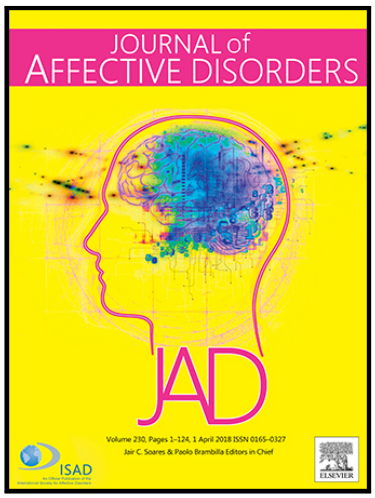


Mental Health and Its Correlates among Children and Adolescents during COVID-19 School Closure: The Importance of Parent-Child Discussion

Suqin Tang , Mi Xiang , Teris Cheung , Yu-Tao Xiang

PII: S0165-0327(20)32860-3
DOI: https://doi.org/10.1016/j.jad.2020.10.016
Reference: JAD 12558

To appear in: *Journal of Affective Disorders*

Received date: 11 July 2020
Revised date: 3 October 2020
Accepted date: 7 October 2020

Please cite this article as: Suqin Tang , Mi Xiang , Teris Cheung , Yu-Tao Xiang , Mental Health and Its Correlates among Children and Adolescents during COVID-19 School Closure: The Importance of Parent-Child Discussion, *Journal of Affective Disorders* (2020), doi: https://doi.org/10.1016/j.jad.2020.10.016

Highlights

- A representative sample of 4,342 primary and secondary school students were investigated.
- The three most prevalent symptoms were: anxiety (24.9%), depression (19.7%), and stress (15.2%).
- Students were generally satisfied with life and 21.4% became more satisfied with life.
- Perceived benefit and parent-child discussion were protective factors of mental health.
- Parent-child discussion was related to less symptoms even in students perceived no benefit from home quarantine.

TITLE

Mental Health and Its Correlates among Children and Adolescents during COVID-19 School Closure: The Importance of Parent-Child Discussion

Suqin Tang[a#*], Mi Xiang[b#*], Teris Cheung[c], Yu-Tao Xiang[d,e]

[a] Department of Sociology, Law School, Shenzhen University, Shenzhen, China

[b] School of Public Health, Shanghai Jiao Tong University, Shanghai, China

[c] School of Nursing, Hong Kong Polytechnic University, Hong Kong SAR, China

[d] Unit of Psychiatry, Institute of Translational Medicine, Faculty of Health Sciences, University of Macau, Macau SAR, China

[e] Center for Cognition and Brain Sciences, University of Macau, Macau SAR, China

[#] Suqin Tang and Mi Xiang contributed equally to this article and should be considered joint first author.

[*] Joint corresponding authors:

Correspondence to Department of Sociology, Law School, Shenzhen University, C-1217, Zhili Building, Canghai Campus, Shenzhen University, 3688 Nanhai Avenue, Nanshan, Shenzhen 518060, China, Tel: +86-755-26917419, E-mail: jasminetsq@hotmail.com (S. Tang).

Correspondence to School of Public Health, Shanghai Jiao Tong University, 227 Chongqing Road, Shanghai 200025, China, Tel: +86-21-63846590, E-mail: kou_mitsu@hotmail.com (M. Xiang).

Abstract

Background: School closures due to the COVID-19 outbreak have affected 87% of the world's students physically, socially, and psychologically, yet rigorous investigation into their mental health during this period is still lacking.

Methods: A cross-sectional online survey of 4,342 primary and secondary school students from Shanghai, China was conducted during March 13–23, 2020. Besides demographic information, psychological distress (including depression, anxiety, and stress), life satisfaction, perceived impact of home quarantine, and parent-child discussions on COVID-19 were assessed.

Results: The three most prevalent symptoms were: anxiety (24.9%), depression (19.7%), and stress (15.2%). Participants were generally satisfied with life and 21.4% became more satisfied with life during school closures. Senior grades were positively correlated with psychological symptoms and negatively associated with life satisfaction, whereas the perceived benefit from home quarantine and parent-child discussions on COVID-19 were negatively correlated with psychopathological symptoms and positively correlated with life satisfaction. Among participants who perceived no benefit from home quarantine, those who had discussions with their parents about COVID-19 experienced less depression, anxiety, and stress.

Limitations: Limitations included the inability to infer the casual relationship, no parental report for mental health of children aged 6 to 9, and the inadequate measurement of parent-child discussion.

Conclusions: Mental health problems and resilience co-existed in children and adolescents during the COVID-19 outbreak. Given the important role of parent-child discussions, open communication between parents and children about the pandemic should be encouraged to help children and adolescents cope with mental health problems in public health crisis.

Keywords: Mental health; Children and adolescent; Parent-child discussion; School closure; COVID-19

Introduction

The outbreak of the coronavirus disease (COVID-19) has brought global affects with over 33 million cases and over 1 million deaths as of September 30, 2020 (World Health Organization, 2020a). Most countries implemented social distancing measures to slow down the spread of the infection, the most universally used methods include home quarantines and national school closures. In Shanghai, China, where this study was conducted, there were 339 local cases and 75 imported cases by March 23, 2020, when the data collection ended (State Council Information Office of the People's Republic of China, 2020). Shanghai launched its highest-level emergency response against the COVID-19 on January 24, 2020, and the level 1 emergency response had been active until March 23, 2020. During the level 1 emergency response period, Shanghai had closed all public venues and canceled all large-scale public events, and required people from infected areas to stay at home or be quarantined in groups for 14 days (Cui, 2020). Due to school closures, online learning had been implemented to all 1.435 million primary and secondary students in Shanghai (ShangHaiEye, 2020).

As estimated by the United Nations Educational, Scientific and Cultural Organization (UNESCO) on March 26, 2020, school closures have affected 87% of the world's students (i.e., more than 1.5 million children and young people in 165 countries) by restricting access to education (United Nations Educational, Scientific and Cultural Organization, 2020). Besides the potential inequality caused by the

digital divide and distance learning practices (United Nations Educational, Scientific and Cultural Organization, 2020), school closure may also cause disruptions in the physical activity, social interaction, and mental health of children and adolescents (Wang et al., 2020).

Restrictions on movement can have a substantial psychological impact. A systematic review of 24 studies examined the psychological impact of pandemic-related quarantine on hospital staff, parents, children, and the general population (Brooks et al., 2020). They found that quarantined people had an elevated risk of developing acute and post-traumatic stress symptoms and disorders, and showed a higher prevalence of general psychological symptoms, emotional disturbances, depression, stress, low mood, irritability, and anxiety-induced insomnia.

