

# Emotional and Behavioral Changes in Preschool Firstborn Children During Transition to Siblinghood: A Mixed Methods Study

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**Purpose:** To help firstborn children in families expecting a second child navigate the role transition more smoothly, we investigated the emotional and behavioral changes of firstborn children during the transition to siblinghood (TTS) and the factors that contribute to these changes.

**Patients and Methods:** From March to December 2019, a total of 97 firstborn children (Mage=3.00± 0.97, and female = 51) were included in the study through a questionnaire survey of their mothers, and two follow-up visits were conducted in Chongqing, China. Individual in-depth interviews were conducted with 14 mothers.

**Results:** Both quantitative and qualitative results suggest that emotional and behavioral problems of firstborn children tend to increase during TTS, particularly in issues such as anxiety/depression, somatic complaints, withdrawal, sleep problems, attention problems, and aggressive behavior, as well as internalization problems, externalization problems and total problems in the quantitative study ( $P<0.05$ ). A poor father-child relationship may increase emotional and behavioral problems in firstborn children ( $P=0.05$ ). Further qualitative analysis found that younger age and outgoing personality of the firstborn child may improve the emotional and behavioral problems.

**Conclusion:** The firstborn children did have more emotional and behavioral problems during TTS. But these problems can be regulated by family factors and their own characteristics.

**Keywords:** emotion and behavior, transition to siblinghood, firstborn children, preschool, mixed method

## Introduction

Preschoolers are in a period of rapid brain development and are beginning to display profound emotional development. Physiologically, the brain has increased structures involved in interoception and emotion,<sup>1,2</sup> and the ability of children to recognize emotion develops rapidly at preschool age.<sup>3,4</sup> As preschool children have more opportunities to contact the outside world, their emotions, behaviors, and personalities are also easily affected.<sup>5</sup> Transition to siblinghood (TTS) refers to the process wherein a child becomes a sibling. About 90% of Western children have at least one sibling, and most of them experienced the birth of a younger sibling during their preschool years.<sup>6,7</sup> TTS is a process of family structural adjustment that can have some positive or negative changes on older siblings, such as reduced parent-child interactions and emotional adjustment ability or improved language expression ability.<sup>8</sup> The vast majority of siblings had been at odds with each other in words or actions, want more attention, and engage in regressive behavior. If not handled properly, it may cause psychological problems for the child in the future.<sup>9</sup> Persistent negative influences in early childhood are associated with depression in adolescence and even mental health problems in adulthood.<sup>4,10</sup> Hence, it

is an important public issue to explore the emotional and behavioral changes in firstborn children during TTS to reduce influences on emotional and behavioral problems and help their transition to sibling relationships more smoothly.

## Theory of Emotional and Behavioral Changes in Firstborn Children During TTS

How will the emotion and behavior of the firstborn child change upon the arrival of the second child, and will it have more positive or negative effects? Researchers have held different views on these issues, and there are some controversial theoretical ideas.<sup>11</sup>

According to past empirical evidence, the birth of the second child may be a stressful event, and the firstborn child needs to adapt to the new role after the birth of the second child, which will cause certain psychological pressure and psychological threat to the firstborn child and will lead to a variety of negative emotions and behaviors.<sup>12,13</sup> Firstborns would experience sadness, anxiety, depression, and other negative emotions.<sup>14,15</sup> Under certain circumstances, firstborn children are indifferent to their mothers, and the mother-child attachment becomes unstable.<sup>16–18</sup> Firstborn children exhibit more dependent behavior, sleep problems, misbehavior, and regressive behavior than only child.<sup>19</sup> Cortisol is a biomarker of the stress response system in mammals. After the birth of a younger sibling, urinary cortisol levels in older wild bonobos increased fivefold and remained elevated for seven months.<sup>20</sup> Which provides physiological evidence that TTS is a stressful event for firstborns.

However, Volling's team has a contrary view on this issue in their several years studies with a dozen papers, including a large SRCD monograph.<sup>21</sup> Her research does not support the idea that TTS is a crisis event and the impact of the arrival of a second child is acceptable for most firstborn children and families.<sup>22,23</sup> Although the firstborn children may have severe adjustment difficulties during TTS, it is limited to a very small number of children. The challenge it can turn to an opportunity for further growth and development for younger children.<sup>11</sup> The arrival of the second child increases the willingness of the firstborn to share, collaborate, and help take care of the second child,<sup>24,25</sup> improving self-care,<sup>26</sup> and enhancing verbal expression.<sup>15</sup>

## The Influencing Factors of Children's Emotions and Behaviors

The factors that influence changes in firstborns come mainly from the individual level and the family level.<sup>27</sup> At the individual level, children's emotions and behaviors are attached to their intrinsic characteristics.<sup>11</sup> Differences in gender, age, and temperament may cause firstborn children to exhibit different emotional and behavioral problems.<sup>11</sup> For younger and bad-tempered firstborns, emotional and behavioral problems are more pronounced. And there may be more problems with siblings of the same gender.<sup>15</sup> Meanwhile, children's emotional and behavioral problems are closely linked to family factors. Family structure, parental relationship, parent-child attachment, parenting style, and family economic status are the main factors that produce differences in children's emotions and behaviors.<sup>28–30</sup> Lack of parent-child interaction, maternal mental illness, and poor family environment are all associated with emotional and behavioral problems in children.<sup>31</sup>

## The Present Study

Currently, there is no systematic conclusion about the impact of having a second child on the first child. Especially after more than 30 years of the one-child policy in China, most families have only one child. Now, as birth control policies are adjusted, many families are having a second or even third child changing the family structure. The firstborn, who expected to be the only child, had to be transformed into the role of an older brother or sister. There are differences in the developmental trajectories of children across cultures. In China, research on changes and influencing factors in the emotions and behaviors of firstborn children have been carried out gradually. But still they have started relatively late and are limited. This study intends to follow up and observe the emotional and behavioral changes of preschool children during TTS through longitudinal cohort studies and to evaluate the emotional and behavioral characteristics of preschool children in different groups. We explored the factors that influence emotional and behavioral changes in children during TTS, with the goal of improving the mental health of firstborn children.

## Materials and Methods

### Participants

In the obstetric clinics of two hospitals in Chongqing, southwest China, we enrolled children who met the criteria from March to December 2019. The inclusion criteria were: (1) There was only one child in the family; (2) The age of the child was 1.5–5 years old; (3) The mother was pregnant with her second child and was in the second or third trimester. We excluded single-parent families, reorganized families, and firstborn children with mental health conditions such as autism and depression. Informed consent was issued to the mothers who met the standards, and the mothers filled in the questionnaire after informed consent.

