

# Feeling unloved is the most robust sign of adolescent depression linking to family communication patterns

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## Abstract

Using network analysis, this study investigated how family communication patterns (*Conversation* and *Conformity*) were related to and predictive of adolescent overall depression severity and specific symptoms. A community sample of adolescents (10–17 years,  $n = 1327$ ) completed the Children's Depression Inventory and the Revised Family Communication Pattern Instrument. Depressive symptoms were also re-assessed 6 months later. Results showed that *Conversation* orientation protected against, whereas *Conformity* orientation increased the risk of adolescent depression. Family communication particularly influenced the child's feeling of being unloved, and feeling unloved was the only symptom prospectively predicted by two communication orientations at baseline. These findings revealed the path linking family factors to adolescent depression and may have implications for future family-based interventions.

## KEYWORDS

adolescents, depression, family communication, network analysis

## INTRODUCTION

Adolescence is a key period for developing symptoms of depression (Thapar et al., 2012). Early-onset depression has high rates of recurrence (Benjet et al., 2020) and is associated with a variety of concurrent and future psychosocial dysfunctions (Verboom et al., 2014). Even for adolescents who do not meet the criteria for major depressive disorders, sub-threshold depression has been related to interpersonal distress, academic difficulties, and increased suicidality, among other functional impairments (Bertha & Balázs, 2013). Therefore, it is crucial to identify risk and protective factors that influence the psychogenesis of adolescent depression, so as to facilitate better prevention and early intervention.

Among multiple factors affecting depressive symptoms in adolescents (e.g., biological, socioemotional changes),

parenting styles and family settings are important and modifiable factors, which could be targeted in family-based interventions to improve long-run child outcomes (Ewing et al., 2015). Previous research investigating the role of family factors on child psychopathology has generally focused on affective parenting characteristics, including warmth, aversiveness (Yap et al., 2014), and emotional socialization (Schwartz et al., 2012). However, other aspects of parent-child interactions may also affect children's mental health, such as family communication. Specifically, family communication patterns, through which family members create a shared social reality (Koerner & Fitzpatrick, 2006), contribute significantly to healthy family functioning and the development of internalizing symptoms among adolescents (Hughes & Gullone, 2008). Parent-child open communication can exert a protective effect on adolescent internalizing

and externalizing problems (Manczak et al., 2018), whereas maladaptive communication such as co-rumination focusing on problems and negative feelings may deteriorate adolescents' anxiety and depressive symptoms (Ioffe et al., 2020).

According to the Family Communication Patterns Theory, two orientations, namely *Conversation* and *Conformity*, are used to make understanding and being understood easier within a family (Ritchie & Fitzpatrick, 1990). *Conversation* orientation encourages all members to participate in family-related decision-making and problem-solving. Children's independent opinions and choices are taken seriously by parents. In contrast, *Conformity* orientation is characterized by uniformity of attitudes and beliefs. This uniformity is usually determined by parents and children should be unquestioningly obedient to their parents. The abovementioned communication styles not only reflect the quality of parent-child relationships but may also contribute uniquely to youth mental health outcomes. For instance, autonomy granting, a positive parenting style closely linked to *Conversation* orientation, has been found to buffer adolescent depression risks (Gorostiaga et al., 2019; Yap et al., 2014). On the other hand, authoritarian parenting, which is the common practice in families emphasizing *Conformity* orientation, might be predictive of more severe depressive symptoms in adolescents (Gorostiaga et al., 2019; Yap et al., 2014). However, very few studies have systematically examined how different family communication patterns are associated with adolescents' concurrent depressive symptoms. Moreover, most previous studies examining the effects of parenting on depression have been conducted with cross-sectional data (with only few exceptions, del Barrio et al., 2016; Jacobsen et al., 2012), and more longitudinal research is needed to explore whether parent-child communication is predictive of children's emotional problems.

The importance of family communication patterns may vary with children's age and sex, as well as cultural contexts. As early and middle adolescents gradually shift more time from family to peer interactions (Smetana et al., 2006), the role of family functioning may wane when adolescents get older. Even if the parent-child relationship quality is not very good, older adolescents are more likely to successfully seek compensatory warmth and support from peers. As for sex differences, some studies provide evidence that poorer family relationship is more strongly correlated with depressive symptoms in adolescent girls than in boys (Chen & Yu, 2015; Davies & Windle, 1997), whereas others have not found support for sex as a moderator (Eberhart et al., 2006; Lewinsohn et al., 1998). Given the sex-specific social-emotional developmental characteristics (Zahn-Waxler et al., 2008), it is worthwhile to further examine whether family communications would differentially affect boys' versus girls' susceptibility to depression. Cultural contexts might also moderate the associations between parenting behaviors and child outcomes (Lansford, 2022). For instance, the effects of parent behavior control vary considerably across cultures, with greater parental control associated with adolescent psychological disorders in Western, but not Eastern, cultures

(Rothenberg et al., 2020). In Western individualistic social contexts, cultural norms allow adolescents greater agency in communicating with their parents and shaping parent-adolescent relationships (Smetana, 2017). In a collectivistic culture such as the Chinese context, however, filial piety and parental authority are greatly valued through social interdependence, respect for parents and elders, and conforming to norms (Zhang et al., 2017). Compared with Western parents, Chinese parents endorse higher levels of harsh discipline, place less emphasis on autonomy, and exert more control to maintain harmony (Qin et al., 2009; Zhang et al., 2017). When Chinese parents behave in a way consistent with cultural norms, children will be more likely to interpret their parents' behavior as justified rather than being rejecting and hostile, and believe it is appropriate and acceptable for parents to set rules (Lansford, 2022). Therefore, the *Conformity* orientation, which is a common practice in Chinese families, may not be necessarily linked to more severe depressive symptoms among Chinese adolescents. However, as most prior research was based on Western individualistic cultures, whether the link between family communication patterns and children's emotional problems shows cultural-specific features in the Chinese context remains largely unknown.