Serious concerns about the mental health of children and adolescents during the pandemic-related quarantine and school closures have been raised (Golberstein et al., 2020; Wang et al., 2020); the debate whether the benefits of the mandatory measures outweigh the psychological costs continues (Rubin and Wessely, 2020; Viner et al., 2020). An earlier study found 30% of isolated or quarantined American children in areas severely impacted by H1N1 met the criteria for posttraumatic stress disorder (PTSD) based on parental reports (Sprang and Silman, 2013). Current evidence related to COVID-19 were all provided by Chinese scholars. The prevalence of depressive symptoms were 22.6% in primary school students (Xie et al., 2020) and 26.3% in secondary school students (Tang and Ying, 2020). The prevalence of anxiety symptoms in China were 18.9%, 22.0%, and 29.8% in primary students from Hubei Province (Xie et al., 2020), primary and secondary students from Shaanxi Province (Li et al., 2020), and secondary school students from Sichuan Province (Tang and Ying, 2020), respectively.

In addition to capturing children and adolescents' mental health status during the COVID-19 pandemic, key risk and protective factors need to be identified to further understand who are in the at-

risk subgroups and what could be done to protect them against mental health problems and to maintain their mental health status.

Perceptions on the epidemic and its possible impact matter in predicting mental health status. Fear of being infected was another risk factor for depressive symptoms in primary school students (Xie et al., 2020) and anxiety symptoms in children and adolescents during the COVID-19 pandemic (Li et al., 2020). Similarly, it is likely that for children and adolescents who are confined to their homes due to school closure during the COVID-19 pandemic, their perception of the impact of home quarantine may play an important role in relation to their mental health.

During home confinement, parents are usually the ones who interact the most with children and adolescents. The World Health Organization (WHO) advises parents to discuss COVID-19 with their children in an honest and age-appropriate way that addresses children's concerns and eases their anxiety (World Health Organization, 2020b). In this way, close and open communication between parents and children may serve as a protective factor in children's mental health. Previous studies on epidemics and pandemics, however, have not examined either the perceived impact on children and adolescents nor that of parent-child discussion.

To address these gaps in the literature, we aimed to estimate the prevalence of depressive, anxiety, and stress symptoms, and levels of life satisfaction, among children and adolescents experiencing home quarantine and school closure in Shanghai due to COVID-19. We also aimed to identify factors related to their mental health status, with a closer examination of the role of the perceived impact of home quarantine and parent-child discussion relating to mental health status during the COVID-19 pandemic.

Methods

Sample

We followed the CHERRIES guideline for online surveys (see Supplementary File 1). This cross-sectional online survey was conducted among 4,391 students in primary school (grades 1–5), junior

secondary school (grades 6–9) and senior secondary school (grades 10–12). Cluster sampling was adopted to randomly select one school from each of the six districts in Shanghai, China, and all students in the six identified schools were recruited.

Measures

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

The Chinese version of DASS-21(Wang et al., 2016) was used to measure psychological distress during home quarantine due to COVID-19. The Chinese DASS-21 is a self-report measure containing seven items in each subscale to measure the constructs of depression, anxiety, and stress. Participants responded to each item by rating the frequency and/or severity of symptoms over the previous week using a 4-point Likert scale (0 = *did not apply to me at all*, 4 = *applied to me very much or most of the time*). To yield equivalent scores to the full 42-item version of DASS-21, the total score of each subscale was multiplied by two for scores that range from 0–42. The scale could be used to identify individuals who were at high risk of developing mental health problems with cutoffs, 10 for depression, 8 for anxiety, and 15 for stress (Lovibond and Lovibond, 1995). The DASS-21 has previously been used to assess children and adolescents aged 11 to 19 in China (Mellor et al., 2014; Zhang et al., 2016) and populations after traumatic events such as the Sichuan earthquake (Chan et al., 2012; Zhang et al., 2016). In the current sample, the Cronbach's alphas of depression, anxiety, and stress subscales were .913, .883, and .898, respectively.

Life satisfaction

Life satisfaction was assessed using two parameters, namely, current life satisfaction and a change in life satisfaction since the pandemic. The former was assessed using a 11-point Likert scale (0 = *extremely dissatisfied*, 11 = *extremely satisfied*), and the latter asked the question, *How do you see your current life now compared to before*? and rated on a 5-point Likert scale (-2 = *a lot worse*, -1 = *worse*, 0 = *pretty much the same*, 1 = *better*, 2 = *a lot better*).

Perceived impact of home quarantine

Children and adolescents' perceived impact of home quarantine due to COVID-19 was measured in terms of positive and negative impact using a self-constructed questionnaire. The positive impact consisted of five possible benefits and negative impact consisted of eight potential problems. Participants were asked to rate how well each item applied to them on a 6-point Likert scale (0 = *did not apply to me at all*, 5 = *applied to me very much*). The average scores of each dimension were calculated to represent the overall positive and negative impact. The differences between the two dimensions were recoded as *perceived beneficial* (1) if the average score of the positive impact was higher than that of the negative impact, and recoded to *perceived not beneficial* (0) if the average score of the positive impact equaled to or was lower than that of the negative impact. If participants rated "*did not apply to me at all*" for all items, their data would be excluded in analyses using this variable. In the current sample, the Cronbach's alphas of the positive and negative impact dimensions were .829 and .868, respectively.

Parent-child discussion on COVID-19

Parent-child discussion on COVID-19 was measured by asking participants whether their parents had discussed COVID-19 with them or not. If the participants responded *yes*, they were asked about the frequency of discussion during the past month. Answers were recoded as *not at all* (0), *at least once monthly* (1), *at least once weekly* (2), or *at least once daily* (3).

Procedure

The online survey was conducted during March 13–23, 2020 (after approximately two months of the COVID-19 outbreak). The survey was performed by Wenjuanxing (wjx.cn). Prior to distribution, we piloted the survey within several co-workers, postgraduate students, primary and secondary school students who did not study in the sampled schools and asked them to give feedback on content and functionality. A link to the survey was sent to six teachers in charge of student affairs in six schools.

The teachers then forwarded the link to all classes' social network groups and asked parents to have their child completing the self-reported questionnaire.

Both the students' and parents' consent were obtained. For students, implied consent was adopted. The consent information page including the purpose of the study, voluntariness of participation, confidentiality, length of time of the study, data retention was presented before entering the formal survey. Only when the students ticked the box "I understand the information described above and agree to participate in this study", they would enter the formal survey. Otherwise, the webpage window would be closed automatically. For parents, as the schools agreed to participate in the study, passive consent was adopted. If they did not wish to give consent, they were requested to make this known to the school.

To ensure quality responses, research assistants and teachers were assigned to each of the six schools to be on duty online. If the parents and students were confused about certain questions in the questionnaire, they can ask the research assistant and teachers immediately so that the questions could be explained and clarified on time. Other than clearing the confusion, the research assistant and teachers were required not to provide help on answering questions. Parents were instructed to assist primary school students. Ethical approval was obtained prior to data collection from the Ethics Committee of Shanghai Jiaotong University School of Medicine (SJUPN- 201813).

Statistical analysis

The characteristics of the sample were summarized using descriptive statistics. Cronbach's alpha coefficients measured the internal reliability of each subscale of DASS-21 and the self-constructed questionnaire for the perceived impact of home quarantine; a cut-off of .70 was used to indicate good internal reliability.

Comparative profiles of demographic and quarantine-related variables between screened and unscreened subgroups of depression, anxiety, and stress were examined using Chi-square tests.

