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ARTICLE

Protective Factors for Loneliness among Adolescents during COVID-19: Role of the Interpersonal Relationships and Sibling Status

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ABSTRACT

This study examined the moderating effects of parent-child, same-sex, opposite-sex and teacher-student relationships between sibling status and loneliness during COVID-19. A total of 1,591 adolescents in China completed the study questionnaires which assessed the aforementioned variables. The results showed that same-sex and teacher-student relationships moderated the association between sibling status and loneliness. The results indicated that among participants with good same-sex relationships during COVID-19, compared to non-only-children participants, the only-children participants were more likely to experience a lower level of loneliness. However, participants with poor same-sex relationships experienced similar level of loneliness regardless of whether they had siblings. These findings would be helpful for parents, teachers, and other stakeholders to take effective measures to reduce loneliness feelings among Chinese adolescents.

KEYWORDS

COVID-19; only-children and non-only children; interpersonal relationships; loneliness; moderating effects

1 Introduction

The emergence of the COVID-19 disease caused an unprecedented global public health crisis [1] and increased feelings of loneliness [2,3]. Since the pandemic has persisted, the world has already experienced several infection waves; without vaccinations, lockdown and social distancing are the only ways to curb the spread of the disease [4]. With such discontinuation of physical interaction, it is evident that significant loneliness can lead to other mental health challenges [5–8]. Loneliness refers to the experience of negative feelings caused by deficits in an existing relationship [9]. Empirical studies have shown that loneliness peaks during early adolescence [10] and leads to negative physical, behavioral and

psychological outcomes [11–15]. For example, studies have shown that loneliness is positively associated with depression and anxiety [12,15] and an unhealthy lifestyle [16]. As loneliness can have a substantial impact on individuals and communities [17,18], it has recently been gaining more research attention [19]. However, despite previous empirical studies on loneliness, more studies are needed to further clarify what factors might cause people to feel lonely [20]. This problem is very urgent as identifying the determinants of loneliness is an early critical step for establishing and implementing interventions.

One of the factors that may influence loneliness among adolescents is sibling status. Sibling status can be used to classify adolescents into two categories: only-children and non-only children. Studies have suggested that, for adolescents, sibling relationships are a protective factor for the psychosomatic problems such as loneliness; thus, individuals without siblings are likely to be lonelier than those with siblings [21,22]. Previous studies have shown that non-only-children adolescents experience lower levels of loneliness than those who are only-children [23,24].

In addition, interpersonal relationships are an important predictor of adolescents' subjective experiences of loneliness [25,26]. There is clear evidence that interpersonal relationships are correlated to loneliness, negatively. One study that demonstrates this found that good-quality interpersonal relationships are associated with lower levels of loneliness [27]. These findings suggest that strong interpersonal relationships can significantly reduce the risk of loneliness. That said, the type of relationship may be particularly important on this association. For adolescents, the main interpersonal relationships formed are parent-child, same-sex, opposite-sex, and teacher-student [28,29]. Literature has shown that opposite-sex relationships, same-sex relationships, and teacher-student relationships all contribute to loneliness among adolescents [26], indicating that certain sub-types of interpersonal relationships can impact loneliness levels.

Although sibling status and interpersonal relationships are associated with loneliness, the question remains unclear for how their interaction influences loneliness. Researchers have suggested that environmental variables (e.g., friendship quantity and quality) can function as moderators in this association [30]. The moderating effects of interpersonal relationships on loneliness have been examined in some studies. For instance, adolescents with social anxiety who have good quality interpersonal relationships are less likely to feel lonely than adolescents with poor quality relationships [31]. There is potentially a lot to be learned by exploring the moderating effect of interpersonal relationships between sibling status and loneliness. Previous studies have suggested that the influence of interpersonal relationship sub-types have the potential to differ between the adolescent only-children and non-only-children [32,33]. Specifically, it is been found that adolescent non-only-children have the closest relationships with their same-sex friends [32]. In addition, compared with adolescent only-children, adolescent non-only-children are more likely to be influenced by opposite-sex relationships [33]. Taken together, the association between interpersonal relationships and loneliness among adolescents might be moderated by sibling status. In the present study, we aimed to explore this probable association.