Moreover, depressive symptom profiles are quite heterogeneous (Fried & Nesse, 2015). Certain symptoms (e.g., sadness, loneliness, self-hatred) appear to be more strongly correlated with the overall depression severity and psychosocial functioning during adolescence (Fried & Nesse, 2014) and thus, are more central and influential than other symptoms (e.g., somatic concerns, indecisiveness) (Gijzen et al., 2021; Mullarkey et al., 2019). It remains unclear what specific depressive symptoms might be directly influenced by family communication. In other words, *Conversation* and *Conformity* orientation may only affect a subset of depressive symptoms. Identifying how the presence of certain communication patterns would activate/deactivate certain depressive symptoms can shed light on the exact path linking family factors to adolescent internalizing problems. Network approach is a novel framework where mental disorders are viewed as a system of co-occurring symptoms interacting with and reinforcing one another (Borsboom & Cramer, 2013). Using network approach, we could better understand how family communication patterns affect certain symptoms to cause or protect against depression. Alternatively, communication styles may alter the network structure of adolescent depression (e.g., the strength of interconnections between different symptoms), rather than merely influence specific depressive symptoms. A more strongly connected depression network, like a self-sustained feedback loop, has been shown to be predictive of longer lasting and more severe depression (van Borkulo et al., 2015). Thus, if family factors do change the density of symptom network, interventions targeting parenting and family communication can be of great potential to alleviate youth mental health problems.

In this study, we aimed to investigate the relationship between family communication patterns and depression in a

large sample of Chinese adolescents aged 10–17. Using child-report scales, different communication styles were correlated with concurrent depression at baseline (Time 1; T1). To further explore whether and how family communication was predictive of children's depressive symptoms, children's depression was reassessed 6 months later (Time 2; T2). We hypothesized that *Conversation* orientation may be protective against, but *Conformity* orientation may be positively associated with adolescent depression. This effect of family communication on depression was hypothesized to be persistent over 6 months. To further reveal the mechanism underlying how parent–child communication influenced children's depressive symptoms, two networks including all depressive symptoms (Network1: T1; Network2: T2) and the two communication orientations were constructed. We focused on the subset of depressive symptoms that were directly related to and predicted by communication orientations. Then, we examined whether family communication patterns would affect network structures (e.g., density of networks) of depression. Our hypothesis was that adolescents in families with low *Conversation* and/or high *Conformity* orientation might have a more strongly connected depression network. Finally, we also examined potential effects of age and sex on depressive symptoms and family communication patterns. It was hypothesized that the relationship between family communication and children's depression was more prominent during early adolescence and may vary in the two sex groups, with stronger correlation in adolescent girls relative to that in boys.

## METHODS

### Participants

The data were collected from a study surveying youth mental health in Shanghai, China, between 2020 and 2021. There were 1327 children and adolescents (10–17 years old, Mean age = 13.02 years,  $SD = 1.75$ , 0.98% missing; 52.8% males) from four regional primary and secondary schools (4th–11th grade) completing the relevant checklist with no missing data. Most participants were in two-parent families (85.7%) (9.5% single-parent families; 2.3% others; 2.6% missing). Paternal (6.2% did not finish high school, 14.2% high school, 60.5% bachelor's degree, 10.6% master's degree, 3.8% PhD, 4.5% missing) and maternal (8.2% did not finish high school, 14.1% high school, 62.8% bachelor's degree, 8.6% master's degree, 2.1% PhD, 4.2% missing) educational levels were diverse in this sample. Participants accessed an online platform to complete questionnaires of family communication and depressive symptoms in a computer room during school hours. To explore the predictive effects of family communication on children's depression, all students repeated the measure of depressive symptoms approximately 6 months later.

This study was approved by the Institutional Review Board on Human Research Protection of Changning Mental

Health Center (M202035). Before the start of enrollment, we presented parents and adolescents a consent form outlining the purpose of this study, data security procedures, the voluntary nature of initiative, and their right to withdraw at any time. Written consent from parents and assent from adolescents were obtained.

## Measures

### Children's depression

All participants completed the Chinese version of the Children's Depression Inventory (CDI; Yu & Li, 2000) to self-report their depressive symptoms in the past 2 weeks. They also completed the CDI for the second time 6 months later. The CDI consists of 27 items investigating a wide range of emotional, cognitive, somatic, and interpersonal symptoms of depression. Each item is scored on a 3-point Likert scale (e.g., *I don't feel alone* = 0, *I often feel alone* = 1, *I feel alone all the time* = 2), and total scores range from 0 to 54, with higher scores indicating more severe symptoms. The CDI showed good reliability in the current sample (T1: Cronbach's  $\alpha = .90$ ; T2:  $\alpha = .91$ ).

### Family communication patterns

The Revised Family Communication Pattern Instrument (RFCP) is a 26-item questionnaire measuring two dimensions of parent–child communication styles: *Conversation* orientation (15 items; e.g., “My parents like to hear my opinion, even when I don't agree with them.”) and *Conformity* orientation (11 items; e.g., “When I am at home, I am expected to obey my parents' rules.”) (Ritchie & Fitzpatrick, 1990). The items of *Conversation* orientation were presented first, followed by the items of *Conformity* orientation. Participants used a 5-point Likert scale to indicate their agreement on each statement (1—*Disagree Strongly*, 5—*Agree Strongly*). Scores for all items in a given subscale were averaged to obtain the mean score of the corresponding communication orientation. Therefore, the score for the *Conversation* or *Conformity* orientation for any individual ranges from 1 to 5.

The original RFCP has been translated into Chinese and has been validated and widely used in the Chinese context (Fang et al., 2004). All adolescents completed the Chinese version of the RFCP (children's version) at T1. In this study, both the *Conversation* orientation (Cronbach's  $\alpha = .95$ ) and the *Conformity* orientation ( $\alpha = .91$ ) subscales had satisfactory internal consistency.

## Statistical analysis

To examine whether depressive symptoms, family communication patterns, and their correlations varied with age and sex, all participants were divided into a young (13 or less)

( $n = 722$ ) and old (above 13) ( $n = 605$ ) group and in sex comparison, they were divided according to their sex. Two-way analysis of variance (ANOVA) was conducted to estimate the effects of age, sex, and age-by-sex interaction on the CDI total scores and two communication orientation scores.

Pearson correlations between the two communication orientations (at T1) and the CDI total score (at T1 and T2) were first calculated in the whole sample. After controlling for the baseline CDI total score, we also examined whether communication orientations were still significantly correlated with CDI total scores at T2. Then, Pearson correlations were estimated separately in the two age and sex subgroups, and we examined whether the correlational coefficients were affected by age and sex via using the  $r$ -to- $z$  transformation and conducting  $z$  tests. Additionally, we used the SPSS PROCESS macro (Hayes & Matthes, 2009) to conduct regression analysis and examine whether the correlations between communication orientations and depression were moderated by age and sex groups.

## Network analyses

For the network construction, we dichotomized all the CDI items to signify the presence (1) and absence (0) of depressive symptoms. Items reporting either “1” or “2” were recoded as present, whereas items scored as “0” were recoded as absent. The dichotomization of each item may be one of the optimal ways to model trichotomous items in a network, especially when the CDI scores were positively skewed in a non-clinical community sample (Gijzen et al., 2021; Mullarkey et al., 2019).