Independent sample *t*-tests and one-way analyses of variance (ANOVA) were conducted to investigate group differences in symptom levels of depression, anxiety, and stress, and life satisfaction. Binary logistic regression analyses and multiple linear regression analyses were conducted to examine the independent associations between demographic and quarantine-related characteristics and depression, anxiety, stress, and life satisfaction. Demographic and quarantine-related variables were entered into the regression models as independent variables, and mental health variables were considered dependent variables. Multivariate analyses of variance (MANOVA) were used to test the interaction between significant quarantine-related variables in association with the severity of depression, anxiety, and stress, and simple effect tests were conducted following significant interactions.

The associations were reported as odd ratios (ORs) or unstandardized coefficient B and 95% confidence intervals (CIs). *P* values <.05 were considered statistically significant (two-sided). Analyses were performed using IBM SPSS Statistics, version 26.

Results

Demographic and quarantine-related characteristics

The total of 4,722 students were approached, and 4,391 students completed the survey, with a response rate of 93.0%. Among the respondents, 35 students did not fill out their demographic information and 14 students responded in patterned ways. Their responses were excluded, resulting in a valid sample of 4,342 students. Post-survey interviews with teachers suggested that the two most frequently mentioned reasons for not submitting or not completing the survey were having forget to fill out the questionnaire during the given time frame and the lengthiness and tediousness of the survey.

The mean age of the sample was 11.86±2.32 years, ranging from 6–17. Boys accounted for 51% of the sample. The proportion of primary, junior secondary, and senior secondary school students were 22.9%, 69.6%, and 7.4% respectively. Over half (51.8%) of the students experienced the impact of

home quarantine as positive. The majority (84.7%) had discussed the pandemic with their parents. Table 1 shows the detailed demographic and quarantine-related information.

Prevalence of depression, anxiety, and stress

Table 2 provides the percentages that met threshold for depression, anxiety, and stress, as well as means and standard deviations of symptom scores in the total sample and subgroups. Among the participants, 24.9% had experienced symptoms of anxiety, followed by 19.7% for depressive symptoms and 15.2% for stress symptoms. Five hundred participants (11.5%) met thresholds of depression, anxiety, and stress at the same time. Percentages of mild, moderate, severe, and extremely severe levels of these symptoms are listed in Supplementary Table 1.

Senior secondary school students yielded the highest prevalence and levels of depressive, anxiety, and stress symptoms, and primary school students the lowest. Positive screens and symptom levels for depression, anxiety, and stress were higher among those who were more negative about the impact of home quarantine and who had no discussion about the COVID-19 with their parents. Boys and girls did not show any difference in the prevalence and symptom levels of all three conditions.

Current and changed life satisfaction

Table 3 presents the means and standard deviations of overall and subgroups' levels of life satisfaction. Participants were generally satisfied with their current status, with the mean score (8.74±2.21) significantly higher than 6 (*satisfied*) [$t(4341) = 81.835$, $p < .001$]. The median was 9 (*very satisfied*) and the mode was 11 (*extremely satisfied*), indicating that half of the participants were very satisfied and those who were extremely satisfied were the largest subgroup (29.8%). Most participants experienced no change in life satisfaction (59.4%), and 21.4% were more satisfied with their lives during the pandemic.

Bonferroni post hoc tests showed that senior secondary students were more satisfied with life than primary ($p = .011$) and junior secondary ($p = .005$) students. Participants who perceived themselves as

having benefited from the quarantine reported higher current life satisfaction. In addition, participants who had discussed the pandemic with their parents reported higher levels of current life satisfaction than those who had not.

Correlates of depression, anxiety, and stress

Table 4 shows the odds ratio for depression, anxiety, and stress from binary logistic regression analyses and the unstandardized coefficients for the symptom levels from multiple linear regression analyses. The rates of positive screens for depression, anxiety, and stress and the symptom levels varied based on grade, perceived impact of the quarantine, and parent-child discussion about the pandemic. Junior secondary school students were at higher risk of developing anxiety and experienced more severe levels of all symptoms than primary school students, while senior secondary students were at higher risk of developing depression, anxiety, and stress than other grades. The presence of perceived benefit and parent-child discussion lowered the risk of meeting the threshold of depressive, anxiety, and stress symptoms. Similarly, being senior secondary students and the absence of perceived benefit and parent-child discussion were associated with higher levels of all three types of symptoms.

Correlates of current and changed life satisfaction

Table 5 presents demographic and quarantine-related variables relating to current and changed life satisfaction in two multiple linear regression models. Taking all factors into consideration, participants who perceived themselves as having benefited from the home quarantine and had discussion on COVID-19 with their parents reported significantly higher levels of current life satisfaction. Besides, perceived beneficial was significantly associated with increased life satisfaction during the pandemic. Interestingly, senior secondary school students were less satisfied with life than others, but their levels of life satisfaction had increased more dramatically than others during the pandemic.

Interaction between perceived beneficial and parent-child discussion

In order to further explore how children and adolescents' intrapersonal perception on the impact of quarantine, interpersonal interaction with parents regarding COVID-19, and the interaction effects between perceived beneficial and parent-child discussion in association with the severity of depression, anxiety and stress, as well as levels of life satisfaction, were examined.

The 2 (perceived beneficial) × 2 (parent-child discussion) ANOVA analysis indicated significant effect for interactions between perceived beneficial and parent-child discussion for depressive symptom levels [$F(1, 4103) = 13.036$, $p < .001$, $\eta_p^2 = 0.003$], anxiety symptom levels [$F(1, 4103) = 12.752$, $p < .001$, $\eta_p^2 = 0.003$], stress symptom levels [$F(1, 4103) = 11.667$, $p = .001$, $\eta_p^2 = 0.003$], and the total score of DASS-21 [$F(1, 4103) = 13.756$, $p < .001$, $\eta_p^2 = 0.003$]. There was no significant interaction effect between perceived beneficial and parent-child discussion for either current or changed life satisfaction (all *p*s > .05).

To further examine the significant interaction effects, simple effect tests were conducted. Results showed a significant simple effect of parent-child discussion in participants who perceived no benefit from the quarantine for severity of depressive symptoms [$F(1, 4103) = 49.703$, $p < .001$, $\eta_p^2 = 0.012$], anxiety symptoms [$F(1, 4103) = 38.203$, $p < .001$, $\eta_p^2 = 0.009$], stress symptoms [$F(1, 4103) = 26.979$, $p < .001$, $\eta_p^2 = 0.007$], and the total score of DASS-21 [$F(1, 4103) = 41.264$, $p < .001$, $\eta_p^2 = 0.010$]. Figure 1 presents the means and standard error bars of depressive, anxiety, and stress symptom scores by group. These findings indicated that for participants who perceived no benefit from the quarantine and those who had discussion about COVID-19 with their parents experienced less depression, anxiety, and stress.

