


The positive role of parental attachment and communication in Chinese adolescents' health behavior and mental health during COVID-19

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Abstract

Introduction: Given that coronavirus disease 2019 (COVID-19) has largely influenced adolescents' physical and mental health around the globe, it is important to identify protective factors that may promote adolescents' positive adjustment during the pandemic. This study aimed to examine the role of parental attachment and COVID-19 communication in adolescents' health behavior and mental health during COVID-19.

Methods: A total of 442 Chinese parent–adolescent dyads (mean age of adolescents = 13.35 years; 50% girls) completed two-wave longitudinal surveys over the span of 2 months during the pandemic (Wave 1: July 2020; Wave 2: September 2020). At each wave, adolescents reported on their COVID-19-related health behavior, general health behavior, depressive symptoms, and anxiety symptoms. At Wave 1, parent–adolescent attachment security and COVID-19 communication were also assessed.

Results: Adolescents' attachment security to parents was associated with their increased COVID-19-related and general health behavior as well as decreased depression and anxiety over 2 months during COVID-19. Moreover, more frequent parent–adolescent COVID-19 communication was associated with adolescents' increased COVID-19-related and general health behavior over time. Notably, attachment security's and COVID-19 communication's associations with health behavior largely remained the same after taking into account both factors simultaneously. In addition, results from exploratory analyses suggest that more frequent COVID-19 communication mediates the link between attachment security and increased health behavior.

Conclusions: These findings highlight the importance of promoting attachment security and COVID-19 communication between parents and adolescents during the pandemic, which may play a positive role in adolescents' health behavior and mental health.

KEYWORDS

adolescents, attachment, COVID-19, health behavior, mental health, parent-child communication

1 | INTRODUCTION

The coronavirus disease-2019 (COVID-19) has affected nearly every aspect of life around the globe. During the pandemic, it is key to take measures to protect people's physical and mental health. For example, almost all governments and organizations have been advising the public to engage in preventive health behavior (e.g., wearing a mask) and general health behavior (e.g., healthy sleep and diet) to stay healthy during the pandemic. In addition to challenges to physical health, the

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outbreak of COVID-19 has also caused mental health problems such as anxiety disorders and depressive symptoms across countries (e.g., J. Gao et al., 2020; Ornell et al., 2020; Pfefferbaum & North, 2020; Rajkumar, 2020). During COVID-19, adolescents' health behavior and psychological well-being may be particularly concerning, as adolescence is known as a developmental stage marked by the onset of many behavioral and emotional problems (P. Chen & Jacobson, 2012; Jennings & Reingle, 2012; Lee et al., 2014). Given the important role of parents in children's development during adolescence (Hoskins, 2014), it is necessary to identify family contexts that may promote adolescents' health behavior as well as their mental health during COVID-19 (Shek, 2020). Therefore, the current research examined the role of parent–adolescent attachment security and COVID-19 communication in Chinese adolescents' health behavior (i.e., COVID-19-related and general health behavior) and mental health (i.e., depressive and anxiety symptoms) during COVID-19.

1.2 | Adolescents' health behavior and mental health during the pandemic

In response to COVID-19, engaging in protective health behavior (e.g., practicing social distance and wearing a mask) has become particularly crucial and responsible, because such behavior is thought to not only protect one's own health, but also aim at helping prevent the spread of COVID-19 and thus protect the welfare of others (Centers for Disease Control and Prevention, 2020; World Health Organization, 2020). Moreover, general health behavior (e.g., eating healthy and exercising regularly) is also essential during the pandemic, because unhealthy lifestyles induced by quarantine may increase the risks of other health issues such as obesity and cardiovascular disease (Mattioli et al., 2020; Rundle et al., 2020). Scholars have called for attention that adolescents' health behavior during COVID-19 may be particularly concerning (Andrews et al., 2020; Nivette et al., 2021). Adolescence is a developmental period marked by heightened reward sensitivity that may contribute to high rates of irresponsible behavior (Galván et al., 2007). Compared to younger children and adults, adolescents tend to engage in more risky and irresponsible behaviors (for a review, see Jennings & Reingle, 2012). Therefore, adolescents may not be willing to adhere to COVID-19 restrictions during the pandemic. Indeed, recent research suggests that a considerable portion of adolescents do not follow the recommended preventive health behavior (i.e., 15%–40% with regard to different health behavior), shift to unhealthier diets, and engage in less physical activity during the pandemic (Campbell et al., 2021).

Besides health behavior, COVID-19 also brings challenges to adolescents' mental health. Adolescents' psychological well-being may be particularly at risk during the pandemic, because their abilities to process and regulate emotions are still under development (Casey et al., 2019; Silvers et al., 2012; Yurgelun-Todd, 2007). In general, adolescents often experience emotional and mood changes, which are associated with dampened psychological well-being (Maciejewski et al., 2014). Moreover, the onset of mental health problems such as depressive and anxiety symptoms tend to occur during adolescence (de Lijster et al., 2017; Dunn & Goodyer, 2006; Jonsson et al., 2011; Lee et al., 2014). Stressful life events, such as the previous outbreaks of influenza A (H1N1) and Ebola, increase the risk of mental health problems by eliciting the public's negative emotional responses (e.g., depression and anxiety; Liao et al., 2014; Van Bortel et al., 2016). During the early period of COVID-19, studies across the globe indicate that adolescents experience higher levels of anxiety disorders and depressive symptoms compared to pre-pandemic levels (Houghton et al., 2022; Racine et al., 2020; D. Wang et al., 2022).