1.1 The Present Study

In summary, the focus of the present study was to explore the relationship between sibling status, interpersonal relationships, and loneliness levels among adolescents during COVID-19. Specifically, we explored the influence of parent-child, same-sex, opposite-sex, and teacher-student relationships on the associations between sibling status and loneliness. Based on previous studies, we proposed the associations between sibling status and loneliness to be moderated by interpersonal relationship sub-types.

1.2 Hypothesis

The hypotheses for this study are as follows:

H1: Sibling status makes significant contributions to loneliness;

H2: Parent-child, same-sex, opposite-sex, and teacher-student relationships make significant contributions to loneliness;

H3: Parent-child, same-sex, opposite-sex, and teacher-student relationships moderate the association between sibling status and loneliness.

2 Method

2.1 Participants

The present study's sample was high school students from three cities in China (Xi'an, Lanzhou, and Baoji) utilizing convenience sampling technique. A total of 1,750 students of 12 schools participated in this study from September 10, 2020 to October 16, 2020. Participation into this study was voluntary. Any senior high school student who did not participate in a similar study could volunteer to participate. A purposive sampling technique was used for selecting the participants of the study. After excluding incomplete responses (9.9%), a total of 1,591 participants' responses were utilized in this study. Before administering the study questionnaire, informed consent from participants and their parents/legal guardians were collected. Each participant received a pen as a reward after completing the questionnaire. The mean age of the participants was 15.90 years (SD = 0.91 years). All participants were from Grade 11; other demographic information is presented in Table 1.

Table 1: Socio-demographic characteristics of the participants

Variables	Groups	Frequency (%)
Gender	Female	779 (49%)
	Male	812 (51%)
Age	13 years	1 (0.1%)
	14 years	69 (4.3%)
	15 years	36 (2.3%)
	16 years	1 (0.1%)
	17 years	402 (25.1%)
	18 years	27 (1.7%)
	19 years	636 (39.8%)
Sibling status	Having sibling (s)	702 (44.12%)
	No sibling	889 (55.88%)
Monthly income	0–3,000 Chinese Yuan	611 (38.40%)
	3,001–5,000 Chinese Yuan	344 (21.62%)
	5,001–10,000 Chinese Yuan	137 (8.61%)
	Over 10,000 Chinese Yuan	499 (31.36%)

2.2 Measures

The present study's questionnaire included the UCLA Loneliness Scale–version 2 (UCLA-LS-v2 [34]), the Interpersonal Relationship Scale [35], and a personal information form containing questions about participants' age, gender, and sibling status.

2.2.1 UCLA Loneliness Scale (UCLA-LS)

The University of California at Los Angeles Loneliness Scale–version 2 ([UCLA-LS-v2] [34]; [Chinese version] [26]) was utilized to assess the subjective experience of loneliness among adolescents. The UCLA-LA is a 20-item self-report measure that provided participants' subjective feelings of loneliness. Participants were asked to rate their opinion on each item (e.g., "I have nobody to talk to") using a four-point Likert-type scale, ranging from 1 (I never feel this way) to 4 (I often fell this way). The scores used in this study were calculated by summing the scores of each item, and higher scores indicated more loneliness symptoms. The total scores ranged between 20 and 80. In the current study, Cronbach's alpha coefficient for this scale was 0.86. Confirmatory factor analysis results showed that unifactor structure of the UCLA Loneliness scale [Chinese version] had good model fit for this study's sample (χ^2 = 949.81, df = 167, $p < 0.001$, Goodness of fit index [GFI] = 0.97, Comparative Fit Index [CFI] = 0.95, Tucker-Lewis Index [TLI] = 0.95, Root mean square error of approximation [RMSEA] = 0.05, Standardized root mean square residual [SRMR] = 0.06).

2.2.2 The Interpersonal Relationship Scale

The Interpersonal Relationship Scale [35] was utilized to assess the quality of interpersonal relationships, which has been confirmed to have good reliability and validity [25,26]. The scale comprises five sub-scales: opposite-sex relationships, same-sex relationships, parent-child relationships, teacher-student relationships and stranger relationships. Since stranger relationships are not the main form of interpersonal relationships for adolescents [26], we excluded it. For each item, participants were asked to rate how much they agreed on a five-point Likert-type scale, ranging from 1 (It does not fit me at all) to 5 (It fits my situation perfectly).

