 1.58 (0.79) $^{\text{Baseline}}$; 1.64(0.78) $^{\text{Follow-up}}$ |

Note: [a] Longitudinal data were those who completed both baseline and follow-up assessments.

[b] The participation rate was calculated using the denominator of the total students in the three primary schools. That is, 1108/4260 for baseline; 2026/4260 for

follow-up; and 543/4260 for those who attended both baseline and follow-up assessments.

[c] Perceived academic performance was assessed using an item (How do you perceive your academic performance?) with a five-point Likert scale: 1 = very good; 5 = very poor.

Table 2 Time Spent Engaging in Internet-Related Behavior, Problematic Internet-Related Behavior Use, and Psychological Distress in Cross-Sectional Data (N = 1108 for Baseline and = 2026 for Follow-up) and Longitudinal Data Between Time 1 (Baseline Assessment) and Time 2 (Assessment During COVID-19 Outbreak; n = 543)

| | **Cross-sectional data** | | **Longitudinal data** | | | |
|---|---|---|---|---|---|---|
| | Baseline Mean (95% CI) | Follow-up Mean (95% CI) | Time 1 Mean (95% CI) | Time2 Mean (95% CI) | *t*-value | *p*-value |
| Smartphone use[a] | 1.09 (0.99, 1.19) | 2.17 (2.08, 2.26) | 0.85 (0.71, 0.99) | 1.99 (1.78, 2.20) | 9.24 | <0.001 |
| Social media use[a] | 0.39 (0.34, 0.44) | 1.06 (0.99, 1.13) | 0.32 (0.22, 0.42) | 1.08 (0.92, 1.23) | 8.14 | <0.001 |
| Gaming[a] | 0.73 (0.65, 0.81) | 0.84 (0.77, 0.90) | 0.70 (0.53, 0.87) | 0.89 (0.72, 1.06) | 1.62 | 0.11 |
| SABAS | 1.87 (1.81, 1.93) | 2.06 (2.02, 2.10) | 1.80 (1.72, 1.88) | 1.85 (1.77, 1.93) | 1.09 | 0.28 |
| BSMAS | 1.60 (1.56, 1.64) | 1.51 (1.48, 1.54) | 1.58 (1.53, 1.63) | 1.42 (1.37, 1.47) | 4.88 | <0.001 |
| IGDS-SF9 | 1.48 (1.45, 1.51) | 1.42 (1.39, 1.45) | 1.44 (1.39, 1.49) | 1.33 (1.29, 1.37) | 4.02 | <0.001 |
| DASS-21 | 0.49 (0.46, 0.51) | 1.20 (1.19, 1.21) | 0.49 (0.44, 0.53) | 1.22 (1.19, 1.25) | 33.28 | <0.001 |

Note: SABAS = Smartphone Application-Based Addiction Scale; BSMAS = Bergen Social Media Addiction Scale; IGDS-SF9 = Internet Gaming Disorder Scale-Short Form; DASS-21 = Depression, Anxiety, Stress Scale-21.

[a] Presented using daily hours spent on smartphones, social media use, and gaming.

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Running head: Internet behaviors and distress in COVID-19

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Supplementary Table S1 Multiple regression models predicting psychological distress (assessed using DASS-21) in cross-sectional data and predicting psychological distress at follow-up in longitudinal data