In addition to all CDI items, two communication orientations (*Conversation* and *Conformity*) (continuous variables) were also included as nodes in the network. The association between two nodes is referred to as an edge, with green edges representing positive associations and red edges representing negative associations. In the context of a dataset with both binary and continuous variables, the mixed graphical model (MGM) was used to estimate the network (Haslbeck & Waldorp, 2020). To obtain a sparse and conservative network, the L1-penalized regression and extended Bayesian information criterion were adopted to shrink small edge coefficients to zero and identify the set of edges among the 29 nodes.

To highlight the most central (i.e., important) nodes in the network, we computed the centrality index of Strength, which represents the sum of the absolute weights of the edges connecting the node to all the other nodes. Strength can be considered an indicator of how strongly a symptom is directly associated with other nodes in the network, which is one of the most often used centrality metrics and is also argued to be the most stable (Gijzen et al., 2021; Mullarkey et al., 2019).

To investigate the stability of our MGM model, we estimated edge-weights accuracy, centrality stability, and bootstrapped difference test for Strength centrality using

2500 times bootstrapping (Epskamp et al., 2017) (details in Appendix S1).

The networks were separately constructed for T1 and T2 data. Network estimating and bootstrapping were performed using *mgm* 1.2-11 and *bootnet* 1.4.3 packages, respectively in R 4.0.4.

## Expanding depression network to family communication

We first used a graphical function named “flow” within *qgraph* (Epskamp et al., 2012) to examine which depressive symptoms at T1 were directly linked to and which symptoms at T2 were predicted by *Conversation* orientation and *Conformity* orientation. This method put the node of family communication to the left and vertically showed which edges directly or indirectly related to the communication orientation.

Next, we compared the depression networks (comprising 27 nodes of CDI items) between adolescents whose families were high in *Conversation* (or *Conformity*) orientation and those whose families were low in the corresponding orientation. Specifically, the entire sample was split into two groups according to their RFCP subscale scores (low: <mean; high:  $\geq$ mean). The *NetworkComparisonTest* 2.2.1 was used to assess differences between two networks based on three invariance measures (global strength (i.e., the absolute sum of all weighted edges) invariance, network structure (i.e., the maximum difference in edge weights) invariance, and edge invariance) (van Borkulo et al., 2022). The significances were calculated under distributions from 1000 times permutation tests. The network comparison tests were conducted for both T1 and T2 CDI data, which could reveal potential influences of communication orientations on depression network structure concurrently and over time, respectively.

## Network comparison by sex and age group

Finally, we also used the *NetworkComparisonTest* to examine three specific differences (i.e., global strength, network structure, and specific edges) between symptom networks (with 27 CDI items as nodes) in males and females and in young and old groups.

## RESULTS

### Descriptive statistics

Mean and standard deviation of the two family-communication orientations, overall depression indexed by the CDI total score, and presence of all depressive symptoms at two timepoints are shown in Table 1.

As indicated by the ANOVA, adolescent girls showed higher levels of depressive symptoms than boys at both T1



TABLE 1 Descriptive data of CDI symptoms and family communication patterns

	T1 (baseline)		Symptom presence (%)	T2 (6 months later)		Symptom presence (%)
	Mean	SD		Mean	SD	
Conversation orientation	3.61	0.99				
Conformity orientation	3.01	1.01				
CDI total score	12.61	8.47		12.41	8.78	
CDI1 Sadness	0.25	0.53	20.6	0.26	0.53	22.0
CDI2 Pessimism	0.03	0.17	2.8	0.04	0.19	3.8
CDI3 Self-deprecation	0.12	0.32	11.8	0.10	0.31	10.4
CDI4 Anhedonia	0.41	0.54	38.9	0.43	0.56	39.6
CDI5 Misbehavior	0.18	0.47	13.9	0.19	0.48	14.6
CDI6 Pessimistic worrying	0.60	0.75	43.6	0.55	0.73	40.6
CDI7 Self-hatred	0.28	0.53	24.0	0.28	0.54	24.0
CDI8 Self-blame	0.42	0.61	36.0	0.35	0.60	28.7
CDI9 Suicidality	0.39	0.56	35.0	0.39	0.58	34.1
CDI10 Crying	0.23	0.51	18.9	0.20	0.48	16.4
CDI11 Irritability	0.56	0.74	41.3	0.55	0.73	41.3
CDI12 Social Withdrawal	0.29	0.53	25.7	0.32	0.56	27.3
CDI13 Indecisiveness	0.56	0.56	52.8	0.55	0.55	52.1
CDI14 Negative body image	0.61	0.65	51.8	0.61	0.67	50.6
CDI15 School work difficulty	0.52	0.68	41.4	0.46	0.67	35.8
CDI16 Sleep disturbance	0.40	0.68	29.1	0.36	0.63	27.4
CDI17 Fatigue	0.51	0.69	39.6	0.55	0.72	41.5
CDI18 Reduced appetite	0.25	0.52	20.3	0.23	0.49	20.0
CDI19 Somatic concerns	0.33	0.59	26.9	0.35	0.61	28.0
CDI20 Loneliness	0.35	0.60	28.5	0.36	0.61	28.6
CDI21 School dislike	0.55	0.64	47.1	0.60	0.65	50.9
CDI22 Lack of friendship	0.47	0.53	44.8	0.48	0.55	45.7
CDI23 School performance decrement	0.54	0.72	40.1	0.52	0.73	37.8
CDI24 Low self-esteem	0.86	0.62	72.3	0.82	0.64	68.9
CDI25 Feeling unloved	0.31	0.52	27.5	0.30	0.52	26.3
CDI26 Disobedience	0.54	0.54	51.6	0.54	0.54	51.8
CDI27 Fights	0.37	0.53	35.0	0.39	0.54	36.5

( $F[1,1323] = 16.37, p < .001$ ; female: Mean = 13.56,  $SD = 8.79$ ; male: Mean = 11.76,  $SD = 8.08$ ; Cohen's  $d = 0.21$ ) and T2 ( $F[1,1323] = 7.52, p = .006$ ; female: Mean = 13.08,  $SD = 8.90$ ; male: Mean = 11.81,  $SD = 8.64$ ; Cohen's  $d = 0.14$ ) assessments. At T1, the effect of age group-by-sex interaction was also significant ( $F[1,1323] = 3.76, p = .05$ ), indicating the sex difference of depression was larger in the old group. The main effect of age group on depressive symptoms was non-significant (T1:  $F[1,1323] = 0.87, p = .35$ ; T2:  $F[1,1323] = 1.47, p = .23$ ).