A total of 97 children were investigated at baseline (mothers were in their third trimester). Two follow-up surveys were conducted at 2 and 12 months after the birth of the second child. Among them, seventy-two children (74.23%) were followed up 2 months after the birth of the second child, sixty children (61.86%) were followed up 12 months after the birth of the second child, and 35 children (36.08%) were followed up both times. Information in this study was provided by the firstborn's mother. Mothers who met the criteria to participate in the questionnaire were contacted, and the semi-structured interview outline was used to conduct an in-depth individual interview with the mothers after their informed consent.

A total of 16 qualitative interviews were conducted between September 2019 to December 2020 among the mothers with informed consent in the cohort, involving 14 mothers of firstborn children from six districts in Chongqing. Two mothers (IDI-3 and IDI-7) were interviewed once when their second child was 2 months and 12 months old, respectively. One mother (IDI-8) had an interview when her second child was 2 months old, and the other 11 had an interview when their second child was 12 months old (Figure 1).

### Questionnaire Survey

#### Basic Information About Participants

According to the purpose of the survey, a questionnaire designed by our team was used to investigate the basic information of firstborn children. The survey contents mainly include (1) The information of firstborn children: the date of birth and gender; (2) The family information of participants: the date of birth of the mother, and the type of family (nuclear family or extended family), the annual household income, parents' education level, parental relationship, mother-child relationship, father-child relationship, family atmosphere, parenting style, etc.

#### Emotional and Behavioral Problems

Firstborn children's emotional and behavioral problems were collected using the 1.5–5-year-old Children's Behavioral Scale Parent Version (CBCL),<sup>32</sup> which contained 99 items (67 items were summarized into 7 emotional and behavioral factors and 3 comprehensive questions, and 32 items were summarized into other questions). Each of the 99 items was scored on a scale of 0, 1, and 2, with 0 representing "not accurate", 1 representing "near or sometimes accurate", and 2 representing "very accurate or often accurate". The higher the score, the more severe the emotional and behavioral problems. In this study, Cronbach's alpha of each factor of the CBCL scale ranged from 0.602 to 0.879, and the value of Kaiser-Meyer-Olkin (KMO) was 0.928. After Bartlett's Test,  $P < 0.001$ .

The seven emotional and behavioral factors are as follows: emotionally reactivity, anxious/depressed, somatic complaints, withdrawn, sleep problems, attention problems, and aggressive behavior. Three comprehensive emotional and behavioral problems are internalizing problems (emotionally reactivity, anxious/depressed, somatic complaints, withdrawn), externalizing problems (attention problems, aggressive behavior), and total problems.

### Qualitative Interviews

#### Interview Methods

Individual in-depth interviews were conducted by telephone/WeChat and recorded after obtaining the consent of the interviewees. The interviews were semi-structured, using a prepared interview outline, and each interview lasted about 20–40 minutes.

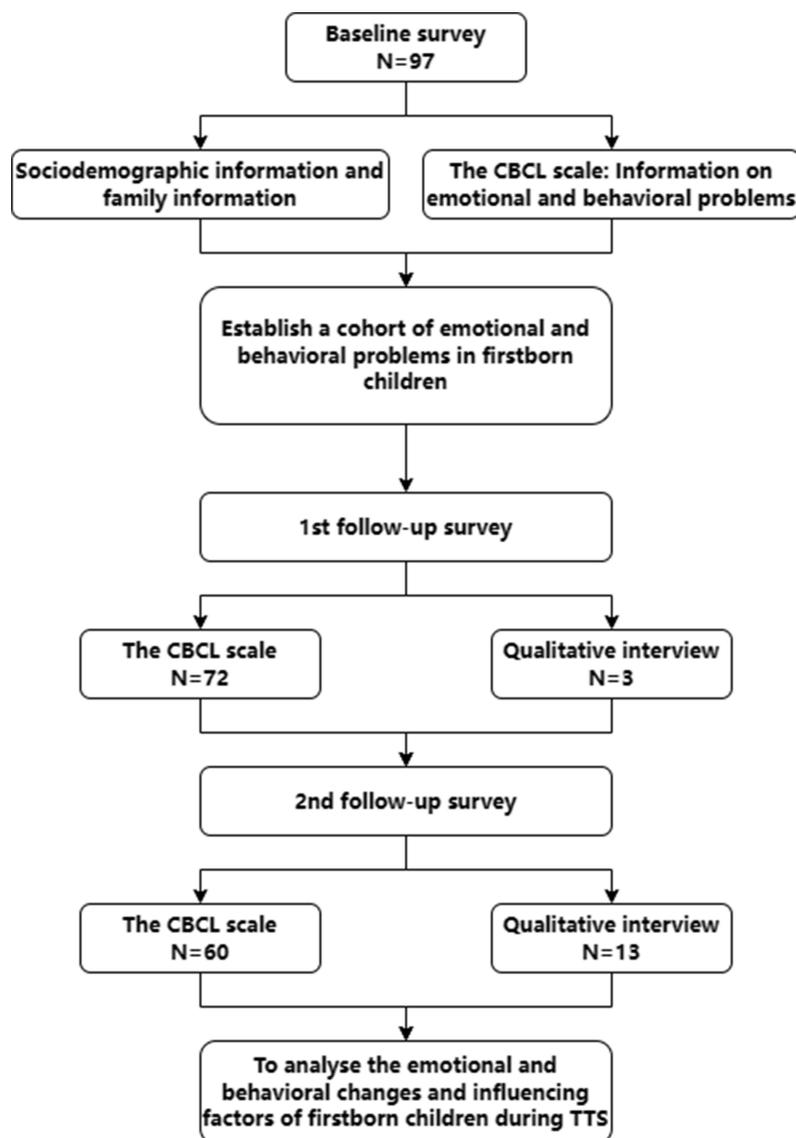


Figure 1 Study framework.

### Content of Interviews

The interview outline was prepared by referring to the quantitative questionnaire results. The specific interview contents were as follows: (1) The changes in the firstborn's attitude and attachment to parents and their emotional and behavioral changes before the birth of the second child, at 2 and 12 months of age of the second child; (2) The reasons for the emotional and behavioral changes of the firstborn children; (3) Intervention measures and their effects on the change of children's negative emotions and behaviors, as well as mother's suggestions.