Given the significant role of parent-child discussion, following binary logistic and multiple linear analyses on the effects of discussion frequency on depression, anxiety, stress, and life satisfaction. Taking all the demographic and quarantine-related factors into consideration, higher discussion

frequency related to less likelihood of presenting depressive symptoms (OR = 0.812, 95% CI: 0.756~0.873, $p < .001$; B = -0.913, 95% CI: -1.154~-0.673, $p < .001$), anxiety symptoms (OR = 0.846, 95% CI: 0.791~0.905, $p < .001$; B = -695, 95% CI: -0.928~-0.462, $p < .001$), and stress symptoms (OR = 0.817, 95% CI: 0.755-0.884, $p < .001$; B = -0.672, 95% CI: -0.937~-0.408, $p < .001$), as well as lower levels of all symptoms (B = -2.281, 95% CI: -2.983~-1.597, $p < .001$). Discussion frequency was positively related to current life satisfaction (B = 0.163, 95% CI: 0.100~0.227, $p < .001$), and marginally related to changed life satisfaction (B = 0.022, 95% CI: -0.001~0.045, $p = .060$).

Discussion

This study examined the mental health status of children and adolescents during school closure due to COVID-19 in Shanghai, China. Primary and secondary schools started online education from March 2, 2020 and continued until schools started to reopen after April 27, 2020.

Children and adolescents' most prevailing mental health problem was anxiety, with a prevalence rate of 24.9%, which is slightly higher than reported in a study conducted one month earlier (22.0%; Li et al., 2020) mostly due to the elevated prevalence for secondary school students. In China, secondary school students face more academic pressure than primary school students as they need to prepare for the *zhongkao* (entrance examination for senior secondary school) and *gaokao* (the national higher education entrance examination). Since our study was conducted in the first two weeks of online schooling, adjusting to new forms of learning, online classes, and studying alone at home without face-to-face interaction with teachers and classmates may have contributed to secondary school students' more elevated anxiety levels. The second most prevalent mental health problem was depression, with an incident rate of 19.7%. The rate for primary school students (17.3%) was very similar to the pooled prevalence of depressive symptoms in Chinese primary school students reported in a recent systematic review (17.2%; 95% CI: 14.3%-20.5%; Xu et al., 2020) but lower than reported in primary school

students in Wuhan and Huangshi, in Hubei Province, who were also surveyed during the same period of time (22.6%; Xie et al., 2020) The latter is understandable as Hubei was the most seriously affected area in China during the COVID-19 pandemic.

The prevalence rate of depression for secondary school students (20.5%) was slightly lower than the pooled prevalence rate reported in a systematic review on depression among Chinese secondary school students (24.3%; 95% CI: 21.3%-27.6%; Tang et al., 2019) and lower than findings during the COVID-19 pandemic (Tang and Ying, 2020). The lower prevalence of depressive symptoms among secondary school student in our study could be explained by the choice of screening instrument. Screening instruments can affect findings among adolescents (Tang et al., 2019) but not children (Xu et al., 2020). The study's adapted DASS-21 showed a relatively lower prevalence of depression than other measures (Tang et al., 2019).

The prevalence of stress symptoms (15.2%) was lower than anxiety and depressive symptoms. Acute stress symptoms are usually observed within the first month of a stressful event (American Psychiatric Association, 2013). Since the current data was collected more than one month after the outbreak of COVID-19, due to the strict measure implemented by the Chinese government, the pandemic was under control by early March, so children and adolescents may have started to experience less stress symptoms. Notwithstanding, researchers and clinicians should pay attention to the fact that three out of twenty children and adolescents suffered from stress symptoms and provide timely intervention before they develop PTSD.

Children and adolescents were generally satisfied with their current life status. Over 80% thought their lives were either the same or better since the pandemic. This finding was not surprising, given the co-existence of psychological distress and resilience in children and adolescents when faced with change or adversity. The study conducted in Wuhan and Huangshi, Hubei Province, showed that 51.7% of primary school students worried about being infected with COVID-19; that said, 40.8% of them

were optimistic about the development of the pandemic (Xie et al., 2020), supporting the finding that negative and positive feelings could co-exist during a traumatic event such as the COVID-19 pandemic.

Our study revealed a pattern that depression, anxiety, and stress among children and adolescents increased gradually and substantially from primary and junior secondary to senior secondary school. This is consistent with previous findings in systematic reviews (Barker et al., 2019; Tang et al., 2019; Xu et al., 2020). The increased psychological distress from early to late adolescence might be due to biological changes (especially hormonal changes during adolescence), increased adverse life events (e.g., academic pressure increasing from primary to secondary school, interpersonal challenges with parents and friends; Schubert et al., 2017). Our study also found that as adolescents progress to higher grades, their life satisfaction decreased. This was not surprising given the negative correlation between life satisfaction and psychological distress in the current study (from -.188 to -.161, all *p*s < .01).

Benefit finding was identified as one of the important protective factors against depression, anxiety, and stress. Our study found that children and adolescents perceived home quarantine as more positive than negative, and this yielded less psychological distress and more life satisfaction. Their perceived benefits of home quarantine included increased time available to spend with parents and on personal activities. Benefit finding is defined as "the positive effects that result from a traumatic event" (Helgeson et al., 2006) and is commonly observed among children and adolescents facing health-related threats such as cancer (Rosenberg et al., 2019; Wicks and Mitchell, 2010) and diabetes (Helgeson et al., 2009; Tran et al., 2011). A meta-analysis of studies showed that benefit finding in adults was related to less depression and more positive well-being, but was unrelated to anxiety (Helgeson et al., 2006). Another meta-analysis of studies conducted on children and adolescents found a significant to marginally significant negative relation between post-traumatic growth (or benefit finding) and depression, anxiety, general symptoms of stress, and emotional distress (Meyerson et al., 2011). Our findings also echo other studies conducted during the COVID-19 pandemic. For instance,

primary students who were not optimistic about the development of the pandemic were at an increased risk of depressive symptoms compared with those who were optimistic (Xie et al., 2020). In short, benefit finding can buffer the possible negative impact brought on by home quarantine and school closures due to pandemic. Guiding children and adolescent to perceive the pandemic from a constructive angle and to discover positive aspects in difficult times could be an appropriate way to help them to cope with the pandemic.

Parent-child discussion on the pandemic was another important protective factor, as children and adolescents who discussed the pandemic with their parents were less likely to present symptoms of depression, anxiety, and stress. Even in those who failed to find benefit from their current situation, parent-child discussion still prevented them from developing more severe symptoms of depression, anxiety, and stress. This highlights the crucial role of open communication between parents and children when coming to terms with stress and crisis. Among all psychosocial factors associated with depression in Chinese adolescents, parent-child communication had the largest effect size (r = .43; Tang et al., 2020) In line with previous findings, the duration and frequency of communication alleviated the effects of stressors on depressive symptoms (Guang et al., 2017). Our study also found that the frequency of discussion about the ongoing public health crisis mitigated depression, anxiety, and stress, and boosted life satisfaction. It is worth noting that Chinese parents tend to use supportive behaviors rather than verbal expression to deliver care and love to their children compared with American parents (Zhang and Wills, 2016), so Chinese parents especially need to be encouraged to discuss life events more frequently with their children to facilitate their children's mental health during times of public health crisis.