1.3 | Adolescent–parent attachment

Parents may play a crucial role in promoting adolescents' health behavior and mental health during COVID-19. Therefore, in addition to personal factors that are related to adolescents' adjustment (e.g., empathic concern, Pfattheicher et al., 2020; Qu et al., 2022), it is also important to identify family contexts that play a role in adolescents' adjustment during the pandemic. With regard to the relationship between parents and adolescents, attachment is a fundamental bond that is key to adolescent development (Allen & Land 1999). Attachment enables children to retain a feeling of safety under stress, and to engage in exploration to acquire mastery of the environment in the absence of stress (Carlson & Sroufe, 1995). Therefore, attachment to parents allows children to relate to their parents as a “secure base” in their learning and exploration and as a “safe haven” they can seek protection when they feel threatened (Ainsworth, 1989). Past research consistently demonstrates that secure attachment has a positive influence on nearly all aspects of child development (e.g., cognitive, social, and emotional development; Brumariu & Kerns, 2010; Goldberg, 2000; Sroufe et al., 1999). As for adolescence, although it is a period that children increasingly individuate from their parents (Koepke & Denissen, 2012), parents still exhibit large influences on adolescents' development (Hoskins, 2014). Indeed, the attachment system also applies to adolescents, such that adolescent–parent attachment works as a secure base that fosters adolescent cognitive, social, and emotional development (Allen & Land, 1999; Allen et al., 2003).

Adolescents' attachment to parents may promote their engagement in health behavior during the pandemic. According to attachment theory, individuals with secure attachment are more likely to have higher self-efficacy and consider themselves worthy of safety and security (Ainsworth, 1989; Tchakmakjian, 2004), such that they may be more willing to protect

themselves against risk factors. Recent research suggests that secure attachment relationships during early adolescence are associated with mid-adolescents' protective health behavior (e.g., hygiene and social distance) during COVID-19 (Coulombe & Yates, 2022). Besides COVID-19-related protective health behavior, attachment security may promote adolescents' general health behavior, which is also important and at risk during the pandemic (Campbell et al., 2021; Mattioli et al., 2020; Rundle et al., 2020). Indeed, prior research suggests that adolescents' attachment security is positively associated with their engagement in general health behavior such as exercise and healthy diet (Bender & Ingram, 2018).

Parental attachment may also play a positive role in adolescents' mental health during the pandemic. Given that attachment to parents serves as a "safe haven" that children can return to when they feel threatened (Ainsworth, 1989; Bowlby, 1988), attachment is an effective coping mechanism against stress (Howard & Medway, 2004), such that children with secure attachment can comfortably seek parental support in stressful situations to alleviate potential negative emotional consequences. Past studies consistently demonstrate that secure attachment is associated with fewer mental health problems (e.g., internalizing symptoms, anxiety, and depression) during childhood and adolescence (Brumariu & Kerns, 2010; Galbally et al., 2020; McLaughlin et al., 2012; Mikulincer & Shaver, 2012). Moreover, recent research suggests that attachment security is associated with adolescents' fewer mental health symptoms (e.g., anxious and depressive symptoms) during COVID-19 (Coulombe & Yates, 2022). Therefore, it is possible that secure attachment to parents can help adolescents reduce mental health problems such as depressive and anxiety symptoms during the stressful time of COVID-19.

1.4 | COVID-19 communication between parents and adolescents

Besides the general bond between parents and adolescents, it is also important to pay attention to how specific parenting practices contribute to adolescents' health behavior and mental health during the pandemic. Due to lockdowns and restricted social events during COVID-19, parents and adolescents stay at home together for a longer time. Under this circumstance, parenting behavior, such as parent-child communication, may play a particularly important role in adolescents' health (Shek, 2020, 2021). Indeed, recent research suggests that parent-adolescent communication on COVID-19 is linked with adolescents' increased preventive health behavior over time especially among adolescents who are not overstressed (Peplak et al., 2021). UNICEF advised parents to communicate with their children about COVID-19 to increase children's awareness and understanding of COVID-19 (UNICEF, 2020). For example, it is advised that parents and children should discuss how to protect themselves from the virus and how to distinguish between facts and false information about COVID-19 (UNICEF, 2020). According to Family Communication Patterns Theory (FCP, Koerner & Fitzpatrick, 2006; Koerner & Schrodt, 2014), parent-child communication helps children make sense of the social reality, especially with regard to information acquired from outside the family (e.g., media). Parent-child communication on COVID-19 may encourage discussion between parents and adolescents on the topic of COVID-19 (e.g., discussing facts vs. false information and the future of the pandemic with adolescents); also, such communication can give parents the opportunity to teach adolescents effective ways to protect themselves from the virus which adolescents may adopt over time. Taken together, COVID-19 communication between parents and adolescents plays an important role in how adolescents make sense of the pandemic, which may in turn affect their behavioral and emotional adjustment.

Specifically, parent-adolescent COVID-19 communication may play a positive role in adolescents' COVID-19-related protective health behavior as well as their general health behavior. Prior studies across cultures suggest that communication on a specific health-compromising behavior (e.g., substance use and risky sexual behavior) may reduce adolescents' engagement in such behavior (Carver et al., 2017; Sutton et al., 2014). In the context of the current pandemic, by shaping adolescents' understanding of COVID-19 through parent-adolescent communication, parents may guide adolescents to behave responsibly to engage in protective health behavior more often. Moreover, communication about COVID-19 may promote adolescents' overall awareness of health, such that they may increasingly engage in general health behavior (e.g., eating healthy, exercising regularly, and getting enough sleep), which is also essential during the pandemic.

Similarly, COVID-19 communication between parents and adolescents may be beneficial for adolescents' mental health. Scholars have called for greater attention to the potential protective role of COVID-19 communication in children's psychological well-being (Dalton et al., 2020). Although there has not been any empirical evidence on the longitudinal associations between COVID-19 communication and children's or adolescents' mental health, concurrent research suggests that COVID-19-related knowledge (e.g., familiarity with information about prevention and control of COVID-19) is associated with adolescents' less depressive and anxiety symptoms (Zhou et al., 2020). Parent-adolescent COVID-19 communication may facilitate adolescents' COVID-19-related knowledge, and consequently lead to reduced feelings of uncertainty toward COVID-19. Therefore, during COVID-19, such communication may reduce adolescents' mental health problems such as depressive and anxiety symptoms over time.