Specifically, four, eight, nine, and four item sub-scales were used to evaluate participants' parent-child, same-sex, opposite-sex, and teacher-student relationships, respectively. An example item for the parent-child subscale is "My parents are always interfering with my business". For the same-sex subscale, an example item is "No same-sex friend is near me to freely talk about my daily life". One item for the opposite-sex subscale is "I feel nervous when I am talking to an opposite-sex individual". In the teacher-student relationship subscale, an example item is "My teacher does not know me completely". Each of the four subscale scores was calculated by summing the relevant item scores; the higher scores indicated better relationship quality. The total scores of parent-child relationships ranged between 4 and 20; the total scores for same-sex relationships ranged between 8 and 40. For opposite-sex relationships the total scores ranged between 9 and 45; for teacher-student relationships they ranged between 4 and 20. In this study, the Cronbach's alpha coefficient of parent-child, same-sex, opposite-sex, and teacher-student relationships were 0.69, 0.79, 0.75 and 0.78, respectively.

2.2.3 Statistical Analysis

In this study, IBM SPSS v25, JASP 0.14, and ModGraph [36] were utilized for the data management and data analysis. Descriptive statistics (mean, SD, skewness, kurtosis), Pearson-product moment correlation coefficient, independent samples *t*-tests, and linear regression were performed. Data normality was assessed trough skewness and kurtosis. Pearson-product moment correlation coefficient was performed to assess correlation between loneliness and interpersonal relationships. Independent samples t-tests were performed to assess the mean difference in loneliness and interpersonal relationships. A multiple linear regression (hierarchical) was performed to assess the impact of siblings status and interpersonal relationships on loneliness. ModGraph was utilized to draw the moderation effect graphs.

2.3 Ethics

The present study was carried out in accordance with the Declaration of Helsinki and its later amendments. The Ethics Committee of the Northwest Minzu University, China approved this study (2020.05.24.014).

3 Results

3.1 Preliminary Analyses

Descriptive statistics (mean, standard deviation, skewness and kurtosis) and correlation coefficients between loneliness and the four types of interpersonal relationships are presented in Table 2. Kim [37] suggested skewness values of 2 or above and kurtosis values of 7 or above are indicators of the non-normality of the data. Here, skewness (ranged between –1.05 and 0.27) and kurtosis (ranged between 0.20 and 2.26) values (Table 2) are lower than the recommended cut off, suggesting the absence of non-normality in the data. In Table 2, loneliness scores had a significant negative association with four types of interpersonal relationships (correlation coefficients ranged between –0.48 to –0.29). These correlation coefficients provide the prerequisite for the later analysis.

Table 2: Descriptive statistics of the study variables

Variables	*M*	*SD*	Skewness	Kurtosis	2	3	4	5
1. Loneliness	22.32	5.45	0.27	0.86	–0.48**	–0.31**	–0.29**	–0.42**
2. Same-sex relation	30.19	4.19	–1.05	0.96	1	0.50**	0.32**	0.47**
3. Opposite-sex relation	19.27	3.96	–0.15	2.26		1	0.28**	0.35**
4. Parent-child relation	13.61	3.69	–0.09	0.34			1	0.45**
5. Teacher-student relation	15.30	3.47	–0.70	0.20				1

Note: **Represents a significance level of 0.01.

Mean differences in loneliness and the four types of interpersonal relationships by sibling status are in Table 3. The only-children had a significantly higher loneliness score compared to non-only-children (t-value = 2.68, $p < 0.01$, 95% CI [0.20,1.27]). On the other hand, non-only children had a significantly good parent-child relationship score compared to only-children (t-value = –3.40, $p < 0.01$, 95% CI [–0.99, 0.27]).

Table 3: Mean differences in loneliness and interpersonal relationships by sibling status

Variable	Group	*M*	*SD*	*t*-value	95% Confidence Interval	
					Lower bound	Upper bound
Loneliness	one-children	21.90	5.55	2.68**	0.20	1.27
	non-only-children	22.64	5.33			
Same-sex relationship	one-children	30.30	4.14	0.91	–0.61	0.22
	non-only-children	30.11	4.23			
Opposite-sex relationship	one-children	19.25	4.11	0.15	–0.36	0.42
	non-only-children	19.28	3.84			
Parent-child relationship	one-children	13.26	3.84	–3.40**	–0.99	0.27
	non-only-children	13.89	3.55			
Teacher-student relationship	one-children	15.25	3.51	0.57	–0.24	0.44
	non-only-children	15.35	3.42			

Note: **$p < 0.01$.