Several limitations should be considered in interpreting the results. First, the cross-sectional design of this study was unable to illuminate the causal relationship between risk and protective factors, and mental health outcomes. A longitudinal study with follow-up surveys after the schools reopen is

needed to clarify these relationships. Second, although primary school students completed the survey with the assistance of their parents, self-reporting on DASS-21 by primary school students, especially those who aged 6–9 years old, may not be as reliable as other age groups due to possible misinterpretation of some items of the mental health measures. Future research should include both self-reporting and parental reports when assessing mental health outcomes among young children to guarantee the data accuracy. Third, parent-child discussion was measured merely in terms of frequency. The way how parents communicate with children, the specific content of their discussion on the pandemic, the quality of parent-child relationship, and their role in contributing to children's mental health status, are worth exploring in future studies. Finally, some psychosocial factors of children and adolescents' mental health (e.g., academic performance, academic pressure, peer relationship; Tang et al., 2020) were not included in this study. Yet, this study cannot eliminate the possibility of residual confounding caused by these unmeasured variables. Moreover, we did not had the chance to explore the reasons for not participating in the survey from the 7% non-respondents, whom may be from disadvantaged groups such as who had less parents' supervision for online learning, were less adaptive to online learning like reading online materials, or suffered from more psychological distress. Despite these limitations, this study recruited a large representative sample of children and adolescents, assessed their mental health status, and identified the risk and protective factors during COVID-19-related school closures in Shanghai, China.

Anxiety, depression, and stress were common among children and adolescents experiencing home quarantine and school closure due to the outbreak of COVID-19. However, students were generally satisfied with their current life status. Secondary school students were at greater risk of developing depression, anxiety, and stress, whereas benefit finding and parent-child discussion on the pandemic were two protective factors. Policy makers and mental health professionals should ensure that mental health interventions are available and tailored to help children and adolescents cope with public health

crises like the COVID-19 pandemic. Moreover, mental health professionals should develop guidelines for parents on how to help their children during public health crisis.

Role of the funding source

This work was supported by the National Natural Science Foundation of China (grant number: 71804110) for Mi Xiang. Suqin Tang is supported by the Shenzhen University Natural Science Research Grant (grant number: 860-000002110172).

The sponsors were not involved in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication.

Contributors

ST designed the study, managed the literature searches and analyses, undertook the statistical analysis, and wrote the first draft of the manuscript. XM designed the study, conducted data collection, and reviewed and revised the manuscript. TC and YTX reviewed and revised the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of Interests

ALL authors certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

Acknowledgements

The authors gratefully acknowledge the research members, families, children, and adolescents who took part in this research, without whom it would not have been possible.

References

American Psychiatric Association, 2013. Diagnostic and statistical manual of mental disorders, 5th ed. ed. American Psychiatric Publishing, Arlington, VA.

Barker, M.M., Beresford, B., Bland, M., Fraser, L.K., 2019. Prevalence and Incidence of Anxiety and Depression Among Children, Adolescents, and Young Adults With Life-Limiting Conditions: A Systematic Review and Meta-analysis. JAMA Pediatr 173, 835–844. https://doi.org/10.1001/jamapediatrics.2019.1712

Brooks, S.K., Webster, R.K., Smith, L.E., Woodland, L., Wessely, S., Greenberg, N., Rubin, G.J., 2020. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. The Lancet 395, 912–920. https://doi.org/10.1016/S0140-6736(20)30460-8

Chan, R.C.K., Xu, T., Huang, J., Wang, Y., Zhao, Q., Shum, D.H.K., O'Gorman, J., Potangaroa, R., 2012. Extending the utility of the Depression Anxiety Stress scale by examining its psychometric properties in Chinese settings. Psychiatry Research 200, 879–883. https://doi.org/10.1016/j.psychres.2012.06.041

Cui, J., 2020. Cities launch emergency response to contain virus. China Daily.

Golberstein, E., Wen, H., Miller, B.F., 2020. Coronavirus Disease 2019 (COVID-19) and Mental Health for Children and Adolescents. JAMA Pediatr. https://doi.org/10.1001/jamapediatrics.2020.1456

Guang, Y., Feng, Z., Yang, G., Yang, Y., Wang, L., Dai, Q., Hu, C., Liu, K., Zhang, R., Xia, F., Zhao, M., 2017. Depressive symptoms and negative life events: What psycho-social factors protect or

harm left-behind children in China? BMC Psychiatry 17, 402. https://doi.org/10.1186/s12888-017-1554-1

Helgeson, V.S., Lopez, L., Mennella, C., 2009. Benefit finding among children and adolescents with diabetes. Medical illness and positive life change: Can crisis lead to personal transformation? 65–86. https://doi.org/10.1037/11854-004

Helgeson, V.S., Reynolds, K.A., Tomich, P.L., 2006. A meta-analytic review of benefit finding and growth. J Consult Clin Psychol 74, 797–816. https://doi.org/10.1037/0022-006X.74.5.797

Li, S., Wang, Y., Yang, Yuanyuan, Lei, X., Yang, Yufeng, 2020. Investigation on the influencing factors for anxiety related emotioanl disorders of children and adolescents with home quarantine during the prevalence of novel coronavirus pneumonia. Chinese Journal of Child Health Care 28, 407–410. https://doi.org/10.11852/zgetbjzz2020-0169

Lovibond, S.H., Lovibond, P.F., 1995. Manual for the Depression Anxiety Stress Scales., 2nd ed. Psychology Foundation of Australia, Sydney.

Mellor, D., Vinet, E.V., Xu, X., Hidayah Bt Mamat, N., Richardson, B., Román, F., 2014. Factorial Invariance of the DASS-21 Among Adolescents in Four Countries. European Journal of Psychological Assessment 31, 138–142. https://doi.org/10.1027/1015-5759/a000218

Meyerson, D.A., Grant, K.E., Carter, J.S., Kilmer, R.P., 2011. Posttraumatic growth among children and adolescents: A systematic review. Clinical Psychology Review 31, 949–964. https://doi.org/10.1016/j.cpr.2011.06.003

Rosenberg, A.R., Bradford, M.C., Barton, K.S., Etsekson, N., McCauley, E., Curtis, J.R., Wolfe, J., Baker, K.S., Yi-Frazier, J.P., 2019. Hope and benefit finding: Results from the PRISM randomized controlled trial. Pediatric Blood & Cancer 66, e27485. https://doi.org/10.1002/pbc.27485

Rubin, G.J., Wessely, S., 2020. The psychological effects of quarantining a city. BMJ 368. https://doi.org/10.1136/bmj.m313

Schubert, K.O., Clark, S.R., Van, L.K., Collinson, J.L., Baune, B.T., 2017. Depressive symptom trajectories in late adolescence and early adulthood: A systematic review. Aust N Z J Psychiatry 51, 477–499. https://doi.org/10.1177/0004867417700274

ShangHaiEye, 2020. Online classes as schools to stay closed [WWW Document]. URL https://www.shanghaieye.com.cn/detail?postId=78453 (accessed 10.1.20).

Sprang, G., Silman, M., 2013. Posttraumatic stress disorder in parents and youth after health-related disasters. Disaster Med Public Health Prep 7, 105–110. https://doi.org/10.1017/dmp.2013.22

State Council Information Office of the People's Republic of China, 2020. The 58th Press on Prevention and Control of the COVID-19 Held in Shanghai [WWW Document]. URL http://www.scio.gov.cn/ztk/dtzt/42313/42976/42989/43054/Document/1679299/1679299.htm (accessed 10.1.20).