COVID-19 communication may play a mediating role in the link between attachment security and adolescents' adjustment. In families where parents and adolescents have a strong attachment bond, parents may feel more comfortable communicating what they know about the pandemic with adolescents. At the same time, when adolescents are stressed about

COVID-19, those with greater attachment security may be more likely to disclose their worries to their parents, which may stimulate COVID-19-related discussions between parents and adolescents. Taken together, attachment security provides a suitable environment for constructive communication between parents and adolescents, and such communication may, in turn, play a positive role in adolescents' adjustment during the pandemic.

1.5 | Overview of the current study

The goal of the current study was to examine whether attachment security and COVID-19 communication between parents and adolescents are associated with Chinese adolescents' health behavior (i.e., COVID-19-related and general health behavior) and mental health (i.e., depressive and anxiety symptoms) over time. Guided by prior research (Bender & Ingram, 2018; Carver et al., 2017; Coulombe & Yates, 2022), it was hypothesized that both attachment security and COVID-19 communication is associated with adolescents' more frequent COVID-19-related and general health behavior over 2 months during COVID-19. Similarly, it was expected that both attachment security and COVID-19 communication is associated with adolescents' less depressive and anxiety symptoms over this period. Moreover, given that attachment security may facilitate more COVID-19 communication, the current research aimed to examine the potential mediating role of COVID-19 communication in the associations between attachment security and adolescents' adjustment over time. Because of the limited temporal precedence of the current research (i.e., attachment security and COVID-19 communication only have a concurrent relation due to the two-wave design), the mediation models were included as exploratory analyses.

The current research studied Chinese adolescents and their parents when the country was drastically influenced by COVID-19 (from July to September 2020). During this period, vaccination was not yet available. The government spent extensive effort to control the spread of COVID-19. For example, measuring body temperature was required upon entry to any public places and COVID-19 tests were required for domestic traveling. The health code system (i.e., a color-based tracking system that tracks people's movement) was in place to prevent further outbreaks of the pandemic. Moreover, COVID-19-related health behavior (e.g., wearing a mask) was required by the government and advised by the media.

Scholars have pointed out that prior studies on Chinese adolescents during COVID-19 mainly rely on cross-sectional designs (Shek, 2020). To address this issue, the present study employed a two-wave longitudinal design. This longitudinal approach allowed us to examine the role of parent–adolescent attachment security and COVID-19 communication in adolescents' health behavior as well as mental health while taking into account the temporal stability of adolescents' adjustment. At each wave, adolescents reported on their COVID-19-related health behavior, general health behavior, depressive symptoms, and anxiety symptoms. At Wave 1, attachment security and COVID-19 communication between parents and adolescents were also assessed.

2 | METHODS

2.1 | Participants

The sample consisted of 442 Chinese parent–adolescent dyads. Adolescents were seventh graders (Mean age = 13.35 years, SD = 0.36 years) from three middle schools in Shanghai and were evenly distributed across sex (50% girls). Parents who participated in the current study were primary caregivers of the adolescents (70% mothers and 30% fathers; mean age = 41.80 years; SD = 3.81 years). With regard to mothers' educational attainment, 33% did not complete high school, 20% had a high school degree, and 47% had education beyond high school (e.g., a bachelor's or master's degree). With regard to fathers' educational attainment, 29% did not complete high school, 19% had a high school degree, and 52% had education beyond high school (e.g., a bachelor's or master's degree). Parents' educational attainment in the sample was similar to the local average in Shanghai (Shanghai Municipal People's Government, 2020).

2.2 | Procedure

The current study employed a longitudinal design in which adolescents and their parents completed online questionnaires twice over 2 months during COVID-19 (Wave 1: early July 2020; Wave 2: early September 2020). A priori power analysis for linear multiple regression models was conducted using G*Power (University of Kiel, Germany). With $\alpha = .05$ and a small effect size ($f^2 = 0.10$; Cohen, 1988), 151 participants were required to achieve a power of 0.80 (Faul et al., 2007). Therefore, our sample size ($N = 442$) was expected to be more than acceptable. Among 442 families participating at Wave 1, 374 families returned to participate at Wave 2 of data collection. Attrition from Wave 1 to 2 was 15.38%. Comparisons of adolescents and parents completing both waves to those completing only the first revealed no significant differences at Wave 1 on any

variables in this report, $F's < 1.46$, $p's > .22$. To handle missing data, analyses were conducted with AMOS 28.0 (Arbuckle, 2021), which uses full information maximum likelihood estimation to provide reliable standard errors under a wide range of conditions. At each wave, extensive explanations of the research were given, and participants completed the online consent before taking the questionnaire. Ethical approval for the study was obtained from the Institutional Review Board of the School of Social Development and Public Policy at Fudan University. Families received small gifts for their participation.

2.3 | Measures

2.3.1 | Adolescents' attachment security to parents

At Wave 1, attachment security was assessed using the parental attachment measure of the Inventory of Parent and Peer Attachment (IPPA, Armsden & Greenberg, 1987). IPPA has been used in Chinese populations and showed good reliability (e.g., B. B. Chen, 2017). At Wave 1, adolescents reported on their attachment to parents using 20 items assessing three board dimensions of attachment (i.e., degree of mutual trust, 8 items, e.g., "I trust my parent"; quality of communication; 7 items, e.g., "I tell my parent about my problems and troubles"; and extent of alienation, 5 items, e.g., "I get upset easily around my parent") on a 5-point Likert scale ranging from 1 (*almost never or never true*) to 5 (*almost always or always true*). Scores of five items on alienation were reserved, and then the mean was taken across 20 items, with higher numbers indicating adolescents' greater attachment security to their parents ($\alpha = .94$).