### Quality Control

Provide training manuals and conduct training for investigators before fieldwork and formal interviews to ensure they were familiar with the program's background, methodology, and content. A 4-day pre-survey was conducted in the maternity clinic of the hospital before the formal investigation. The questionnaires were checked immediately during and after the survey. Before each interview, the interviewer explained the interview criteria to the interviewee. After each interview, investigators transcribed the interview recordings verbatim into a one-word document,

which was then double-checked. Multiple investigators were familiar with the transcribed material, and at least two did the coding, tabulating, and interpreting independently.

This study conducted questionnaire surveys, combined with individual in-depth interviews with the mothers of subjects, compared, analyzed, and combined the description of the mothers on the changes in firstborn children's emotion and behavior and the reasons for the changes with the results of quantitative questionnaire analysis, so as to make the research results more objective and scientific.<sup>33,34</sup>

## Data Analyses

Epidata 3.1 was used to double input the collected data and check and correct errors, and IBM SPSS Statistics 25.0 (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp) was used to analyze the data. Chi-square tests and *t*-tests were used to compare the differences in basic information, family socioeconomic status, family relationships, and parenting styles between children in the third trimester, two months after birth, and 12 months after the birth of the second child, and to analyze the influence factors of emotional and behavioral changes. A One-Way Repeated Measures ANOVA was used to analyze changes in children's emotional and behavioral problems during TTS. The data was judged anomalous by boxplots and corrected using the Greenhouse-Geisser method when the spherical assumption was violated. The emotional and behavioral changes of firstborn children were grouped by the Group-Based Trajectory Modeling (GBTM) in STATA16 (StataCorp. 2019. Stata Statistical Software: Release 16. College Station, TX: StataCorp LLC), and the distribution of influencing factors between different groups was compared. The significance level was set at 0.05.

Thematic framework analysis was used to formulate a thematic framework based on the qualitative interview outline and emerging issues from the pre-experimental interview transcript data. MAXQDA 2020 (VERBI GmbH, Berlin, Germany) was used to manage the data (The thematic framework can be seen in [Appendix 1](#)). The data was collated and analyzed in strict accordance with the five steps of familiarizing with the data, formulating a theme frame, encoding, tabulating, and interpreting.

## Results

### Quantitative Results

The mean age of the subjects was  $3.00 \pm 0.97$  years old at baseline, with 45 boys and 51 girls (One gender information is missing, and one participant did not report annual household income). There were no differences in basic information ( $P > 0.05$ ) ([Table 1](#)). There were also no differences in basic information and baseline CBCL scores between retained and lost subjects at the 2-month follow-up and 12-month follow-up ( $P > 0.05$ ) ([Tables S1](#) and [S2](#), shown in [Appendix 2](#)).

For firstborn children, except for emotionally reactive ([Figure 2A](#)) scores, the scores of the other six emotional and behavioral factors, as well as internalizing problems, externalizing problems, and total problems changed from baseline to follow-up survey. The scores of anxious/depressed ( $P = 0.017$ ,  $P = 0.012$ ) ([Figure 2B](#)), aggressive behavior ( $P = 0.004$ ,  $P = 0.002$ ) ([Figure 2G](#)), internalizing problems ( $P = 0.035$ ,  $P = 0.004$ ) ([Figure 2H](#)), externalizing problems ( $P = 0.002$ ,  $P = 0.001$ ) ([Figure 2I](#)) and total problems ( $P = 0.002$ ,  $P = 0.001$ ) ([Figure 2J](#)) were significantly higher at 1st follow-up and 2nd follow-up than those at the baseline. The score of sleep problems ( $P = 0.018$ ) ([Figure 2E](#)) increased only when the second child was followed up at 1st follow-up and the scores of somatic complaints ( $P = 0.013$ ) ([Figure 2C](#)) and attention problems ( $P = 0.007$ ) ([Figure 2F](#)) increased only at 2nd follow-up. The withdrawn ( $P = 0.002$ ,  $P = 0.036$ ) ([Figure 2D](#)) scores of firstborn children at 2nd follow-up were higher than those at baseline and 1st follow-up.

During TTS, the total problems score of firstborn children continued to increase. The change in the total problems score of the firstborn children was modeled based on the trajectory of the group. According to the model fit ([Table 2](#)), the firstborn children were divided into three groups according to the increased levels of total problems score ([Figure 3](#)). The total problems score of group 1 showed a low level and a slow growth trend, the total problems score of group 2 showed a medium level and a rapid growth trend, and the total problems score of group 3 showed a high level and a rapid growth after 2 months of the second child.

**Table 1** Comparison of Basic Characteristics of Firstborn Children at Baseline, 1st Follow-Up, and 2nd Follow-Up After the Birth of a Second Child