3.2 Main Analysis

3.2.1 Contribution of Sibling Status to Loneliness

The results showed that sibling status negatively predicted loneliness (B = –1.38, SE = 0.46, β = –0.08, $p < 0.01$, 95% CI [–2.28, –0.48]). This result suggested that non-only-children experienced higher levels of loneliness than only-children during the COVID-19 outbreak. This result confirmed H1.

3.2.2 Contribution of Interpersonal Relationships to Loneliness

The results in Table 4 showed that same-sex relationships (B = −0.43, SE = 0.04, β = –0.33, $p < 0.001$, 95% CI [–0.50, –0.36]), opposite-sex relationships (B = −0.07, SE = 0.03, β = −0.05, $p = 0.04$, 95% CI [−0.14, –0.32]), parent-child relationships (B = −0.10, SE = 0.04, β = −0.07, $p = 0.004$, 95% CI [–0.17, –0.29]), and teacher-student relationships (B = −0.35, SE = 0.04, β = –0.22, $p < 0.001$, 95% CI [–0.43, –0.42]) negatively predict loneliness. These four types of inter-personal relationships contributed 28.0% variability of loneliness ($F_{(4, 1571)} = 159.63$, $p < 0.001$). These results confirmed H2.

Table 4: Regression results of the four types of interpersonal relationship on subjective feeling of loneliness

Variable	B	*SE*	*β*	*p*-value	95% CI of B	
					Lower	Upper
Constant	43.42	0.88		<0.001	41.70	45.14
S-S relation	–0.43	0.04	–0.33	<0.001	–0.50	–0.36
O-S relation	–0.07	0.03	–0.05	0.04	–0.14	–0.32
P-C relation	–0.10	0.04	–0.07	0.004	–0.17	–0.29
T-S relation	–0.35	0.04	–0.22	<0.001	–0.43	–0.042

Note: $R^2 = 0.289$, Adjusted $R^2 = 0.287$, $F_{(4, 1571)} = 159.63$, $p < 0.001$.
S-S relation = same-sex relationship; O-S relation = opposite-sex relationship; P-C relation = parent-child relationship, T-S relation = teacher-student relationship.

3.3 Interaction of Sibling Status and Interpersonal Relationships on Loneliness

The moderating effects of interpersonal relationships on the association between sibling status and loneliness are shown in Table 5. The interaction between same-sex relationships and sibling status on loneliness was significant (B = –0.73, SE = 0.09, β = –0.28, $p < 0.001$, 95% CI [–0.90, –0.56]). For further analysis of the effects of sibling status on loneliness among adolescents with different degrees of same-sex relationships, the participants were divided into two groups according to the average level (M = 39.03) of same-sex relationships: participants with a higher score than the mean score were coded as adolescents with good quality same-sex relationships, whereas participants with a lower score than the mean score were coded as adolescents with bad quality same-sex relationships. Results showed the effect of sibling status on loneliness among adolescents with good same-sex relationships (β = −1.60, SE = 0.54, β = –0.10, $p < 0.01$, 95% CI [–2.65, –0.540]) was stronger than on those with poor same-sex relationships (β = −0.58, SE = 0.65, β = –0.04, $p > 0.05$, 95% CI [–1.85, 0.69]). These results indicated that among participants with good quality same-sex relationships during COVID-19, compared with the non-only-children, the only-children participants were more likely to experience a lower level of loneliness. However, participants with poor quality same-sex relationships experienced a similar level of loneliness regardless of whether they had siblings.