2.3.2 | Parent-adolescent COVID-19 communication

At Wave 1, parents reported on the frequency of COVID-19 communication using items adapted from UNICEF's checklist of parenting tips (UNICEF, 2020). On a 5-point Likert scale ranging from 1 (*never*) to 5 (*all the time*), parents rated the frequency of various types of COVID-19 communication they engage with their adolescents (5 items; e.g., "I discuss with my child about the ways to protect ourselves from COVID-19" and "Whenever my child has questions about COVID-19, I try my best to answer them"). The mean was taken across all items, with higher numbers indicating more frequent COVID-19 communication between parents and adolescents ($\alpha = .87$).

2.3.3 | Adolescents' COVID-19-related health behavior

At both Wave 1 and Wave 2, adolescents reported on their COVID-19-related health behavior using items adapted from the World Health Organization's guidance on protective health behavior (World Health Organization, 2020). On a 5-point Likert scale ranging from 1 (*never*) to 5 (*all the time*), adolescents rated the frequency of each behavior (5 items; e.g., "practice social distance" and "wear a mask when you go outside") during the week. The items were averaged, with higher numbers indicating more frequent COVID-19-related health behavior ($\alpha = .84$ at Wave 1 and $.86$ at Wave 2).

2.3.4 | Adolescents' general health behavior

At both Wave 1 and Wave 2, adolescents reported on their general health behavior using items adapted from the general behavior subscale of the Health Protective Behavior Scale (Ping et al., 2018). On a 5-point Likert scale ranging from 1 (*never*) to 5 (*all the time*), adolescents rated the frequency of each behavior (7 items, e.g., "eat fruits and vegetables every day" and "get enough sleep") during the week. The items were averaged, with higher numbers indicating more engagement of general health behavior ($\alpha = .80$ at Wave 1 and $.81$ at Wave 2).

2.3.5 | Adolescents' depressive symptoms

At both Wave 1 and Wave 2, adolescents reported on their depressive symptoms using the Short Mood and Feelings Questionnaire (SMFQ; Angold et al., 1995), a measure that has been widely used to measure adolescents' depressive symptoms across cultures (Cheung et al., 2016; Orben & Przybylski, 2019). On a 5-point Likert scale ranging from 1 (*never*) to 5 (*very often*), adolescents rated how much they felt each feeling or acted each action (13 items, e.g., "felt miserable or unhappy" and "cried a lot") during the past 2 weeks. The mean was taken across all items, with higher numbers indicating greater depressive symptoms ($\alpha = 0.95$ at Wave 1 and $.96$ at Wave 2).

2.3.6 | Adolescents' anxiety symptoms

At both Wave 1 and Wave 2, adolescents reported on their anxiety using the Generalized Anxiety Disorder-7 scale (GAD-7; Spitzer et al., 2006). The Chinese version of GAD-7 has been validated and has shown good reliability in prior studies (Y. Wang et al., 2018). On a 4-point Likert scale ranging from 1 (*not at all*) to 4 (*nearly every day*), adolescents rated how often they were bothered by each problem (7 items; e.g., “feeling nervous, anxious, or on edge” and “becoming easily annoyed or irritable”) during the past 2 weeks. The items were averaged, with higher numbers indicating greater anxiety symptoms ($\alpha = .96$ at both waves).

3 | RESULTS

3.1 | Overview of analyses

The current research consisted of three sets of analyses. The first set of analyses examined the role of parent-adolescent attachment security and COVID-19 communication in adolescents' health behavior and mental health over 2 months during COVID-19. Attachment security and COVID-19 communication were included separately into the models to predict adolescents' COVID-19-related health behavior, general health behavior, depressive symptoms, and anxiety symptoms over time. The second set of analyses examined the unique role of attachment security and COVID-19 communication in adolescents' health behavior and mental health, such that attachment security and COVID-19 communication were included simultaneously in the models to predict adolescent adjustment over time. The third set of analyses were exploratory analyses that examined the potential mediating role of COVID-19 communication in the associations between attachment security and adolescent adjustment.

3.2 | Descriptive analyses

Table 1 shows descriptive statistics and the Pearson correlations among variables. Families reporting greater attachment security also reported more frequent parent-adolescent COVID-19 communication. In families that reported greater attachment security or more frequent COVID-19 communication between parents and adolescents, adolescents showed more COVID-19-related and general health behavior as well as less depressive and anxiety symptoms at both waves, except that COVID-19 communication was not associated with COVID-19-related health behavior and anxiety at Wave 1. Parents' educational attainment was positively correlated with attachment security and negatively correlated with adolescents' depressive symptoms at both waves. Adolescents reported greater attachment security to mothers (vs. fathers).

3.3 | Attachment security, COVID-19 communication, and adolescents' adjustment

A set of analyses was conducted to examine whether parent-adolescent attachment security and COVID-19 communication were associated with adolescents' health behavior and mental health over time. In the context of path analysis models, each aspect of adolescents' adjustment (i.e., COVID-19-related health behavior, general health behavior, depressive symptoms, and anxiety symptoms) at Wave 2 was predicted by attachment security and COVID-19 communication at Wave 1, while controlling for adolescents' prior adjustment, age, gender, and parents' gender and educational attainment. We first added attachment security and COVID-19 communication separately into the analyses (Model 1 and 2 in Table 2), and then included them simultaneously to identify their unique and overlapping roles in adolescents' adjustment (Model 3 in Table 2). Given that all possible links were included in these models, they were saturated with perfect fit.