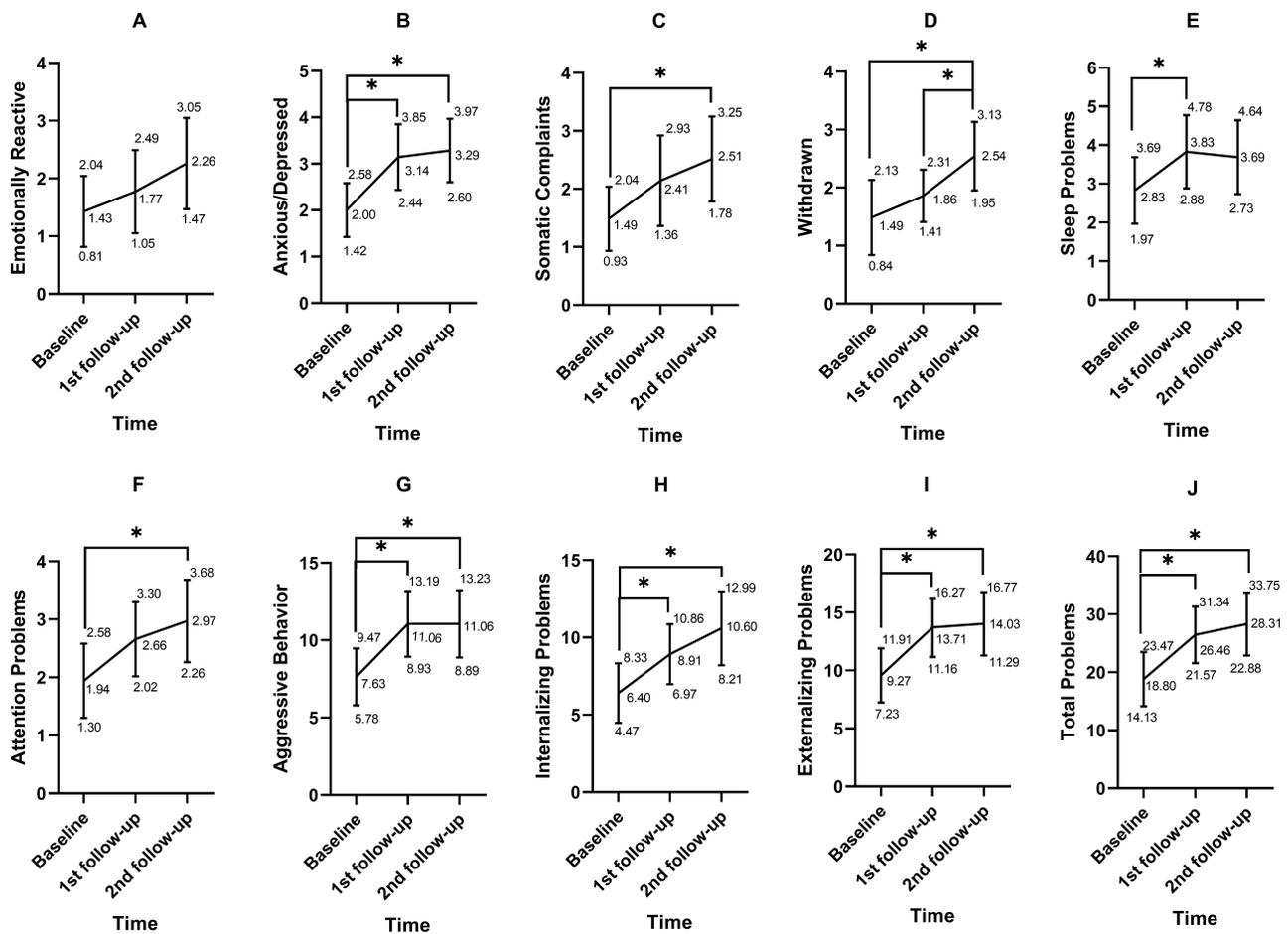
Characteristics	Baseline (N=97)	1st Follow-Up (N=72)	2nd Follow-Up (N=60)	F/ $\chi^2$ #	P
Firstborn's age at baseline, Mean (SD), years	3.00(0.97)	3.04(1.02)	2.92(0.89)	0.034	0.967
Mothers' age at baseline, Mean (SD), years	30.19(2.91)	30.11(2.82)	30.07(2.97)	0.263	0.769
Gender					
Boys, n (%)	45(46.88)	29(40.85)	28(46.67)	0.699	0.705
Girls, n (%)	51(53.12)	42(59.15)	32(53.33)		
Temperament types					
Easy to maintain, n (%)	90(92.78)	67(93.06)	55(91.67)	0.621	0.961
Difficult to maintain, n (%)	4(4.12)	3(4.17)	2(3.33)		
Slow to start, n (%)	3(3.09)	2(2.78)	3(5.00)		
Family type					
Nuclear families, n (%)	10(10.31)	7(9.72)	5(8.33)	0.168	0.919
Extended families, n (%)	87(89.69)	65(90.28)	55(91.67)		
Parental relationship					
Good, n (%)	53(54.64)	41(56.94)	33(55.00)	0.096	0.953
Moderate, n (%)	44(45.36)	31(43.06)	27(45.00)		
Mother-child relationship					
Good, n (%)	80(82.47)	59(84.00)	49(83.78)	0.018	0.991
Moderate, n (%)	17(17.53)	13(16.00)	11(16.22)		
Father-child relationship					
Good, n (%)	65(67.01)	50(69.44)	40(66.67)	0.151	0.927
Moderate, n (%)	32(33.99)	22(30.56)	20(33.33)		
Family atmosphere					
Good, n (%)	26(26.80)	19(26.39)	14(23.33)	0.255	0.880
Moderate, n (%)	71(73.20)	53(73.61)	46(76.67)		
Maternal parenting style					
Democratic, n (%)	83(85.57)	61(84.72)	49(81.67)	0.441	0.802
Non-democratic, n (%)	14(14.43)	11(15.28)	11(18.33)		
Paternal parenting style					
Democratic, n (%)	65(67.01)	49(68.06)	41(68.33)	0.036	0.982
Non-democratic, n (%)	32(32.99)	23(31.94)	19(31.67)		
Annual household income					
≤240,000¥, n (%)	64(66.67)	47(66.20)	39(66.10)	0.007	0.997
>240,000 ¥, n (%)	32(33.33)	24(33.80)	20(33.90)		
Maternal education					
Senior high school and below, n (%)	7(7.22)	6(8.33)	3(5.00)	0.575	0.717
College and above, n (%)	90(92.78)	66(91.67)	57(95.00)		
Father's education					
Senior high school and below, n (%)	11(11.34)	8(11.11)	7(11.67)	0.010	0.995
College and above, n (%)	86(88.66)	64(88.89)	53(88.33)		

Notes: #t-test was used for age comparison. The chi-square test was used for constituent ratio comparison, and if the theoretical frequency of cells is less than 5, Fisher exact test is used.

A good father-child relationship may be associated with lower levels of total problem scores, but there was no statistical significance ( $P=0.05$ ) (Table 3).

## Qualitative Results

The average age of mothers who participated in the qualitative interview was  $31.07 \pm 2.56$  years old. Among the 14 children (7 girls and 7 boys), the average age of the children at baseline was  $4.21 \pm 0.97$  years old (Table S3, shown in Appendix 2). The qualitative data were summarized as four main themes through the thematic framework analysis.



**Figure 2** Changes in emotional and behavioral problem scores in firstborn children at baseline, 1st follow-up, and 2nd follow-up. **Notes:** \*The significant level is less than 0.05. (A) Emotionally reactivity; (B) Anxious/depressed; (C) Somatic complaints; (D) Withdrawn; (E) Sleep problems; (F) Attention problems; (G) Aggressive behavior; (H) Internalizing problems; (I) Externalizing problems; (J) Total problems.