Table 5: Results of the interaction between interpersonal relationships and sibling status on loneliness

Variable	B	*SE*	*β*	*p*-value	95% CI of B	
					Lower	Upper
Model 1						
Constant	83.76	1.55		<0.001	90.72	86.80
Sibling status	–1.37	0.38	–0.07	<0.001	–2.11	–0.63
S-S relation	–0.69	0.05	–0.40	<0.001	–0.79	–0.59
O-S relation	–0.11	0.05	–0.06	<0.01	–0.22	–0.01
P-C relation	–0.34	0.08	–0.11	<0.001	–0.49	–0.19
T-S relation	–0.40	0.07	–0.16	<0.001	–0.53	–0.27
Model 2						
Constant	42.59	0.21		<0.001	42.18	43.00
S-S relation X SS	–0.73	0.09	–0.28	<0.001	–0.90	–0.56
O-S relation X SS	–0.12	0.09	–0.05	0.15	–0.29	0.05
P-C relation X SS	–0.22	0.12	–0.05	0.08	–0.46	0.03
T-S relation X SS	–0.46	0.11	–0.12	<0.001	–0.68	–0.25

Note: Model 1: $R^2 = 0.35$, $F_{(5, 1498)} = 158.99$, $p < 0.001$.
Model 2: $R^2 = 0.16$, $F_{(4, 1525)} = 73.42$, $p < 0.001$.
Note: *SE* = standard error, CI = confidence interval, S-S relation = same-sex relationship, O-S relation = opposite sex relationship, P-C relation = parent-child relationship, T-S relation = teacher-student relationship.

The results in Table 5 showed a significant interaction between teacher-student relationships and sibling status on loneliness (B = −0.46, SE = 0.11, β = –0.12, $p < .001$, 95% CI [–0.68, –0.25]). For further analysis of the effects of sibling status on loneliness among adolescents with different degrees of teacher-student relationships, the participants were divided into two groups according to the average level (M = 15.30) of teacher-student relationships: participants with a higher score than the mean score were coded as adolescents with good quality teacher-student relationships, whereas participants with a lower score than the mean score were coded as adolescents with bad quality teacher-student relationships. Results showed the effect of sibling status on loneliness among adolescents with good teacher-student relationships (β = –1.43, SE = 0.59, β = –0.09, $p < 0.05$, 95% CI [–2.59, –0.28]) was stronger than on those with poor teacher-student relationships (β = –1.40, SE = –0.08, β = 0.63, $p < 0.05$, 95% CI [–2.63, –0.17]).

However, Table 5 also showed non-significant interactions between opposite-sex relationships and sibling status (B = –0.12, SE = 0.09, β = –0.05, $p = 0.15$, 95% CI [–0.29, 0.05]), and parent-child relationships and sibling status (B = –0.22, SE = 0.12, β = –0.05, $p = 0.08$, 95% CI [–0.20, 0.03]) on loneliness. Fig. 1 depicts the moderating effects of the four types of interpersonal relationships on the association between sibling status and loneliness. These results partially confirmed H3, as half of the assessed relationships (same-sex relationship and teacher-student relationship) moderated the association between sibling status and loneliness.

Fig. 1a shows the moderating effect of the same-sex relationship on the association between sibling status and loneliness. Fig. 1b shows the moderating effect of the opposite-sex relationship on the association between sibling status and loneliness. Figs. 1c and 1d show the moderating effect of the parent-child relationship and teacher-student relationship, respectively, on the association between sibling status and loneliness.