Compared with the younger group, older adolescents reported higher levels of the *Conversation* orientation ( $F[1,1323] = 10.22, p = .001$ ; younger: Mean = 3.53,  $SD = 1.00$ ; older: Mean = 3.71,  $SD = 0.98$ ; Cohen's  $d = 0.18$ ), indicating parents' greater autonomy granting when children turn into middle and late adolescence. No significant main effect of sex ( $F[1,1323] = 2.41, p = .12$ ) or interaction effect ( $F[1,1323] = 0.75,$

$p = .39$ ) was found for the *Conversation* orientation. For the *Conformity* orientation, the age effect ( $F[1,1323] = 1.52, p < .22$ ) and age group-by-sex interaction ( $F[1,1323] = 1.94, p < .16$ ) were non-significant, but there was a main effect of sex ( $F[1,1323] = 5.01, p = .025$ ), with girls (Mean = 2.95,  $SD = 0.99$ ) reporting slightly lower levels of *Conformity* than boys (Mean = 3.07,  $SD = 1.03$ ) (Cohen's  $d = 0.12$ ).

## Correlation results

Across the whole sample, child-report *Conversation* orientation was significantly negatively correlated with the overall depressive symptoms as measured by the CDI total score at both T1 ( $r = -.556$ ) and T2 ( $r = -.463, ps < .001$ ), while *Conformity* orientation was positively correlated with the

severity of depression (T1:  $r = .226$ , T2:  $r = .187$ ,  $ps < .001$ ). After controlling for the baseline depression (i.e., CDI score at T1), *Conversation* orientation was still significantly associated with lower levels of future depression at T2 ( $r = -.10$ ,  $p < .001$ ), but the positive correlation between *Conformity* orientation and T2 depression disappeared ( $r = .032$ ,  $p = .24$ ).

As indicated by the  $z$  tests after  $r$ -to- $z$  transformation, the correlations demonstrated similar patterns across sex and age groups (Table 2). Similarly, our regression analysis showed that the correlations between two communication orientations and children's depression (at T1 and T2) were not significantly moderated by the age groups (young vs. old) ( $p$  values for the interaction term  $> .27$ ). However, the correlations were moderated by sex groups. Specifically, the negative correlation between *Conversation* orientation and concurrent depression (at T1) was stronger in the female group than that in the male group (effect of the interaction term:  $t = -2.92$ ,  $p = .004$ ,  $\Delta R^2 = .0043$ ; girls:  $\beta = -5.40$ , boys:  $\beta = -4.27$ ). The positive correlation between *Conformity* orientation and children's depression (at both T1 and T2) was also stronger in girls than that in boys (T1: effect of the interaction term:  $t = 3.50$ ,  $p = .005$ ,  $\Delta R^2 = .0086$ ; girls:  $\beta = 2.81$ , boys:  $\beta = 1.25$ ; T2:  $t = 2.47$ ,  $p = .014$ ,  $\Delta R^2 = .0044$ ; girls:  $\beta = 2.30$ , boys:  $\beta = 1.15$ ). These moderation results suggested that family communication patterns might be more closely related to depressive symptoms in female adolescents than in males.

## Network structure and stability

The network of family communication orientations and depressive symptoms at T1 was presented in Figure 1. As for the nodes that were most connected to others in the network, sadness, self-hatred, self-deprecation, loneliness, and irritability were the most important nodes as indicated by the strength centrality index (Figure S1a) and the bootstrapped results (Figure 2). On the other hand, *Conformity* orientation and symptoms of disobedience had negligible and weak strength in the network, suggesting their loose connections with other symptoms. As for the network at T2 (Figure S2), the results were quite consistent. Self-hatred, irritability, loneliness, and sadness were still the most central nodes, along with pessimistic worrying (Figure S1b; Figure S3).

The correlation stability coefficient was satisfactory for strength at both T1 (0.595) and T2 assessments (0.672)

(Figure S4), and the precision of edges was acceptable (Figure S5), indicating high reliability of our estimated network.

## Flow network of family communication

For concurrent depressive symptoms, the flow networks of *Conversation* orientation and *Conformity* orientation are shown in Figure 3a and 3b, respectively. *Conversation* orientation was directly and negatively related with sadness, anhedonia, pessimistic worrying, self-hatred, indecisiveness, sleep disturbance, school dislike, school performance decrement, low self-esteem, and feeling unloved. *Conformity* orientation was directly and positively related with crying, sleep disturbance, and feeling unloved. Feeling unloved was the thickest edge (i.e., suggesting the strongest correlation) linked with *Conversation* orientation. Along with the symptoms of sleep disturbance, feeling unloved was one of the only two CDI items directly linked to both communication orientations.

The two communication orientations were also directly linked to several depressive symptoms over 6 months, albeit with weaker edge strength (Appendix S1, Figure S6a,b). *Conversation* orientation was consistently and negatively related to anhedonia, school dislike, and feeling unloved at two timepoints; *Conformity* orientation was positively associated with future symptoms of self-blame and feeling unloved. Note that feeling unloved was the only item that was prospectively predicted by two communication orientations.

## Network comparisons

Network comparison was conducted to compare the networks of High ( $n = 682$ , mean *Conversation* = 4.42 [ $SD = 0.44$ ], mean *Conformity* = 2.90 [ $SD = 1.08$ ]) versus Low ( $n = 645$ , mean *Conversation* = 2.76 [ $SD = 0.64$ ], mean *Conformity* = 3.14 [ $SD = 0.93$ ]) *Conversation* orientation. Similarly, we also compared the networks of High ( $n = 607$ , mean *Conformity* = 3.91 [ $SD = 0.60$ ], mean *Conversation* = 3.48 [ $SD = 1.04$ ]) versus Low ( $n = 720$ , mean *Conformity* = 2.26 [ $SD = 0.59$ ], mean *Conversation* = 3.73 [ $SD = 0.94$ ]) *Conformity* orientation.