### Theme 1: Emotional and Behavioral Changes of Firstborn Children During TTS

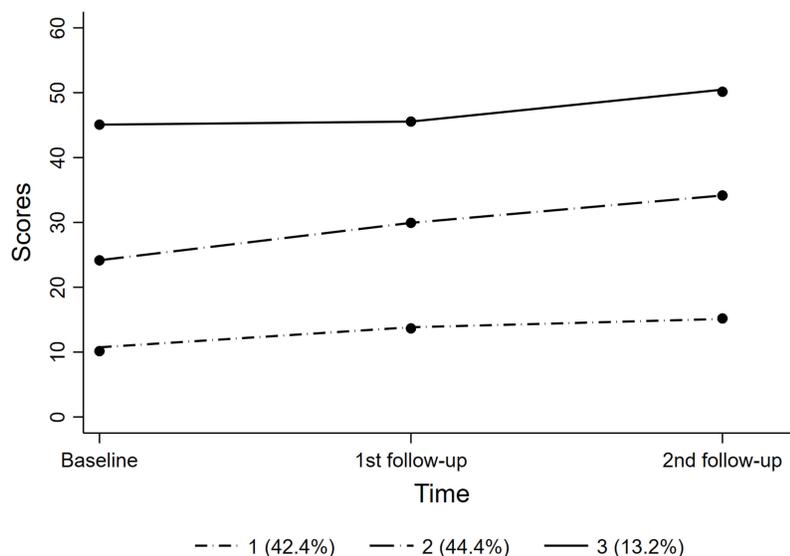
According to the mothers’ description, although some children had positive changes in their emotions and behaviors during TTS, more of them showed negative changes (Figures 4 and 5). Some citations are shown in [Box 1](#) and [Box 2](#), shown in [Appendix 3](#).

### Theme 2: Reasons for Emotional or Behavioral Changes in Firstborn Children

Based on the results of the interviews, it was found that the child’s own personality and traits, as well as certain family factors, affect the emotions and behavior of the firstborn. Some mothers reported that children with positive and cheerful personalities and younger children showed fewer emotional and behavioral problems during TTS. A good relationship between parents, a harmonious home atmosphere, and good home education can reduce emotional and behavioral

**Table 2** Model Fit Indicators and Average Posterior Probability with Two Through Four Classes

Number of Categories	Average Posterior Probability (AvePP)				Bayesian Information Criterion (BIC)	Entropy
	Group 1	Group 2	Group 3	Group 4		
2	91.67%	92.02%			-928.80	0.711
3	90.37%	86.09%	84.16%		-927.68	0.725
4	90.11%	87.21%	76.23%	87.10%	-930.95	0.767



**Figure 3** Changes in total problems scores across three groups.

problems in firstborn children. Some mothers saw the arrival of a second child as a challenge for their firstborn. In addition, the emotional and behavioral changes of firstborn children may also be influenced by conditions in other families with a second child (Figure 6). Some citations are shown in Box 3, shown in Appendix 3.

**Table 3** Comparison of Basic Information Between Groups with Different Changes in Scores of Emotional and Behavioral Problems

Characteristics	Group 1 (N=41)	Group 2 (N=43)	Group 3 (N=13)	Z/ $\chi^2$ #	P
Firstborn's age at baseline, Mean (SD), years	3.14(1.08)	2.79(0.87)	3.26(0.87)	1.909	0.154
Mothers' age at baseline, Mean (SD), years	29.54(3.08)	30.35(2.43)	31.69(3.35)	2.953	0.057
Gender					
Boys, n (%)	22(53.66)	17(40.48)	6(46.15)	1.451	0.501
Girls, n (%)	19(46.34)	25(59.52)	7(53.85)		
Temperament types					
Easy to maintain, n (%)	39(95.12)	40(93.02)	11(84.62)	2.917	0.550
Difficult to maintain, n (%)	1(2.44)	2(4.65)	1(7.69)		
Slow to start, n (%)	1(2.44)	1(2.33)	1(7.69)		
Family Type					
Nuclear families, n (%)	4(9.76)	4(9.30)	2(15.38)	0.736	0.804
Extended families, n (%)	37(90.24)	39(90.70)	11(84.62)		
Parental relationship					
Good, n (%)	25(60.98)	24(55.81)	4(30.77)	3.677	0.168
Moderate, n (%)	16(39.02)	19(44.19)	9(69.23)		
Mother-child relationship					
Good, n (%)	37(90.24)	33(76.74)	10(76.92)	2.699	0.240
Moderate, n (%)	4(9.76)	10(23.26)	3(23.08)		
Father-child relationship					
Good, n (%)	33(80.49)	25(58.12)	7(53.85)	6.071	0.050
Moderate, n (%)	8(19.51)	18(41.88)	6(46.15)		
Family atmosphere					
Good, n (%)	16(39.02)	8(18.60)	2(15.38)	5.458	0.065
Moderate, n (%)	25(60.98)	35(81.40)	11(84.62)		

(Continued)

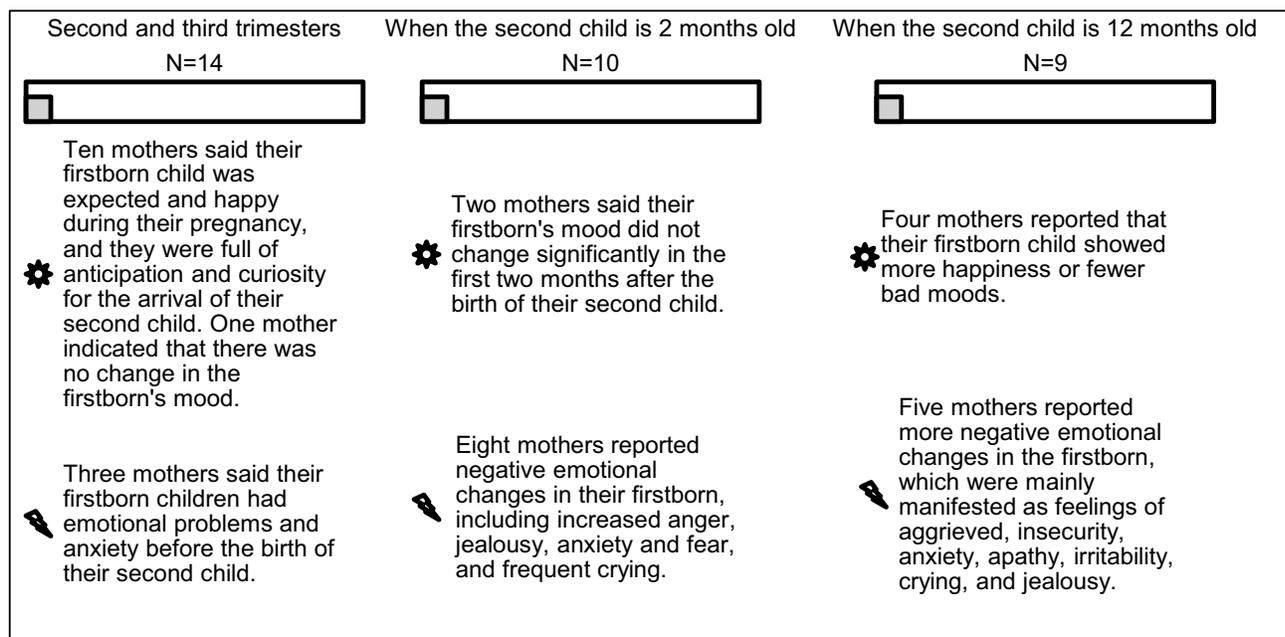
**Table 3** (Continued).