As shown in the Model 1 of Table 2, in line with the hypotheses, attachment security was associated with adolescents' more frequent COVID-19-related and general health behavior at Wave 2 (COVID-19-related health behavior: $\beta = .13$, $p = .03$; general health behavior: $\beta = .13$, $p = .02$), controlling for health behavior at Wave 1 and other covariates. Moreover, attachment security at Wave 1 was also associated with adolescents' less depressive and anxiety symptoms at Wave 2 (depressive symptoms: $\beta = -.29$, $p < .001$; anxiety symptoms: $\beta = -.20$, $p < .001$), controlling for depressive/anxiety symptoms at Wave 1 and other covariates.

As shown in the Model 2 of Table 2, COVID-19 communication at Wave 1 was associated with adolescents' more frequent COVID-19-related and general health behavior at Wave 2 (COVID-19-related health behavior: $\beta = .19$, $p < .001$; general health behavior: $\beta = .17$, $p < .001$), controlling for health behavior at Wave 1 and other covariates. However, COVID-19 communication was not associated with adolescents' depressive or anxiety symptoms over time (depressive symptoms: $\beta = -.06$, $p = .23$; anxiety symptoms: $\beta = -.08$, $p = .10$).

TABLE 1 Descriptive statistics and correlations of variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Wave 1														
1. Attachment security	-													
2. COVID-19 communication	0.20***	-												
3. COVID-19 health behavior	0.22***	0.04	-											
4. General health behavior	0.40***	0.14**	0.48***	-										
5. Depressive symptoms	-0.47***	-0.14**	-0.07	-0.24***	-									
6. Anxiety symptoms	-0.32***	-0.08	-0.15**	-0.25***	0.72***	-								
Wave 2														
7. COVID-19 health behavior	0.19***	0.22***	0.29***	0.24***	-0.19***	-0.13*	-							
8. General health behavior	0.30***	0.27***	0.14*	0.46***	-0.25***	-0.20***	0.46**	-						
9. Depressive symptoms	-0.49***	-0.13*	-0.13*	-0.29***	0.58***	0.44***	-0.19***	-0.26***	-					
10. Anxiety symptoms	-0.32***	-0.12*	-0.16**	-0.27***	0.40***	0.42***	-0.18**	-0.23***	0.77***	-				
Other variables														
11. Child age	-0.02	0.00	-0.02	-0.10	0.03	0.01	0.01	0.01	0.11*	0.04	-			
12. Child gender	0.07	0.08	0.03	-0.06	0.02	0.05	0.14*	0.06	-0.02	-0.09	-0.06	-		
13. Parent gender	0.19***	0.01	-0.01	-0.02	-0.13*	-0.07	0.07	-0.05	-0.05	-0.03	-0.08	-0.01	-	
14. Parent education	0.20***	0.08	0.03	0.07	-0.10*	0.03	-0.00	0.05	-0.12*	-0.04	-0.07	-0.01	0.10*	-
Mean	3.76	3.72	4.42	4.24	2.14	1.65	4.34	4.19	2.06	1.58	13.35	0.01	0.40	-0.00
SD	0.83	1.12	0.72	0.72	0.96	0.78	0.77	0.70	0.91	0.72	0.36	1.00	0.92	0.92
Range	1-5	1-5	1-7	1-5	1-5	1-4	1-7	1-5	1-5	1-4	12.3-15.5	-1 to 1	-1 to 1	-1 to 1

Note: For child gender, -1 = boys and 1 = girls. For parent gender, -1 = father and 1 = mother. For parental education (the average between mother and father), -1 = less than a college degree and 1 = college degree or higher. Abbreviation: SD, standard deviation. **p* < .05; ***p* < .01; ****p* < .001.

TABLE 2 Predicting adolescents' health behavior and mental health from parent–adolescent attachment security and COVID-19 communication

	COVID-19 health behavior			General health behavior			Depressive symptoms			Anxiety symptoms		
	B	SE	β	B	SE	β	B	SE	β	B	SE	β
Model 1:												
Age	0.05	0.11	.02	0.10	0.10	.05	0.21	0.11	.09*	0.04	0.10	.02
Child gender	0.09	0.04	.11	0.03	0.04	.04	0.00	0.04	.00	-0.06	0.04	-.08
Parent gender	0.04	0.04	.05	-0.05	0.04	-.06	0.08	0.04	.09	0.04	0.04	.05
Parent education	-0.02	0.05	-.03	0.02	0.04	.02	-0.03	0.04	-.03	-0.01	0.04	-.02
Prior adjustment	0.27	0.06	.25***	0.39	0.05	.40***	0.42	0.05	.45***	0.34	0.05	.37***
Attachment security	0.12	.05	.13*	0.11	0.05	.13*	-0.31	0.06	-.29***	-0.18	0.05	-.20***
Model 2:												
Age	0.03	0.11	.01	0.08	0.10	.04	0.23	0.11	.09*	0.05	0.10	.02
Child gender	0.08	0.04	.10	0.02	0.03	.03	-0.01	0.04	-.01	-0.06	0.04	-.09
Parent gender	0.07	0.04	.08	-0.03	0.04	-.04	0.06	0.05	.06	0.02	0.04	.02
Parent education	-0.02	0.04	-.03	0.02	0.04	.02	-0.06	0.05	-.06	-0.03	0.04	-.04
Prior adjustment	0.29	0.06	.27***	0.41	0.05	.43***	0.54	0.04	.57***	0.40	0.05	.43***
COVID-19 communication	0.23	0.06	.19***	0.18	0.06	.17***	-0.08	0.07	-.06	-0.10	0.06	-.08
Model 3:												
Age	0.03	0.11	.02	0.08	0.09	.04	0.22	0.11	.09*	0.04	0.10	.02
Child gender	0.08	0.04	.10	0.02	0.03	.03	0.00	0.04	.01	-0.06	0.04	-.08
Parent gender	0.05	0.04	.06	-0.04	0.04	-.06	0.08	0.04	.08	0.04	0.04	.05
Parent education	-0.04	0.04	-.04	0.01	0.04	.01	-0.03	0.04	-.03	-0.01	0.04	-.01
Prior adjustment	0.27	0.06	.25***	0.36	0.05	.38***	0.42	0.05	.45***	0.34	0.05	.37***
Attachment security	0.09	0.05	.09	0.10	0.05	.11*	-0.31	0.06	-.28***	-0.17	0.05	-.19***
COVID-19 communication	0.22	0.06	.18***	0.17	0.06	.16**	-0.03	0.06	-.02	-0.06	0.06	-.06