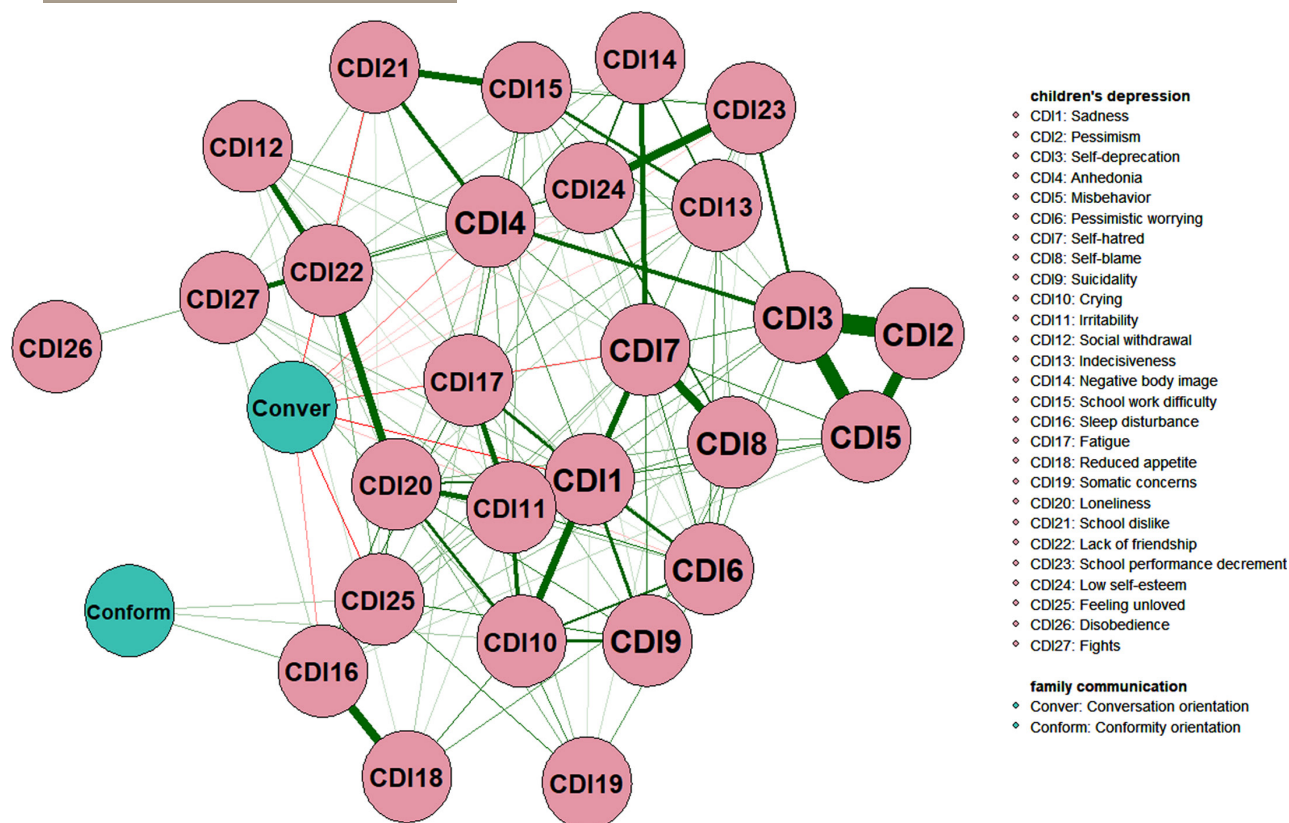
For the T1 assessment, the depression network of the High *Conversation* group ( $n = 682$ ) was more densely connected than that of the Low *Conversation* group

**TABLE 2** Pearson correlations between depressive symptoms and family communications across different sex and age groups

Correlations	Males ( $n = 701$ )	Females ( $n = 626$ )	$Z_{\text{difference}}$	Younger ( $n = 722$ )	Older ( $n = 605$ )	$Z_{\text{difference}}$
Conversation & CDI_wave1	−0.535**	−0.598**	0.732	−0.558**	−0.555**	0.034
Conversation & CDI_wave2	−0.461**	−0.476**	0.151	−0.478**	−0.456**	0.221
Conformity & CDI_wave1	0.160**	0.316**	1.307	0.249**	0.199**	0.414
Conformity & CDI_wave2	0.137**	0.256**	0.977	0.213**	0.158**	0.448

Abbreviation: CDI, Children's Depression Inventory.

\*\* $p < .01$  for all the correlations. The comparison of the correlation strength indicated no significant difference between age and sex groups.



**FIGURE 1** Estimated network for two family communication orientations and dichotomized depressive symptoms assessed by CDI in the total sample ( $n = 1327$ ). Note. Green edges represent positive associations between two nodes, while red edges represent negative associations. The thicknesses of lines indicate the weights of the edges.

( $n = 645$ ) (difference in global strength = 9.12; High Conversation = 41.8, Low Conversation = 32.7;  $p = .05$ ). In other words, for adolescents whose families discouraged open conversations, different aspects of emotional problems were more isolated (i.e., a sparser network). However, the two networks did not differ significantly in network structure (i.e., maximum difference in edge weights) ( $p = .63$ ) or specific edge strengths (BH corrected  $p > .35$ ). At the T2 assessment, the High Conversation group also had a denser depression network, although the global strength difference failed to reach statistical significance (global strength: High > Low Conversation; difference = 5.91,  $p = .18$ ). Moreover, these two networks showed distinct structures ( $p = .005$ ), suggesting how the 27 nodes of depressive symptoms were connected with each other (i.e., connection patterns) were different between the High and Low Conversation groups. For edge differences, loneliness was strongly linked with the symptoms of social withdrawal (edge weight = 0.61) and fatigue (edge weight = 0.91) in the High Conversation group, but these associations were negligible and entirely absent in the Low Conversation group. The above findings indicated that the Conversation orientation altered both concurrent and future depression network structures.

When comparing the depression networks of High Conformity ( $n = 607$ ) versus Low Conformity ( $n = 720$ ) orientation, no significant difference was found in global strength (T1:

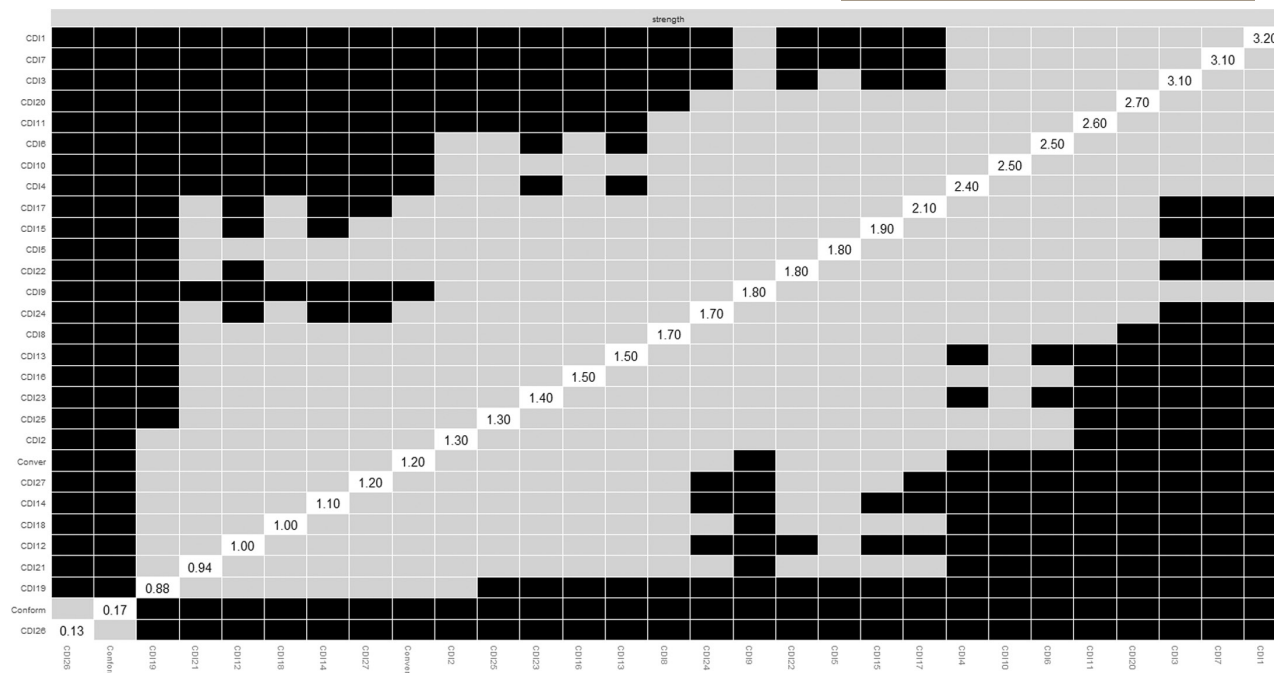
difference = 0.64,  $p = .91$ ; T2: difference = 6.90,  $p = .19$ ), network structure (maximum difference in edge weights  $p = .21$  for T1,  $p = .39$  for T2), or specific edges (BH corrected  $ps > .9$ ).

## Network comparisons by age and sex

We did not find any evidence suggesting that the characteristics of depression networks were significantly different in the young versus old groups (Appendix S1). The depression networks for males and females were similar at the T2 assessment (Appendix S1), but the depression network structure differed between the two groups at T1 ( $p = .037$ ). Specifically, the link between self-hatred and pessimism was much stronger in adolescent boys (edge weight = 1.95) compared with that in girls (not connected) (BH corrected  $p < .001$ ). In contrast, the edge between sadness and social withdrawal was thicker in adolescent girls (edge weight = 0.79) than boys (not connected) (BH corrected  $ps < .001$ ). No other edge weight demonstrated significant difference between the two networks.

## Supplementary analysis

The original CDI has five subscales to tap five domains of depressive symptoms, including Negative Mood, Interpersonal Problems, Ineffectiveness, Anhedonia, and



**FIGURE 2** Bootstrapped difference tests for node strength at T1 assessment. *Note.* Black color indicates nodes differ significantly from one another, whereas gray color indicates no significant difference between nodes ( $\alpha = .05$ ). Values reported in diagonal boxes represent strength of each node. CDI1, sadness; CDI2, pessimism; CDI3, self-deprecation; CDI4, anhedonia; CDI5, misbehavior; CDI6, pessimistic worrying; CDI7, self-hatred; CDI8, self-blame; CDI9, suicidality; CDI10, crying; CDI11, irritability; CDI12, social withdrawal; CDI13, indecisiveness; CDI14, negative body image; CDI15, school work difficulty; CDI16, sleep disturbance; CDI17, fatigue; CDI18, reduced appetite; CDI19, somatic concerns; CDI20, loneliness; CDI21, school dislike; CDI22, lack of friendship; CDI23, school performance decrement; CDI24, low self-esteem; CDI25, feeling unloved; CDI26, disobedience; CDI27, fights; conform, conformity orientation; Conver, conversation orientation

Negative Self-Esteem (Kovacs, 1992). As supplementary analyses, we also constructed networks using five CDI subscale scores coupled with two communication orientations as nodes. Edges represented partial correlations between nodes, controlling for the influence of all the other nodes in the network. The standard guidelines (Epskamp & Fried, 2018) were followed in constructing the regularized partial correlation network. The results were largely consistent (see Figure S7), with the *Conversation* orientation negatively linked to all depressive nodes and the *Conformity* orientation showing positive correlations with five domains of depressive symptoms. Moreover, the *Conformity* orientation had relatively weak correlations with depressive symptoms and therefore stayed peripheral in the network.