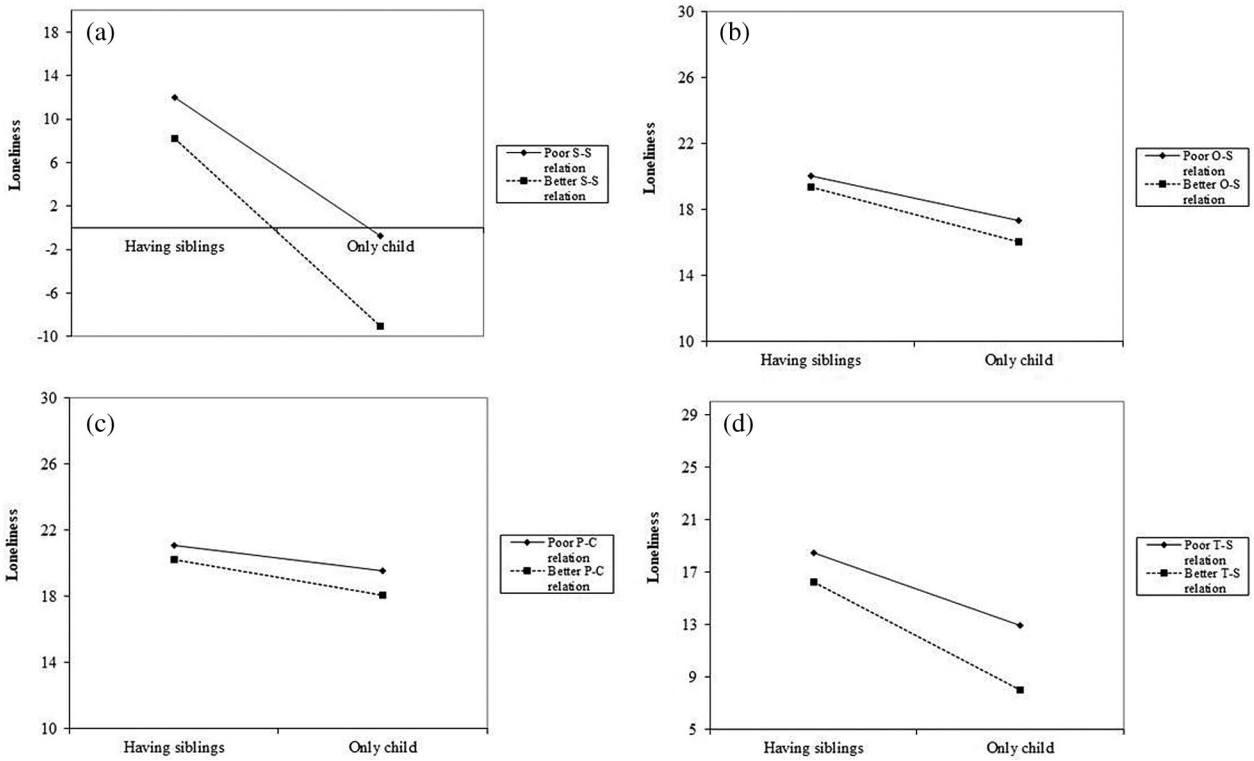

Figure 1: Depiction of the moderating effects of interpersonal relationships between sibling status and loneliness. (a) Same sex relationship (b) Opposite-sex relationship (c) Parent-child relationship (d) Teacher-student relationship

4 Discussion

This study examined the associations between sibling status, interpersonal relationships and loneliness among Chinese adolescents during COVID-19. Preliminary analyses showed that only-children had higher subjective feelings of loneliness and non-only-children had better parent-child relationships. Only-children have less opportunity to play, share toys, ideas, and even interact with same age children or siblings. Therefore, they might have higher feelings of loneliness. Unlike non-only-child families, parents need to distribute their attention overall to children and may pay less attention to a single child compared to only-child parents. In addition, in non-only-child families, due to the increase of children, parents may need to spend more time and experience earning money and have less communication with their children. The results also showed that non-only children had significantly good parent-child relationship scores than only-children. This may be because compared with the only-children, non-only-children have to take care of their younger siblings and play a caretaker role. This role may allow them to be more likely to understand their parents' difficulties and seldom quarrel with their parents.

4.1 Sibling Status and Loneliness

The present's study results showed that sibling status predicted loneliness among adolescents, suggesting that adolescents without siblings experienced a lower level of loneliness than adolescents with siblings. The finding was inconsistent with previous studies that revealed adolescent non-only-children experience lower levels of loneliness than only-children [23,24]. A possible reason for this difference may be related to the degree of care they received from their families during COVID-19. Parents can put all their energy to take care of children; without siblings, only-children receive all that attention. As a

result, they often feel valued and welcomed, have a strong sense of belonging and security, and therefore experience lower loneliness levels. However, for families with more children, the parents cannot give every child as deep of attention to satisfy their spiritual needs. Therefore, children with siblings tend to experience higher levels of loneliness.

4.2 Interpersonal Relationships and Loneliness

The results showed interpersonal relationships were negatively associated with loneliness. Previous studies indicate that interpersonal relationships can buffer the effects of risk factors on loneliness among adolescents [37]. Additionally, some studies have revealed that various sub-types of interpersonal relationships have different functions for adolescents [38,39]. Therefore, this may explain why each interpersonal relationship sub-type can contribute differently to the associations between sibling status and loneliness among adolescents during COVID-19.