Note: For child gender, -1 = boys and 1 = girls. For parent gender, -1 = father and 1 = mother. For parental education (the average between mother and father), -1 = less than a college degree and 1 = college degree or higher.

Abbreviation: SE, standard error.

* $p < .05$; ** $p < .01$; *** $p < .001$.

To identify the unique roles of attachment security and COVID-19 communication in adolescents' adjustment, these two predictors were included into the models simultaneously. The Model 3 of Table 2 showed that the longitudinal associations between COVID-19 communication and adolescents' two types of health behavior remained significant (COVID-19-related health behavior: $\beta = .18$, $p < .001$; general health behavior: $\beta = .16$, $p = .002$), after controlling for attachment security. In addition, when controlling for COVID-19 communication, the longitudinal association between attachment security and adolescents' general health behavior, depressive symptoms, and anxiety symptoms remained significant (general health behavior: $\beta = .11$, $p = .04$; depressive symptoms: $\beta = -.28$, $p < .001$; anxiety symptoms: $\beta = -.19$, $p < .001$), while its associations with COVID-19-related health behavior was no longer significant ($\beta = .09$, $p = .10$).

3.4 | Exploratory analyses

Given that attachment security may facilitate more COVID-19 communication, we next tested if the relations between attachment security and health behavior were mediated by COVID-19 communication in the context of path analysis models. To this end, health behavior at Wave 2 was predicted from attachment security at Wave 1 controlling for adolescents' prior adjustment and other covariates. Notably, the indirect effect from attachment security at Wave 1 to COVID-19

communication at Wave 1 to health behavior at Wave 2 was included in the model. COVID-19-related health behavior and general health behavior were tested in separate models. In addition, bootstrapping was performed in PROCESS 4.0 to verify the indirect effect (Hayes, 2017). As shown in Panel A of Figure 1, COVID-19 communication mediated the association between attachment security and COVID-19-related health behavior. Based on 5000 bootstrap resamples, the indirect path from attachment security to COVID-19 communication to COVID-19-related health behavior was significant (unstandardized indirect effect = 0.03, 95% confidence interval [CI]: [0.01–0.06]), with a reduction of 28% in the total effect such that the direct effect was not significant. Similarly, as shown in Panel B of Figure 1, COVID-19 communication partially mediated the association between attachment security and general health behavior. Based on 5000 bootstrap resamples, the indirect path from attachment security to COVID-19 communication to COVID-19-related health behavior was significant (unstandardized indirect effect = 0.02, 95% CI: [0.00–0.04]), with a reduction of 22% in the total effect.

4 | DISCUSSION

The ongoing COVID-19 pandemic has spread over the world and caused serious challenges to adolescents' physical and mental health. However, there is a lack of empirical research, and especially longitudinal research, that sought to examine family factors that may promote adolescents' health behavior and protect adolescents' mental health during COVID-19. Using a two-wave longitudinal approach, the current study found that parent-adolescent attachment security was associated with adolescents' more frequent COVID-19-related health behavior (e.g., practicing social distance and wearing a mask) and general health behavior (e.g., eating vegetables and exercising) as well as less depressive and anxiety symptoms over 2 months during the pandemic. Moreover, COVID-19 communication between parents and adolescents was associated with adolescents' more frequent COVID-19-related and general health behavior over time. Notably, attachment security's and COVID-19 communication's associations with health behavior mostly remained the same after taking into account each other simultaneously. In addition, exploratory mediation analyses suggest that COVID-19 communication may explain the link between attachment security and adolescents' health behavior over time.

4.1 | The role of attachment security in adolescents' health behavior and psychological well-being

Attachment security to parents was associated with adolescents' more frequent COVID-19-related and general health behavior over 2 months during the pandemic, controlling for adolescents' prior health behavior and other covariates. The results are consistent with prior studies that found attachment security's positive associations with adolescents' COVID-19-

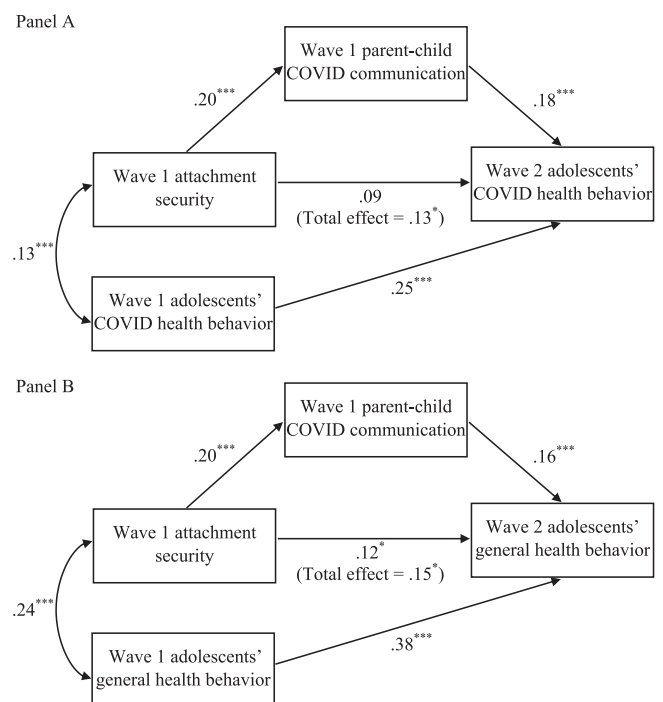


FIGURE 1 COVID-19 communication mediated the association between attachment security and adolescents' COVID-19 health behavior (Panel A)/general health behavior (Panel B). Adolescents' age, gender, and parents' gender and educational attainment were included in the models as covariates but are not shown for ease of presentation. Standardized coefficients are presented. * $p < .05$; *** $p < .001$.