Characteristics	Group 1(N=41)	Group 2(N=43)	Group 3(N=13)	Z/ $\chi^2$ #	P
Maternal parenting style					
Democratic, n (%)	38(92.68)	36(83.72)	9(69.23)	4.609	0.100
Non-democratic, n (%)	3(7.32)	7(16.28)	4(30.77)		
Paternal parenting style					
Democratic, n (%)	32(78.05)	27(62.79)	6(46.15)	5.164	0.081
Non-democratic, n (%)	9(21.95)	16(27.21)	7(53.85)		
Annual household income					
≤240,000¥, n (%)	28(68.29)	28(66.67)	8(61.54)	0.203	0.904
>240,000¥, n (%)	13(31.71)	14(33.33)	5(38.46)		
Maternal education					
Senior high school and below, n (%)	4(9.76)	3(6.98)	0(0)	0.927	0.662
College and above, n (%)	37(90.24)	40(93.02)	13(100.00)		
Father's education					
Senior high school and below, n (%)	6(14.63)	4(9.30)	1(7.69)	0.701	0.749
College and above, n (%)	35(85.37)	39(90.70)	12(92.31)		

**Notes:** #t-test was used for age comparison. The chi-square test was used for constituent ratio comparison, and if the theoretical frequency of cells is less than 5, Fisher exact test is used.

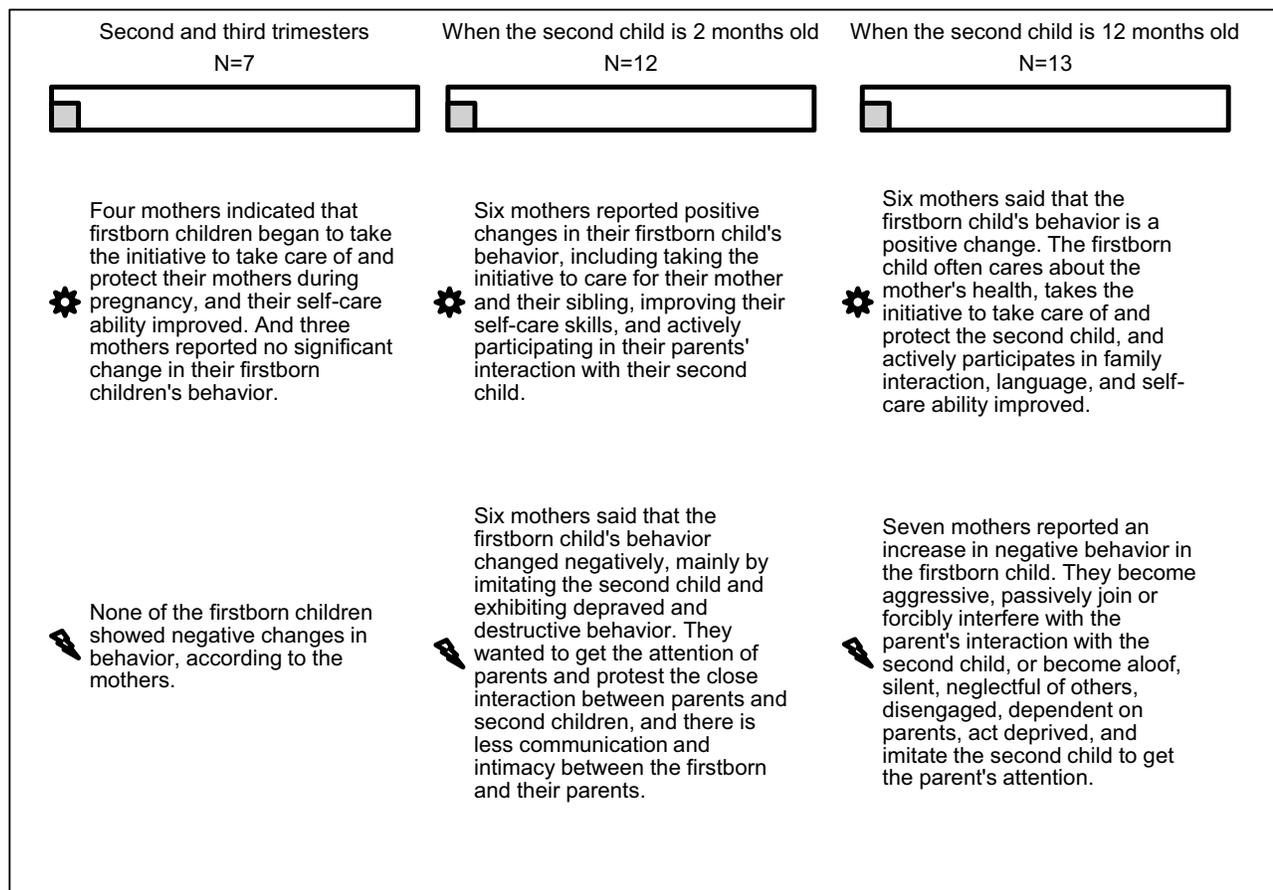
### Theme 3: Measures Taken by Parents and Their Effects

Fourteen mothers shared their experiences dealing with the negative emotions and behaviors of their firstborns during TTS. Four mothers adopted the method of meeting the needs of the child; two criticized the child; two directly ignored the child's problems; ten adopted the method of communication and reasoning; one adopted the method of accompanying the firstborn and creating a harmonious family atmosphere. The effect of these measures is shown in [Figure 7](#). Some citations are shown in [Box 4](#), shown in [Appendix 3](#).