| | Unstand. Coeff. (95% CI) | SE | Stand. Coeff. | $R^2$ (*Adjusted* $R^2$) | *F (df)* |
|---|---|---|---|---|---|
| **Cross-sectional baseline data (N = 1108)** | | | | 0.30 (0.29) | 47.06(10, 1083)** |
| Gender (Ref: boy) | 0.020 (-0.030, 0.070) | 0.025 | 0.023 | | |
| Age | -0.016 (-0.042, 0.010) | 0.013 | -0.034 | | |
| Illness status (Ref: healthy status) | 0.033 (-0.022, 0.088) | 0.028 | 0.033 | | |
| Perceived academic status | 0.030 (-0.003,0.062) | 0.017 | 0.049 | | |
| Time spent on smartphone use | -0.008 (-0.028, 0.013) | 0.011 | -0.027 | | |
| Time spent on social media use | -0.030 (-0.064, 0.005) | 0.018 | -0.053 | | |
| Time spent gaming | 0.016 (-0.006, 0.038) | 0.011 | 0.051 | | |
| SABAS | 0.046 (0.007, 0.085) | 0.020 | 0.093* | | |
| BSMAS | 0.060 (0.010, 0.110) | 0.026 | 0.081* | | |
| IGDS-SF9 | 0.351 (0.287, 0.414) | 0.033 | 0.437** | | |
| **Cross-sectional follow-up data (N = 2026)** | | | | 0.27 (0.27) | 75.60(10, 2015)** |
| Gender (Ref: boy) | 0.017 (-0.008, 0.041) | 0.013 | 0.026 | | |
| Age | 0.002 (-0.009, 0.013) | 0.006 | 0.006 | | |
| Illness status (Ref: healthy status) | 0.183 (0.087, 0.279) | 0.049 | 0.071** | | |
| Perceived academic status | 0.042 (0.026,0.057) | 0.008 | 0.099** | | |
| Time spent on smartphone use | 0.001 (-0.005, 0.006) | 0.003 | 0.007 | | |
| Time spent on social media use | -0.004 (-0.010, 0.003) | 0.003 | -0.025 | | |
| Time spent gaming | 0.001 (-0.006, 0.007) | 0.003 | 0.004 | | |
| SABAS | 0.056 (0.039, 0.074) | 0.009 | 0.181** | | |
| BSMAS | 0.077 (0.051, 0.103) | 0.013 | 0.152** | | |

| | | | | | |
|---|---|---|---|---|---|
| IGDS-SF9 | 0.127 (0.096, 0.158) | 0.016 | 0.232** | | |
| **Longitudinal data (n = 543)** | | | | 0.37 (0.34) | 16.87 (18, 510)** |
| Gender (Ref: boy) | 0.022 (-0.023, 0.067) | 0.023 | 0.037 | | |
| Age | 0.023 (-0.004, 0.050) | 0.014 | 0.063 | | |
| Baseline sick status (Ref: healthy status) | 0.049 (0.000, 0.097) | 0.025 | 0.072 | | |
| Follow-up Sick status (Ref: healthy status) | 0.147 (-0.014, 0.308) | 0.082 | 0.065 | | |
| Baseline perceived academic performance | -0.020 (-0.051, 0.011) | 0.016 | -0.051 | | |
| Follow-up perceived academic performance | 0.028 (-0.003, 0.059) | 0.016 | 0.071 | | |
| Baseline time spent on smartphone use | 0.015 (-0.007, 0.036) | 0.011 | 0.066 | | |
| Follow-up time spent on smartphone use | 0.004 (-0.007, 0.016) | 0.006 | 0.037 | | |
| Baseline time spent on social media use | -0.009 (-0.045, 0.028) | 0.019 | -0.020 | | |
| Follow-up time spent on social media use | -0.012 (-0.028, 0.003) | 0.008 | -0.074 | | |
| Baseline time spent gaming | -0.006 (-0.027, 0.015) | 0.011 | -0.025 | | |
| Follow-up time spent gaming | -0.005 (-0.017, 0.007) | 0.006 | -0.032 | | |
| Baseline SABAS | -0.002 (-0.039, 0.034) | 0.019 | -0.007 | | |
| Follow-up SABAS | 0.097 (0.062, 0.133) | 0.018 | 0.304** | | |
| Baseline BSMAS | 0.017 (-0.027, 0.062) | 0.022 | 0.035 | | |
| Follow-up BSMAS | 0.150 (0.101, 0.199) | 0.025 | 0.308** | | |
| Baseline IGDS-SF9 | -0.019 (-0.081, 0.043) | 0.032 | -0.034 | | |
| Follow-up IGDS-SF9 | 0.035 (-0.031, 0.101) | 0.033 | 0.059 | | |

Note. *$p$ <0.05 ** $p$ <0. 01.

Unstand. Coeff. = unstandardized coefficient; SE = standard error; Stand. Coeff. = standardized coefficient; CI = confidence interval.

SABAS = Smartphone Application-Based Addiction Scale; BSMAS = Bergen Social Media Addiction Scale; IGDS-SF9 = Internet Gaming Disorder Scale-Short Form; DASS-21 = Depression, Anxiety, Stress Scale-21.