Tang, L., Ying, B., 2020. Investigation on mental health status and its influencing factors among secondary school students during the COVID-19 epidemic. Mental Health Education in Primary and Secondary School 57–61.

Tang, X., Tang, S., Ren, Z., Wong, D.F.K., 2020. Psychosocial risk factors associated with depressive symptoms among adolescents in secondary schools in mainland china: A systematic review and meta-analysis. Journal of Affective Disorders 263, 155–165. https://doi.org/10.1016/j.jad.2019.11.118

Tang, X., Tang, S., Ren, Z., Wong, D.F.K., 2019. Prevalence of depressive symptoms among adolescents in secondary school in mainland China: A systematic review and meta-analysis. Journal of Affective Disorders 245, 498–507. https://doi.org/10.1016/j.jad.2018.11.043

Tran, V., Wiebe, D.J., Fortenberry, K.T., Butler, J.M., Berg, C.A., 2011. Benefit finding, affective reactions to diabetes stress, and diabetes management among early adolescents. Health Psychol 30, 212–219. https://doi.org/10.1037/a0022378

United Nations Educational, Scientific and Cultural Organization, 2020. UNESCO rallies international organizations, civil society and private sector partners in a broad Coalition to ensure #LearningNeverStops [WWW Document]. URL https://en.unesco.org/news/unesco-rallies-international-organizations-civil-society-and-private-sector-partners-broad (accessed 7.11.20).

Viner, R.M., Russell, S.J., Croker, H., Packer, J., Ward, J., Stansfield, C., Mytton, O., Bonell, C., Booy, R., 2020. School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review. The Lancet Child & Adolescent Health 0. https://doi.org/10.1016/S2352-4642(20)30095-X

Wang, G., Zhang, Y., Zhao, J., Zhang, J., Jiang, F., 2020. Mitigate the effects of home confinement on children during the COVID-19 outbreak. The Lancet 395, 945–947. https://doi.org/10.1016/S0140-6736(20)30547-X

Wang, K., Shi, H.-S., Geng, F.-L., Zou, L.-Q., Tan, S.-P., Wang, Y., Neumann, D.L., Shum, D.H.K., Chan, R.C.K., 2016. Cross-cultural validation of the Depression Anxiety Stress Scale-21 in China. Psychol Assess 28, e88–e100. https://doi.org/10.1037/pas0000207

Wicks, L., Mitchell, A., 2010. The adolescent cancer experience: loss of control and benefit finding. Eur J Cancer Care (Engl) 19, 778–785. https://doi.org/10.1111/j.1365-2354.2009.01139.x

World Health Organization, 2020a. WHO coronavirus disease (COVID-19) dashboard [WWW Document]. URL https://covid19.who.int/ (accessed 7.11.20).

World Health Organization, 2020b. Helping children cope with stress during the 2019-nCoV outbreak [WWW Document]. URL https://www.who.int/docs/default-source/coronaviruse/helping-children-cope-with-stress-print.pdf?sfvrsn=f3a063ff_2 (accessed 7.11.20).

Xie, X., Xue, Q., Zhou, Y., Zhu, K., Liu, Q., Zhang, J., Song, R., 2020. Mental Health Status Among Children in Home Confinement During the Coronavirus Disease 2019 Outbreak in Hubei Province, China. JAMA Pediatrics. https://doi.org/10.1001/jamapediatrics.2020.1619

Xu, D.-D., Rao, W.-W., Cao, X.-L., Wen, S.-Y., An, F.-R., Che, W.-I., Bressington, D.T., Cheung, T., Ungvari, G.S., Xiang, Y.-T., 2020. Prevalence of depressive symptoms in primary school students in China: A systematic review and meta-analysis. Journal of Affective Disorders 268, 20–27. https://doi.org/10.1016/j.jad.2020.02.034

Zhang, F., Liu, Z., Ma, Z., Hou, Q., 2016. Application of the short version of depression-anxiety-stress scale to stress assessment on students after earthquake. Chinese Journal of Behavioral Medicine 25, 82–85.

Zhang, Q., Wills, M., 2016. A U.S.-Chinese Comparison of Affectionate Communication in Parent-Child Relationships. Communication Research Reports 33, 317–323. https://doi.org/10.1080/08824096.2016.1224166

Table 1

Demographic and Quarantine-Related Characteristics

Variable	N or Mean	% or SD
Age	11.86	2.32
Sex		
Male	2216	51.0%
Female	2126	49.0%
Grade		
Primary School	996	22.9%

1st	231	5.3%
2nd	216	5.0%
3rd	200	4.6%
4th	174	4.0%
5th	175	4.0%
Junior Secondary school	3023	69.6%
6th	890	20.5%
7th	853	19.6%
8th	727	16.7%
9th	553	12.7%
Senior Secondary School	323	7.4%
10th	114	2.6%
11th	108	2.5%
12th	101	2.3%
Positive Impacts		
P1. Do not have to go to school	1.28	1.61
P2. Increased time staying at home	1.90	1.76
P3. Increased time spent with parents	2.49	1.88
P4. Increased time spent in personal stuff	2.72	1.83
P5. Decreased teachers' monitoring	0.93	1.41
Overall positive impact	1.86	1.32
Negative Impact		
N1. Increased parents' monitoring	1.43	1.65

N2. Tedious procedures of online classes	1.34	1.58
N3. Not being able to hang out	2.09	1.91
N4. Not being able to meet friends and classmates	2.42	1.88
N5. Interference with academic performance	1.85	1.75
N6. Disturbance in keeping a normal diet	0.92	1.45
N7. Disturbance in hobbies and interests	1.79	1.79
N8. Disturbance in keeping a regular routine	1.11	1.53
Overall negative impact	1.62	1.22
Perceived beneficial		
Yes	2247	51.8%
No	1860	42.8%
Not applicable	235	5.4%
Parent-Child Discussion		
No	665	15.3%
Yes	3677	84.7%
Daily	1886	43.4%
Weekly	1659	38.2%
Monthly	132	3.0%

Note. SD = Standard Deviation.