**Figure 4** Emotional changes of firstborn children during TTS by mother's description.

**Notes:** ⚙️: Positive change; 🛠️: Negative change.



**Figure 5** Behavioral changes of firstborn children during TTS by mother's description.

**Notes:** : Positive change; : Negative change.

#### Theme 4: Parenting Experiences and Lessons for Firstborn Children

The mothers we interviewed also shared their suggestions on how to better deal with the emotional and behavioral problems of firstborn children during TTS, based on their experience, self-learning, and observation of second-child families around them, which were summarized as follows: (1) Be fair to both children, regardless of age; (2) Perspective-taking: thinking from the perspective of firstborn children; (3) Give more education, communication, and guidance to lead children to take the responsibility as the older brother (older sister); (4) Pay more attention to and accompany firstborn children, and comfort them as soon as possible if they have emotional and behavioral problems; (5) Show the firstborn children the vulnerability of mothers and let them be the master on some decisions. Some citations are shown in [Box 4](#), shown in [Appendix 3](#).

## Discussion

### Changes in Firstborn Children's Emotional and Behavioral Problems

In this study, during TTS, emotional and behavioral problems among firstborn children increased significantly with the birth of a second child. Before and after the birth of a second child, the average score of total problems of firstborn children ranged from 20.98 to 28.02, with detection rates ranging from 11.34% to 20.83%. Through quantitative surveys and qualitative interviews, we found that some firstborns did show an increase in negative emotions and behaviors, such as anxiety, jealousy, and withdrawal at 2 and 12 months after the delivery of a second child, indicating that the birth of the second child may lead to emotional and behavioral problems of firstborn children. This finding can be explained by the stress event model theory and ecosystem theory. The theory of the stress event model suggests that the birth of a second child is a stressful event for the firstborn and the family, posing an inevitable psychological threat to each family

Personality and traits	Family factors	Other factors
<p><input type="checkbox"/> Seven mothers thought the changes in emotion and behavior were related to the children's personalities. Children who are sensible and easy to accept usually have fewer emotional behavior problems, children who are positive and cheerful are better and faster at self-solving emotional and behavioral problems, and children who are willful and spoiled tend to have more serious emotional behavior problems.</p> <p><input type="checkbox"/> Five mothers said changes in emotion and behavior during TTS in the firstborn child were related to the child's age or the age difference between the firstborn and the second child. Some mothers believed that children are more rebellious and have more emotional and behavioral problems when they are 3-4 years old. In addition, some mothers said younger children are unaware of the arrival of a second child, so there are few serious emotional and behavioral problems.</p>	<p><input type="checkbox"/> Two mothers said that the emotional and behavioral changes in firstborn children during TTS might be related to the arrival of the second child. The firstborn children thought that the arrival of the second child took away the family's care and became sensitive and uncomfortable, and had some emotional and behavioral problems.</p> <p><input type="checkbox"/> Five mothers indicated that family education could affect the emotions and behavior of firstborn children during TTS. Correct guidance from parents and accompanying relatives could reduce the occurrence of negative emotions and behavior, and the doting of family members could also encourage unhealthy emotions and behavior in children.</p> <p><input type="checkbox"/> Two mothers indicated that the changes in emotion and behavior of firstborn children during TTS were related to the family atmosphere. A bad family atmosphere would affect the development of psychological behavior of children, accompanied by more emotional and behavioral problems.</p>	<p><input type="checkbox"/> One mother said that the emotional and behavioral changes in firstborn children during TTS would also be influenced by the families with a second child and be easily affected by how the children of other families get along.</p>

**Figure 6** Factors influencing emotional and behavioral changes of firstborn children during TTS by mother's description.

member.<sup>13,16</sup> Ecosystem theory emphasizes the interaction between people and their surrounding social and cultural environment and argues that children's emotions and behaviors are closely related to their environment. According to this theory, individual behavior is the result of interaction between the individual and the environment.<sup>35</sup> During the normal ecological transition period, with some predictable stressful events (such as the birth of a second child), they may still lead to sudden changes in the family environment and the status of children. These pressures alter the psychological structure of the firstborn child and force them to readjust their cognitive structure to adapt to the new environment.<sup>11</sup> As a result, we found that they also tend to show some increased capacity for self-care, expression, and care for others from qualitative interviews.

## Temporal Patterns of Change in Emotional and Behavioral Problems During TTS

Anxiety/depression, aggressive behavior, and sleep problems in firstborns begin to increase significantly 2 months after the birth of a second child. Similarly, we found an increase in anxiety, depression, fear, and aggressive behavior in the firstborn children 2 months after the birth of a second child from maternal descriptions. Stewart found a higher rate of aggressive confrontations between firstborn children and their mothers in the two months following the birth of a second

Satisfy their needs	<ul style="list-style-type: none"> <li>• They said it had immediate effects and had a good improvement effect in the near term.</li> </ul>
Communication and reasoning	<ul style="list-style-type: none"> <li>• Eight mothers said that such treatment effect was good and children could accept it, but the remaining mothers said the effect of reasoning was temporary and could just distract children's attention.</li> </ul>
Emotional support and companionship	<ul style="list-style-type: none"> <li>• It could significantly improve their emotional and behavioral problems.</li> </ul>
Criticism	<ul style="list-style-type: none"> <li>• Only one mother reported that it worked well.</li> </ul>
Disregard	<ul style="list-style-type: none"> <li>• They said that it did not affect alleviating the emotional and behavioral problems of their children.</li> </ul>

**Figure 7** Treatment measures and effects of firstborn children's bad emotional and behavioral problems during TTS by mother's description.

child.<sup>15</sup> Because the newborn attracted most of the mother's attention, the mother and the firstborn were briefly separated after the birth and reminded relatively distant for the next two months.<sup>20</sup> And family members paid less attention to firstborn children, which may damage the sense of security of firstborn children and lead to anxiety and depression.<sup>36</sup> To some extent, milestones in the development of the second child can explain the temporal patterns of change in the behavior of the firstborn.<sup>37</sup> Two months after the birth of the second child, behaviors such as looking up and turning over begin to occur. Family members pay more attention to the second child and ignore the firstborn child. Therefore, firstborn children have high levels of anxiety and antagonistic behavior.