4.3 Moderating Effects of Interpersonal Relationships

Same-sex friendships are important for adolescents in many significant domains [40]. Therefore, it is reasonable to consider that same-sex relationships may alleviate loneliness in adolescents. The present study demonstrated that same-sex relationships serve as a moderator between sibling status and loneliness.

The moderating effects indicated among participants with good quality same-sex relationships during COVID-19, compared with non-only-children, the only-children participants were more likely to experience lower levels of loneliness. However, participants with poor quality same-sex relationships experienced similar levels of loneliness regardless of whether they had siblings. A possible reason for this result may be related to China's culture. Under the influence of "filial piety" culture, most teenagers are unwilling to let their parents worry, and are likely to "report good news but not bad news" when their parents ask. In addition, for adolescents, relationships with same-sex friends are more intimate than relationships with parents [32]. In the backdrop of COVID-19, most people are in a state of anxiety and fear, and need more social support from others. Although parents can give teenagers enough attention and support, many psychological privacies are only shared by teenagers with their same-sex friends. Therefore, when teens have better relationships with their same-sex friends, the only-child can not only experience support from their same-sex friends, but also receive more love and support from their parents compared to non-only-children. Thus, they experience lower levels of loneliness. When same-sex relationships are bad, teens have no one to share their anxieties and fears with, and only get social support from their parents. As a result, children, whether or not they are only-children, experience similar feelings of loneliness.

The moderating effects also indicated among participants with good quality teacher-student relationships during COVID-19, compared with non-only-children, only-children were more likely to experience lower levels of loneliness. Also, among participants with poor quality teacher-student relationships, they have the similar pattern. It is just that for teenagers who have good relationships with teachers and students, the effect of siblings on loneliness is stronger. A possible reason for this result may also be related to China's culture. In Chinese culture, there is an emphasis on students to respect teachers and value education, thus, teachers have a direct influence on students. Therefore, the relationship between teachers and students can affect the loneliness of students. For only-children, not only can they receive support and love from their parents, but if teachers also give enough support and love, they will be less likely to be lonely.

This study has important theoretical significance for expanding the research field on interpersonal relationships and loneliness among adolescents. Studies have examined the associations between interpersonal relationships and loneliness, and revealed a significant relationship between them [41,42]. However, few studies have explored the effects of the different sub-types of interpersonal relationships on

the associations between sibling status and loneliness. To date, this is the first attempt to explore the roles of parent-child, same-sex, opposite-sex and teacher-student relationships between sibling status and loneliness among adolescents during COVID-19. In addition, this study is of great practical significance in alleviating loneliness among adolescents during COVID-19. For example, parents and schools can take a variety of measures to help teenagers build good same-sex relationships in order to reduce loneliness.

5 Limitations and Recommendations

This study has several limitations. First, the sample of this study lacks representativeness. The participants were mostly from northern cities; thus, the representativeness of the sample should be expanded in future studies. Second, there are some confounding factors (e.g., social support, the number of siblings) that may affect the moderation effect of same-sex relationships between sibling status and loneliness. Third, the study has a lack of other variables (depression, anxiety, grief, etc.) that might amplify the predictive nature of loneliness apart from interpersonal relationships and sibling status. Future studies should include these confounding factors in the analysis to expand understanding of the effects of same-sex relationships. Third, self-report data were utilized in this study which might be subjected to biases like social desirability bias, memory recall, etc. Fourth, the study did not include gender information of the siblings and history of infection or quarantine which should be addressed in further studies.

6 Conclusion

The present study suggests that sibling status makes a significant contribution to loneliness. Additionally, interpersonal relationships (i.e., parent-child, same-sex, opposite-sex, and teacher-student relationships) contribute significantly to adolescents' subjective experiences of loneliness. Among the assessed interpersonal relationships, same-sex relationships and teacher-student relationships moderated the association between sibling status and loneliness. These finding would be helpful for parents, teachers, and other relevant stakeholders to know the contributing factors of loneliness among Chinese adolescents. Considering these contributing factors, they can then take appropriate measures to reduce subjective feelings of loneliness among adolescents.

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Conflicts of Interest: This study was carried in the absence of any personal, professional, or financial relationships that could potentially be constructed as a conflict of interest.

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