Table 2

Means, Standard Deviations, and Percentages Met Threshold for Depression, Anxiety, and Stress

	Depression		Anxiety		Stress		Total
	% (N)	M (SD)	% (N)	M (SD)	% (N)	M (SD)	M (SD)
Total	19.7% (857)	4.86 (8.16)	24.9% (1080)	5.18 (7.89)	15.2% (659)	6.68 (8.93)	16.73 (23.83)
Sex							
Male	20.4% (451)	5.10 (8.50)	24.6% (445)	5.19 (8.08)	15.5% (343)	6.81 (9.17)	17.10 (24.61)
Female	19.1% (406)	4.63 (7.78)	25.2% (464)	5.17 (7.69)	14.9% (316)	6.55 (8.67)	16.35 (23.00)
Grade[a]							
Primary	17.3% (172)	4.33 (7.81)	20.7% (206)	4.41 (7.39)	13.0% (129)	6.09 (8.43)	14.83 (22.82)
Junior Secondary	19.2% (581)	4.79 (8.07)	24.7% (747)	5.16 (7.84)	14.9% (449)	6.59 (8.90)	16.55 (23.58)
Senior Secondary	32.2% (104)***	7.22 (9.53)***	39.3% (127)***	7.73 (9.24)***	25.1% (81)***	9.35 (10.20)***	24.30 (27.64)***
Perceived beneficial[b]							
No	23.4% (490)	5.64 (8.64)***	28.3% (592)	5.79 (8.42)***	18.2% (382)	7.52 (9.49)***	18.95 (25.39)***

Yes	16.3% (367)	4.15 (7.61)	21.7% (488)	4.61 (7.33)	12.3% (233)	5.90 (8.31)	14.66 (22.10)
Parent-Child Discussion[c]							
No	26.8% (178)	6.66 (10.11)***	31.0% (206)	6.55 (9.59)***	20.2% (134)	7.83 (10.35)***	21.04 (29.06)***
Yes	18.5% (679)	4.54 (7.71)	23.8% (874)	4.93 (7.52)	14.3% (525)	6.48 (8.64)	15.95 (22.68)

Note. M = Mean; SD = Standard Deviation.

[a] $\chi^2(1)_{depression} = 1.079$, p = .299; $t(4340)_{depression} = 1.905$, p = .057; $\chi^2(1)_{anxiety} = 0.189$, p = .664; $t(4340)_{anxiety} = 0.080$, p = .936; $\chi^2(1)_{stress} = 0.319$, p = .573; $t(4340)_{stress} = 0.956$, p = .339; $t(4340)_{total} = 1.037$, p = .300.

[b] $\chi^2(2)_{depression} = 36.001$; $F(2, 4339)_{depression} = 15.809$; $\chi^2(2)_{anxiety} = 45.473$; $F(2, 4339)_{anxiety} = 21.782$; $\chi^2(2)_{stress} = 28.670$; $F(2, 4339)_{stress} = 16.842$; $F(2, 4339)_{total} = 19.688$.

[c] $\chi^2(1)_{depression} = 34.074$; $t(4340)_{depression} = 6.036$; $\chi^2(1)_{anxiety} = 24.815$; $t(4340)_{anxiety} = 4.922$; $\chi^2(1)_{stress} = 29.378$; $t(4340)_{stress} = 6.008$; $t(4340)_{total} = 5.949$.

[d] $\chi^2(1)_{depression} = 24.494$; $t(4340)_{depression} = 6.199$; $\chi^2(1)_{anxiety} = 15.658$; $t(4340)_{anxiety} = 4.878$; $\chi^2(1)_{stress} = 15.085$; $t(4340)_{stress} = 3.585$; $t(4340)_{total} = 5.080$.

*** $p < .001$.

Table 3

Means and Standard Deviations of Current and Changed Life Satisfaction

	Current Life Satisfaction			Changed Life Satisfaction		
	M (SD)	*t/F*	*p*	M (SD)	*t/F*	*p*
Total	8.74 (2.21)			0.06 (0.79)		
Sex		0.898	.369		0.797	.425
Male	8.71 (2.27)			0.07 (0.85)		
Female	8.77 (2.13)			0.05 (0.73)		
Grade		6.431	**.006**		1.349	.052
Primary	8.77 (2.10)			0.02 (0.81)		
Junior Secondary	8.77 (2.24)			0.07 (0.78)		
Senior Secondary	8.36 (2.19)			0.13 (0.86)		
Perceived beneficial		16.560	**<.001**		18.798	**<.001**
No	8.18 (2.36)			-0.16 (0.74)		
Yes	9.26 (1.91)			0.27 (0.78)		
Parent-Child Discussion		2.066	**.039**		0.126	.900
No	8.56 (2.47)			0.07 (0.84)		
Yes	8.77 (2.15)			0.06 (0.78)		

Note. M = Mean; SD = Standard Deviation. Bolded values: < .05.

Table 4

Correlates of Depression, Anxiety, and Stress[a]

	Depression	Depressive Symptoms	Anxiety	Anxiety Symptom	Stress	Stress Symptom	Total Scores
Variables	OR (95% CI)	B (95% CI)	OR (95% CI)	B (95% CI)	OR (95% CI)	B (95% CI)	B (95% CI)
Sex (male)	1.078 (0.924, 1.258)	0.439 (-0.053, 0.930)	0.973 (0.844, 1.121)	-0.010 (-0.485, 0.466)	1.052 (0.887, 1.248)	0.280 (-0.260, 0.821)	0.709 (-0.725, 2.144)
Grade (junior secondary)	1.176 (0.969, 1.427)	0.633 (0.042, 1.225)*	1.303 (1.089, 1.558)*	0.930 (0.358, 1.502)*	1.221 (0.983, 1.516)	0.730 (0.080, 1.379)*	2.293 (0.569, 4.017)*
Grade (senior secondary)	2.303 (1.714, 3.093)***	2.857 (1.821, 3.893)***	2.530 (1.913, 3.345)***	3.317 (2.315, 4.319)***	2.257 (1.634, 3.116)***	3.300 (2.162, 4.438)***	9.475 (6.454, 12.496)***
Perceived beneficial (yes)	0.576 (0.493,	-1.855 (-2.349, -1.361)	0.623 (0.541, 0.718)***	-1.563 (-2.041, -	0.575 (0.484, 0.682)***	-2.182 (-2.725, -	-5.600 (-7.040, -

	0.672)***	***		1.085)***		1.639)***	4.160)***	
Parent-child	0.485	-2.236	0.662 (0.548,	-1.731	0.643 (0.516,	-1.455	-5.422	
discussion (yes)	(0.485,	(-2.933, -1.540)	0.800)***	(-2.405, -	0.801)***	(-2.220, -	(-7.454,	-
	0.724)***	***		1.057)***		0.689)***	3.390)***	

Note. OR = Odd Ratio; CI =Confidence Interval; B = Unstandardized coefficient B.

[a] Participants who rated "not applied to me at all" for all items of perceived impact of home quarantine were excluded in all analyses (n = 235).

* $p < .05$, *** $p < .001$.