Somatic complaints, withdrawal, and attention problems of firstborn children increased significantly 12 months after the birth of a second child, and withdrawal has continued to increase after the birth of a second child. Some firstborn children become apathetic and passive, exhibit imitation behavior, and even have sleep problems. The increase in somatic complaints in the firstborn may be related to language and motor development in the second child. Helland found that internalizing problems in one sibling were associated with language problems in another sibling and suggested that there may be shared family factors.<sup>38</sup> The firstborn child begins to get along with the second child in more activities, which often leads to conflicts. The partiality of the family to the second child may cause more complaints and problem behaviors of the firstborn child.<sup>39,40</sup> After 12 months of birth, the second child can move independently and walk in a small range. For various reasons, the child may be distracted by the activities of the second child, which interferes with the attention of the firstborn, and the older sibling's craving for attention. The increase in withdrawal behavior may be due to the fact that parents need to learn to take care of two children at an early stage after the birth of the second child causing less time and quality to accompany the firstborn child.<sup>39</sup> The mother is busy caring for the second child, which may make the firstborn child more likely to feel threatened by the birth of the second child, resulting in an unsafe parent-child relationship.<sup>17,41</sup> Since the withdrawal behavior of the child may be influenced by the unsafe parent-child relationship,<sup>42</sup> the withdrawal behavior of firstborn children in the 2 months after second childbirth is higher than that of firstborn children in the third trimester. Twelve months after the birth of the second child, the mother may return to work and spend less time with the firstborn child, which causes the child to develop separation anxiety and then exhibit more nervousness, rumination, and withdrawal behavior 12 months after the birth of the second child than 2 months after the birth of the second child.<sup>43</sup>

In addition, through interviews, it was found that firstborn children had less dependence on their parents 12 months after the birth of a second child, and their self-reliance and self-care ability improved. After the birth of a second child, most firstborn children in China are mainly cared for by their grandparents, who tend to have more parenting experience

than their parents. And studies have shown that more contact with grandparents can improve children's social skills and cognitive development.<sup>44,45</sup>

## Related Risk Factors

The adverse effects caused by the birth of a second child may be acceptable. But the role of the family ecological environment is particularly important.<sup>46</sup> Due to physical changes during pregnancy and the care of the second child after the birth of the second child, the mother pays less attention to and accompanies the firstborn child, and the father may play a more important role during TTS.<sup>47</sup> Active father involvement in early parenting may yield additional benefits.<sup>48</sup> A better relationship between children and their fathers and a democratic paternal parenting style appeared to be associated with lower levels of emotional and behavioral problems in firstborn children. Some studies have shown that the quality of a father's companionship has a greater coefficient of correlation with psychological and behavioral adaptation in children.<sup>49</sup> Different parenting styles can directly affect a child's emotions and behavior, and a father's parenting style can predict a child's future social behavior.<sup>50,51</sup>

Through interviews, it was found that younger firstborns had fewer emotional and behavioral problems. Based on Teti's research and Piaget's theory of cognitive development,<sup>52,53</sup> we conjecture that children under the age of 2 have low social cognitive ability, are in the sensorimotor stage and are unable to distinguish between their own emotions and thoughts and those of others. The period between the ages of 2 and 7 is a critical time for children's language development, during which their speech and thinking develop rapidly. However, there may be competition for resources between siblings born at short birth intervals, which is directly linked to a higher risk of death in older siblings.<sup>54,55</sup> The time of the birth of younger siblings may be related to the risk of the vulnerability of older siblings in early childhood development, and parents should consider optimizing the birth spacing when welcoming a second child.<sup>56</sup>

## Implications and Limitations

Psychological problems in early childhood often persist into adolescence and even adulthood.<sup>57,58</sup> Many children will face the transition from being an only child to being an older brother/sister under the trend of encouraging child-bearing. During this time, if a child's emotional and behavioral problems fail to attract attention and are not well addressed, this can affect long-term health and functioning. Policies and programs that improve children's mental health during childhood can also improve long-term health and may prevent children from developing diagnosable diseases.<sup>59-61</sup> Therefore, promoting good mental health in firstborn children and addressing mental disorders are important public health issues. This study focused on the emotional and behavioral problems of firstborn children during TTS to make up for the lack of research in this area in recent years. We found that firstborn children during TTS are at high risk for emotional and behavioral problems. Questions will be explored more fully and in depth through quantitative research combined with qualitative interviews. Several influencing factors affect the emotional and behavioral changes of firstborn children, which is expected to provide direction for interventions to address emotional and behavioral problems in firstborn children during TTS.

The small sample size of the cohort in this study, less than 100 participants, and some loss of follow-up in the two follow-up surveys make it difficult to explore in depth the influencing factors of emotional and behavioral changes in firstborn children through quantitative studies. In addition, increased emotional and behavioral problems in firstborn children during TTS may also occur with age. Because there was no control group of only children in the study, it was difficult to discern whether the change was caused solely by age. Some researchers have also suggested that the transition period includes a longer period after the birth of a second child than the transition period in this study. Further prospective follow-up studies with larger sample sizes, longer follow-up periods, and a control group are needed to further identify the factors and mechanisms that influence the development of emotional and behavioral problems in firstborn children during TTS.

## Conclusions and Recommendations

The arrival of a second child can lead to more emotional and behavioral problems for the firstborn, but it may also increase their independence and self-care. The age and temperament of the firstborn and the father-child relationship are linked to the changes in the firstborn's emotional and behavioral problems and should be considered fully when

welcoming a second child. Based on the findings of this study, we propose the following measures to reduce children's emotional and behavioral problems during TTS and thus help them successfully survive the sibling transition: (1) Pay attention to the emotional behavior of children as early as possible, especially within 2 months after the birth of the second child. During this period, the emotional and behavioral changes in children are more obvious, especially anxiety/depression, sleep problems, and aggressive behaviors. (2) Children aged 3–5 years have the higher social cognitive ability and sensitivity than children aged 1–2 years. Children with rebellious personalities are more likely to have emotional and behavioral problems. Therefore, more attention should be paid to children aged 3–5 years and children with bad temperaments. (3) Parents need to adjust their bad emotions and behaviors to avoid showing too much anxiety and tension to their children. At the same time, both parents need to learn scientific parenting methods, especially fathers who need to become more aware of being involved in the upbringing of their children and try to improve the quality of companionship on the premise of ensuring sufficient time with firstborn children. (4) Families jointly create a good parent-child relationship and harmonious atmosphere, which plays a crucial role in avoiding and improving the emotional and behavioral problems of firstborn children.

## Abbreviation

TTS, Transition to Siblinghood.

## Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request. Requests to access the datasets should be directed to Q. Liu, liuqin@cqmu.edu.cn.

## Ethical Approval

This study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Ethics Committee of Chongqing Medical University.

## Informed Consent Statement

Informed consent was obtained from all participants involved in the study. And all participants agreed to publish anonymously.

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## Disclosure

The authors declared that they have no conflicts of interest to disclose for this work.

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