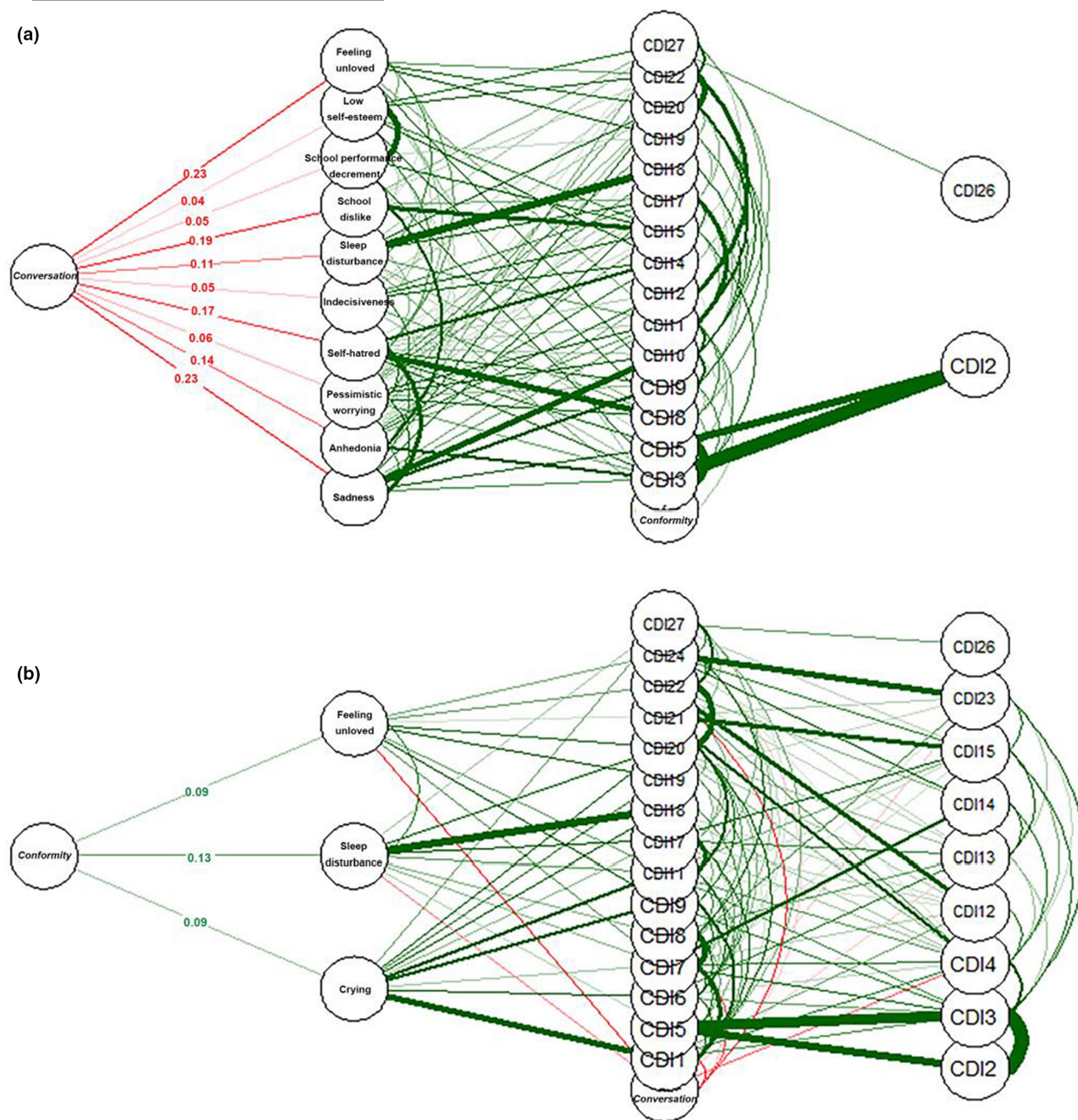
## DISCUSSION

This study examined how distinct patterns of parent-child communication may be correlated with youth self-report depressive symptoms concurrently and 6 months later. Although family factors of communication were peripheral in the network, our results supported differential roles of the two kinds of communication orientations in the development of depressive symptoms among adolescents. While *Conversation* orientation featured by open, comfortable, and non-judgmental communication showed a protective effect

on youth depression, *Conformity* orientation mirroring authoritarian parenting was associated with more severe depressive symptoms.

This is consistent with previous research linking autonomy granting (Yap et al., 2014) and high-quality communication (Ioffe et al., 2020; Manczak et al., 2018) to reduced mental health problems in young people. A family environment that encourages open communication and tolerates different opinions could meet the increasing desire for autonomy when children are transitioning into adolescence (Qin et al., 2009). In such an environment, adolescents are granted more autonomy in issues that they view as under their authority. Therefore, they can boldly put forward their own opinions, even when they disagree with their parents. They are also willing to discuss their thoughts and feelings with parents, and supportive responses from parents could alleviate children's distress and boost their confidence in navigating new experiences (del Barrio et al., 2016). In contrast, adolescents in families emphasizing *Conformity* demonstrated higher levels of depressive symptoms. These families may be characterized by authoritarian parenting style, where parents exert high control over children but show little empathic recognition of child's perspective (Lamborn et al., 1991). Although authoritarian parenting might buffer against externalizing behaviors through harsh discipline, restricted autonomy could give rise to heightened internalizing problems such as depression and withdrawal (Luyckx et al., 2011).





**FIGURE 3** Flow network of (a) *conversation* and (b) *conformity* orientation at T1. *Note.* Green edges represent positive associations between two nodes, while red edges represent negative associations. For clearer visualization, only symptom nodes directly linked to communication orientations were labeled with full names.

Based on the above findings, parents are recommended to openly discuss various issues with their children and grant increasing autonomy to them as they mature. In fact, some parent-directed interventions based on face-to-face visits (Miller et al., 2020) or mobile phone messaging (Chu et al., 2019) have been developed to provide evidence-based information and strategies for parents. These universal and low-intensity interventions could promote positive parental beliefs about adolescents and help parents to recognize and nurture their teens' strengths, which have great potential in facilitating effective parent-child

communication and preventing youth emotional problems and risk behaviors (Chu et al., 2019; Miller et al., 2020).

Although the directions of correlations between two communication orientations and children's depression were as expected, the correlational strengths seemed quite different. While a relatively high negative correlation ( $-0.45$  to  $-0.6$ ) was found between the *Conversation* orientation and depression, the *Conformity* orientation only demonstrated a low positive correlation ( $<0.2$ ) with children's depression. Moreover, only the correlation between *Conversation* orientation and future depression remained significant after

controlling for the baseline depression. This is consistent with our hypothesis regarding cultural perspective. Some parenting behaviors such as warmth and acceptance delivered by open conversations appear to be universally adaptive across cultures, but others such as parent control may show culturally specific effects (Rothenberg et al., 2020). In Western individualistic cultures, parents are expected to relinquish behavioral control and allow adolescents to develop autonomy from their families (Smetana, 2017). By contrast, in collectivistic Chinese contexts, parents are expected to retain a great deal of control even during adolescence (Qin et al., 2009). Such cultural norms set a reference point for adolescents' expectations about parental behaviors and family communication (Lansford, 2022). If parenting behavior is culturally normative, adolescents will be less likely to interpret their parents' behavior as a personal rejection (Lansford et al., 2018), thus weakening the association between the *Conformity* orientation and children's depression. Considering potential moderators such as cultural normativeness and beliefs about the legitimacy of parental authority can lead to a better understanding of cross-cultural similarities and differences in links between family environment/parenting and child outcomes (Lansford, 2022).

Using network analysis, we further identified the subset of depressive symptoms directly associated with family communication patterns. Specifically, adolescents in families encouraging open conversations were more likely to experience pleasure and behave well at home and school (i.e., lower probability of developing anhedonia and school dislike), but adolescents under strict management were more likely to fall into self-blame and develop sleep problems. Notably, parents' emphasis on *Conformity* with a lack of *Conversation* orientation may breed and aggravate children's feeling of being unloved. Feelings of being unloved are not considered part of formal diagnostic criteria and may not be as central as other core symptoms of depression based on DSM/ICD criteria. However, feeling unloved can lead to a sense of helplessness and worthlessness, which is strongly associated with life satisfaction among adolescents (Mullarkey et al., 2021). It has also been identified as a key symptom for detecting concurrent and future depression (McKenzie et al., 2011; Thapar et al., 2016). All these findings highlight the crucial role played by feeling unloved in adolescent depression. Future interventions could target parent-child communication to build a warm and caring family setting, bolstering children's sense of being loved and self-worth, thus protecting them against depression risks.