Table 5

Correlates of Life Satisfaction[a]

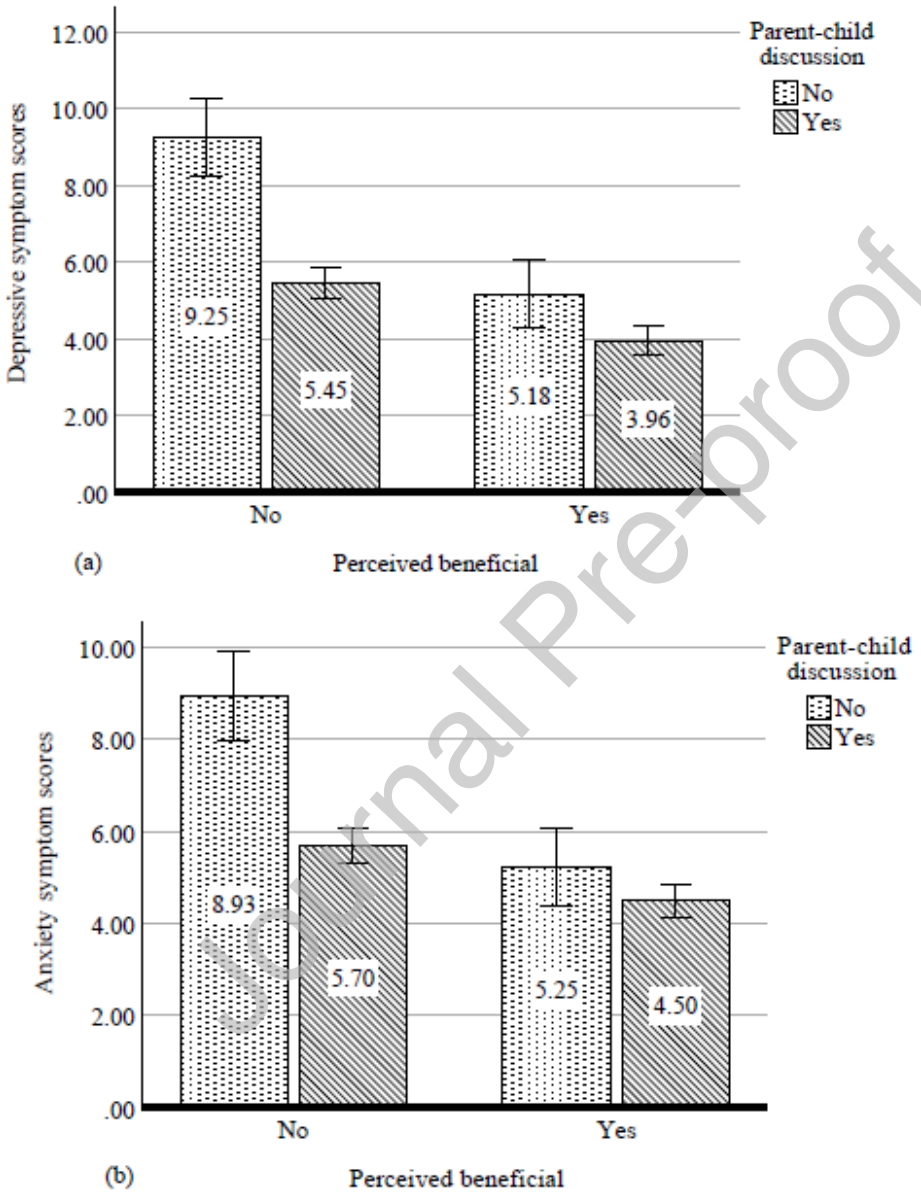
	Current Life Satisfaction	Changed Life Satisfaction
Variables	B (95% CI)	B (95% CI)
Sex (male)	-0.041 (-0.171, 0.088)	0.033 (-0.014, 0.080)
Grade (junior secondary)	-0.055 (-0.211, 0.100)	0.029 (-0.027, 0.086)
Grade (senior secondary)	-0.406 (-0.678, -0.134)*	0.127 (0.028, 0.225)*
Perceived beneficial (yes)	1.215 (1.085, 1.344)***	0.462 (0.414, 0.509)***
Parent-child discussion (yes)	0.204 (0.021, 0.387)*	-0.003 (-0.070, 0.063)

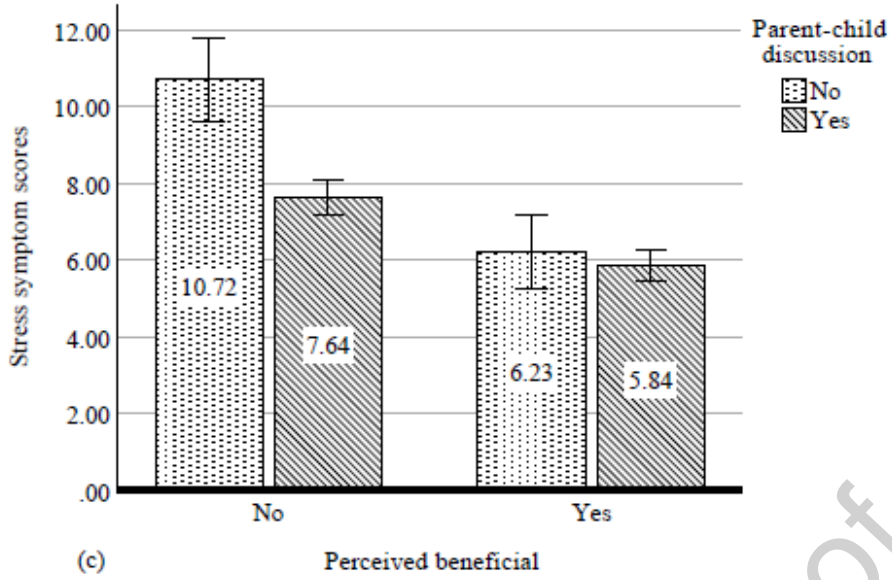
Note. CI = Confidence Interval; B = Unstandardized coefficient B.

[a] Participants who rated "not applied to me at all" for all items of perceived impact of home quarantine were excluded in all analyses (n = 235).

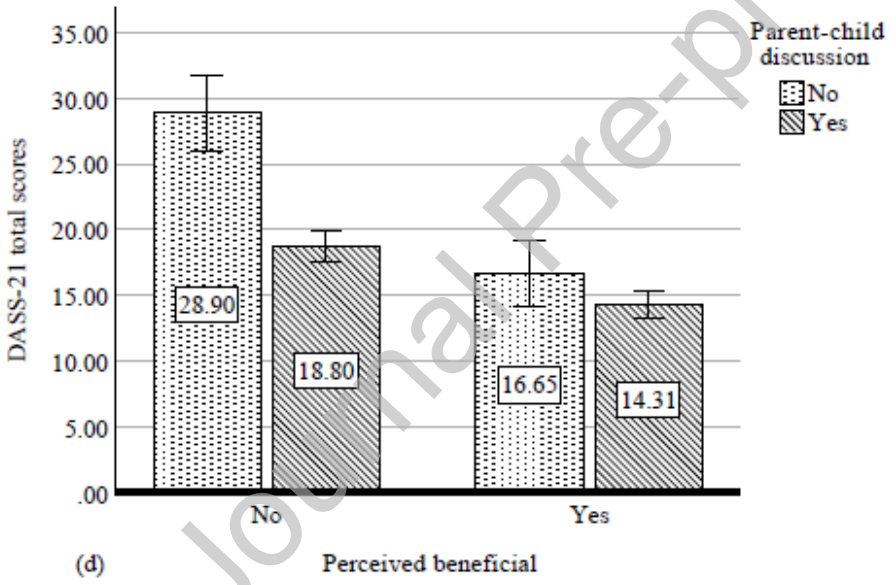
* $p < .05$, *** $p < .001$.

Figure 1. Means and standard error bars of symptom scores. (a) Depressive symptom scores. (b) Anxiety symptom scores. (c) Stress symptom scores. (d) DASS-21 total scores.





(c)



(d)