related health behavior during COVID-19 (Coulombe & Yates, 2022) and general health behavior during a normal time (Bender & Ingram, 2018). Moreover, results of the current study add to the body of literature on the role of family context (e.g., parent–child relationship and parenting practices) in adolescent mental health during the pandemic (Eales et al., 2021; Qu et al., 2021; Skinner et al., 2021; Yang et al., 2021). In line with prior studies on the protective role of secure attachment in children's mental health (Brumariu & Kerns, 2010), attachment security was associated with adolescents' less depressive and anxiety symptoms over time, controlling for adolescents' prior depressive/anxiety symptoms and other covariates.

These results suggest that adolescents' secure attachment to their parents plays its “secure base” and “safe haven” functions during the pandemic. In times like COVID-19 that are stressful for most people around the globe, it is important for adolescents to have parents or other attachment figures they can seek feelings of comfort and security from. Given that attachment's “secure base” function fosters children's learning and exploring (Ainsworth, 1989; Bowlby, 1988), adolescents with secure attachment to their parents may be more capable of understanding and adapting to the reality of COVID-19. In this case, these adolescents may be more likely to behave accordingly (e.g., engage in COVID-19-related and general health behavior to protect their own health). Moreover, since attachment's “safe haven” function allows children to seek safety when they are under stress (Ainsworth, 1989; Bowlby, 1982), adolescents with secure attachment to their parents can seek comfort and help from their parents at times they feel concerned and worried about the pandemic. During such a stressful time, many adolescents may show increases in worries and negative emotions (Houghton et al., 2022; Racine et al., 2020; D. Wang et al., 2022). When adolescents have secure attachment figures that they can discuss their concerns and worries, they may be more capable of coping with COVID-19-related stress and staying mentally healthy during the pandemic.

4.2 | The role of COVID-19 communication in adolescents' health behavior

Besides attachment security, COVID-19 communication between parents and adolescents was also associated with adolescents' more frequent COVID-19-related and general health behavior over 2 months during the pandemic, controlling for adolescents' prior health behavior and other covariates. This is consistent with past studies demonstrating that parent–adolescent communication on a particular topic can reduce adolescents' corresponding health-compromising behavior (e.g., substance use-specific communication and adolescents' substance use; Carver et al., 2017). When adolescents discuss COVID-19 with their parents, they may acquire a more comprehensive understanding of this disease. Therefore, they may be more likely to behave responsibly and acknowledge the necessity of COVID-19-related health behavior. Similarly, COVID-19 communication may promote adolescents' awareness of the importance of health. As a consequence, they may value their health more and adapt to a healthier lifestyle to protect their physical health. It is worth noting that the association between COVID-19 communication and adolescents' health behavior remained significant over and above attachment security. This highlights the unique role of COVID-19 communication that cannot be replaced by positive relationships between parents and adolescents. However, it is also important to note that the positive influence of COVID-19 communication on health behavior may not apply to everyone. For example, when parents and adolescents hold drastically different opinions about COVID-19-related health behavior, COVID-19 communication may result in conflict between parents and adolescents, and such conflict may contribute to adolescents' irresponsible behavior such as not adhering to COVID-19 restrictions. Moreover, a recent longitudinal study suggests that parent–adolescent communication on COVID-19 only promotes adolescents' health behavior when they show low stress during the pandemic, and such communication may also have a negative impact on health behavior among adolescents with heightened stress (Peplak et al., 2021). Therefore, despite that parent–adolescent communication on COVID-19 may promote adolescents' health behavior, the exact practice should be cautious and pay attention to adolescents' individual needs.

The findings of our exploratory mediation analyses also suggest that COVID-19 communication may explain why attachment security was associated with adolescents' greater health behavior. It is possible that, in families where adolescents have greater attachment security with parents, parents and adolescents may have more frequent communication on COVID-19, which helps adolescents engage in more health behavior during the pandemic. With a two-wave design, the current research has limited temporal precedence to fully examine the potential mediating role of COVID-19 communication among the associations between attachment security and adolescents' health behavior. Therefore, it is important for future research to study not only parent–adolescent communication but also other parenting practices as potential mechanisms underlying the influence of attachment security in positive adolescent development during the pandemic.

Although scholars suggest that parent–adolescent COVID-19 communication may play a protective role in children's psychological well-being (Dalton et al., 2020), the current study did not find significant longitudinal associations between COVID-19 communication and adolescents' depressive/anxiety symptoms. It is possible that COVID-19 communication may increase adolescents' awareness and understanding of COVID-19, which has been found to be concurrently associated with less depression and anxiety (Zhou et al., 2020); nevertheless, such knowledge of COVID-19 may not be enough to influence adolescents' mental health over a short period, given that the current research was conducted in a 2-month period. Moreover, although increased time at home provides family members with more opportunities to communicate with each

other (Shek, 2021), adolescents may consider such communication undesirable as they seek individuation from their parents during adolescence (Koepeke & Denissen, 2012). Also, for parent–adolescent dyads who have different opinions about the pandemic, conversations about COVID-19 may not lead to a meaningful discussion or an agreement on opinions, and there is a risk that such unsuccessful conversations may increase adolescents' concern over the pandemic and dampen their parent–adolescent relationship.