Interestingly, family communication, especially the *Conversation* orientation, also seemed to affect the network structures of adolescent depression. Adolescents whose families lacked open conversations had a less closely connected depression network, although they had more severe depressive symptoms. This result ran contrary to our hypothesis. One possible interpretation was that the structure of depressive symptoms became more multifactorial as the severity increased (Fried et al., 2016). For example, adolescents in the High *Conversation* orientation group may have higher levels of energy and more actively participate in various social activities, which in turn

contributes to their lower risk of feeling lonely. However, this strong link between loneliness and social withdrawal/fatigue was totally absent in the Low *Conversation* group. Less dense networks indicated that individual domains in the "depression" construct functioned in isolation with little interaction. Such loosely interconnected networks have been shown to be more treatment resistant, as spreading effects necessary for global improvement became unrealistic (Strauss et al., 2019). It is also likely that network density may not have equal value in predicting the severity and illness duration of depression in adult and adolescent groups. Although a denser symptom network has been found to be prognostic of depression persistence in adult patients of major depression disorders (van Borkulo et al., 2015), one study focusing on adolescents with depression failed to find any significant association between higher network strength and poorer outcomes (Schweren et al., 2018). More work is therefore needed to examine the different role of symptom network structures in adolescent and adult groups with clinical or subclinical levels of depression. Moreover, it should be noted that family factors appear relatively marginal in the depression network. Only a limited subset of depressive symptoms was directly related to the two nodes of communication, and their connections were not very strong. This result is consistent with previous meta-analyses, suggesting only small-to-medium effect sizes of associations between parenting factors and internalizing problems in young people (Gorostiaga et al., 2019; Yap et al., 2014). Many other factors outside of family settings (e.g., peer relationships) become increasingly important during adolescence (Lamblin et al., 2017), so it is necessary to incorporate a wider scope of factors to better explain the development of depression in youth.

Although it was not the main purpose of this study, the network model revealed some important characteristics of adolescent depression. Consistent with previous studies, self-hatred was the most central symptom in the depression network (Gijzen et al., 2021; Kim et al., 2021; Mullarkey et al., 2019). Self-deprecation was also an important symptom in the current sample. Given adolescence is a key period to form positive identity, these findings highlighted the particular relevance of negative self-view to the development of adolescent depression (Mullarkey et al., 2019). Compared with adult depression, loneliness has also been proved to be a more central symptom specific to early-onset depression (Gijzen et al., 2021; Kim et al., 2021; Mullarkey et al., 2019), which reflects adolescents' increased desire for social affiliation and higher sensitivity to the status of interpersonal relationships when going through puberty (Crone & Dahl, 2012). Interestingly, irritability demonstrated high centrality in this depression network as well. Unlike adult depression, irritability is recognized as a cardinal mood symptom in childhood and adolescent depression and is granted an equally significant position to that of sadness in DSM diagnosis (American Psychiatric Association, 2013). Moreover, irritable mood has been found to be a robust predictor of future depression and shows genetic overlap with depression (Vidal-Ribas et al., 2016). Thus, including

irritability as a developmental presentation of depression may be essential for more comprehensively understanding the structure of depressive symptoms in youth.

Finally, this study also explored potential age and sex effects on children's depression and family communication patterns. Our results of higher levels of depressive symptoms in adolescent girls are consistent with previous evidence supporting a marked female preponderance in adolescent-onset emotional disorders (Zahn-Waxler et al., 2008). Further, family communication styles showed a much stronger association with depression in adolescent girls than in boys, supporting girls' higher sensitivity to family environment. Compared with adolescent boys, girls usually have greater concern and preoccupation in maintaining harmonious family relationships, thus they might be more likely to develop psychological problems under discordant family conditions with ineffective communication (Crawford et al., 2001; Davies & Windle, 1997). We also found significant sex differences in network structures of depressive symptoms. In other words, emotional, interpersonal, and cognitive aspects of depression may interplay in a different way in males versus females. For example, low mood was found to be more strongly associated with social withdrawal in girls. Throughout childhood and adolescence, girls show greater social sensitivity and are more invested in relationships with friends and romantic partners (Zahn-Waxler et al., 2008). Heightened need for intimacy and reliance on others may help explain why adolescent girls are more vulnerable to depressive mood when interpersonal relationships are disrupted. As for developmental changes, older adolescents reported higher scores of *Conversation* orientation compared with the younger group. This result is not surprising given parents usually grant greater autonomy as their children grow up. However, it should be noted that the above age effect was small (Cohen's  $d < 0.3$ ), and there was no moderation effect of age group on the correlation between family communication and children's depression. That is, the two patterns of family communication (*Conversation*, *Conformity*) either protect against or increase the risk for depression in a similar way through adolescence.

This study has several limitations. First, the participants in this study formed a non-clinical sample, and our results do not necessarily generalize to adolescents diagnosed with major depressive disorders. Future studies should extend to clinical populations and investigate how family factors contribute to the development of mood disorders in young people. Second, our network was constructed based on between-subject data and could not explain how symptoms were related within individuals. Longitudinal studies with multiple waves (i.e., more than two timepoints) and ecological momentary assessments are needed to examine dynamic network evolution or temporal stability at both individual and group levels. Third, family communication patterns were only assessed at T1, as this study focused on the unidirectional link from family communication to children's depression. However, communication strategies may be reciprocally linked with adolescent behavioral adjustment such that parental communication efforts predict adolescent behavior and vice versa (Hamza & Willoughby, 2011).

A recent meta-analysis has also indicated bidirectional effects between child internalizing symptoms and maladaptive parenting (Pinquart, 2017). In other words, adolescents' emotional problems might reduce their own willingness of sharing or disclosure of information (Hamza & Willoughby, 2011), which in turn affect parents and lead to increases in parental rejection and criticism (Johnco et al., 2021). Therefore, it is necessary to further explore potentially reciprocal relations between family functioning and children's mental well-being. Finally, family communication patterns were measured via child report, which may be more reflective of child-perceived family functioning rather than actual parenting practices. Observational methods to objectively evaluate parent-child relationship, coupled with data from multiple informants (e.g., parent reports), are recommended for future research to provide a more comprehensive view of family communication quality.

Despite the limitations, this study revealed the relations between specific parent-child communication patterns and depressive symptoms in adolescents. Our findings suggest that open communication and autonomy granting are good parenting practices, whereas repressive control may increase children's risk for depression. The present study also added to the current literature by identifying the subset of depressive symptoms (e.g., feeling unloved) directly influenced by family communications.

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## CONFLICT OF INTEREST

None.

## DATA AVAILABILITY STATEMENT

The datasets of the current study are not publicly available but are available from the corresponding author upon reasonable request.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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