4.3 | Implications

The findings of the current research have important theoretical and practical implications. There has been a vast interest in the positive role of attachment security between parents and children in child development (Brumariu & Kerns, 2010; Goldberg, 2000; Sroufe et al., 1999). The current research provides valuable evidence of how attachment security may exert influences on adolescents' behavioral and emotional adjustment in a short period during a stressful time such as the COVID-19 pandemic. As for parent–adolescent communication, past research found that communication on a specific health-compromising behavior (e.g., substance use and risky sexual behavior) may reduce adolescents' engagement in such behavior (for a review, see Carver et al., 2017). The current research extends prior research by suggesting that parent–adolescent communication on a specific health issue does not only predict adolescents' health behavior in this specific domain, but also promotes adolescents' general health behavior.

With regard to practical implications, the findings of the current research highlight attachment security as a potential point of intervention that may promote adolescents' behavioral and psychological adjustment during a stressful time. Prior intervention studies have demonstrated that attachment-based intervention may reduce adolescents' internalizing and externalizing problems (Moretti et al., 2015; Ozturk et al., 2019). Although COVID-19 restrictions may present difficulties for the implementation of interventions, recent research suggests that attachment-based intervention using remote or hybrid methods can be effective during the pandemic (Levy et al., 2021; Schein et al., 2022). In addition, the current research highlights the effectiveness and necessity of COVID-19 communication between parents and adolescents that interventions and policy recommendations should take into consideration. Much attention should be paid to the possible lack of parent–adolescent communication during the pandemic. Many adolescents may face COVID-19 with a lack of parent–adolescent communication because of dampened parent–child relationships during early and middle adolescence (Shek, Zhao, et al., 2021). Moreover, given that death-related topics are often considered taboo in Chinese culture (Cheng et al., 2014, 2019), as well as in Western cultures (C. Gao, 2013), some parents may feel forbidden to discuss the severity and negative consequences of the pandemic with their children. Therefore, policy recommendations need to encourage parents to disregard such taboos and thoroughly communicate with their children on pandemic-related issues.

4.4 | Limitations and future directions

There are several limitations in the current study that point to directions for future research. First, the current research was not able to measure the in-depth quality of parent–adolescent COVID-19 communication. The quality of COVID-19 communication may greatly vary across families. For instance, whereas some parents may have meaningful conversations with adolescents to foster their knowledge and positive attitude regarding the pandemic, some parents may merely command adolescents to comply with COVID-19 restrictions. In worse cases, when there is a lack of correct knowledge about COVID-19, some parents may unintentionally convey misinformation to adolescents through COVID-19 communication. Such differences in quality may largely influence how adolescents adapt to the pandemic situation. Although the measure of COVID-19 communication in the current research has included items that represent high-quality communication parents can provide (e.g., “I remind my child to distinguish rumors and false information about COVID-19” and “I help my child consider the COVID-19 problem from multiple angles”), the exact topics and contents of such communication remain unclear. Future research can employ interview and observation approaches to study the quality of parent-adolescent COVID-19 communication in greater depth.

Second, each construct of the current research was only reported by either parents or adolescents. The single informant methodology within measures limited the possibility to examine convergence and divergence of parents' and adolescents' perspectives on attachment, communication, and adolescents' adjustment. Future research should include both parent-reported and adolescent-reported measures to better understand the role of attachment security and parent–adolescent communication in adolescents' adjustment during the pandemic. Moreover, the current research was not able to distinguish between adolescent-initiated conversations and parent-initiated conversations. It is likely that adolescent-initiated and parent-initiated conversations may have different effects on adolescents' health behavior and mental health during the pandemic. Future research can separately examine adolescent-initiated and parent-initiated conversations to further elucidate the role of parent–adolescent communication in adolescent adjustment.

Third, given the urgency of the COVID-19 pandemic, the current research followed parent–adolescent dyads over a short period (i.e., 2 months) during the pandemic outbreak, which leaves an open question regarding whether attachment security and COVID-19 communication play similar roles in adolescents' adjustment over a longer period of time. Regarding adolescents' health behavior, it may be interesting to study whether attachment security and COVID-19 communication play similar roles in adolescents' general health behavior when the pandemic ends.

Finally, the current study focused on Chinese families' attachment, communication, and adolescents' adjustment during COVID-19. Therefore, it remains unknown whether such associations exist in other countries and cultures. On one hand, prior research suggests that the effects of attachment or communication on adolescents' behavioral and emotional adjustment are similar across countries (e.g., Brumariu & Kerns, 2010; Carver et al., 2017; Sutton et al., 2014). On the other hand, adolescents' adjustment during the pandemic may vary drastically due to differences in COVID-19 situations across countries. Future research can take a cross-cultural approach to investigate whether parent–adolescent attachment security and communication play similar roles in adolescents' adjustment across cultures during the pandemic.

5 | CONCLUSIONS

COVID-19 has widely affected people's physical and mental health around the world, and adolescence may be an age group that is particularly vulnerable. Using a longitudinal approach, the current study suggests that attachment security and COVID-19 communication between parents and adolescents were associated with adolescents' more COVID-19-related and general health behavior, and attachment was also associated with adolescents' less depressive and anxiety symptoms over 2 months during the pandemic. The present research highlights the importance of attachment security and COVID-19 communication on adolescents' behavioral and emotional adjustment during the pandemic. Interventions and policy recommendations aiming at improving adolescents' health behavior and mental health should take into account the effectiveness and necessity of these family factors.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data sets generated and/or analyzed during the current study are not publicly available but are available from the corresponding author on reasonable request.

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