# Corrigendum:
# "Effectiveness of health education programme of primary school-aged children in the urban area of China" in volume 68, 27-38.

P.27

Error: Corresponding Author: Xiaowei Lyu, Ph.D

Correction: Corresponding Author: Xiaowei Lyu

P.32

Error: The Wilcoxon signed-rank test was implemented to analyze the change in outcome variables in each group, while the Mann-Whitney U test was employed to compare the differences in outcome between the intervention and control groups.

Correction: The Wilcoxon signed-rank test was implemented to analyze the change in outcome variables in each group, while the Mann-Whitney U test was employed to compare the differences in outcome between the intervention and control groups and compare between two groups for differences between baseline and after intervention.

P.33

Error: A comparison of the intervention group and the control group at baseline did not show any statistically significant differences in scores of three scales ($p > 0.05$; Table 3).

Correction: At baseline, the score of IRI-PT scale was significantly lower in intervention group than control group ($p=0.000$). Other scores did not statistically significant ($p > 0.05$).

Error: After the intervention, there was statistically significant differences in scores of the IOS and IRI-PT scales ($p <0.05$), although it was not statistically significant in scores of the SASC, FNE, SAD.

Correction: After the intervention, the score of the IOS was significantly higher in intervention group than control group ($p = 0.002$). Differences in changes between two groups indicated that there were statistically significant differences in changes of scores of the IOS ($p = 0.046$) and IRI-PT ($p = 0.000$) scales (Table 3).

P.34

Error:

Table 3. Values in measurements for the intervention and control groups before and after interventions.

| Variable | Intervention group (N=122) | | | | Comparison of within groups | Control group (N=128) | | | | Comparison of within groups | Comparison of between groups | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Baseline | | After intervention | | | Baseline | | After intervention | | | Baseline | After intervention |
| | Median | Mean±SD | Median | Mean±SD | $p^a$ | Median | Mean±SD | Median | Mean±SD | $p^a$ | $p^b$ | $P^c$ |
| 1. SASC | 5.0 | 5.38±4.26 | 4.0 | 4.67±1.46 | 0.004 | 4.0 | 4.61±3.42 | 4.0 | 4.61±4.04 | 0.163 | 0.399 | 0.897 |
| FNE | 3.0 | 3.56±2.97 | 3.0 | 3.00±3.04 | 0.000 | 3.0 | 2.88±2.39 | 3.0 | 2.78±2.66 | 0.368 | 0.109 | 0.733 |
| SAD | 1.0 | 1.82±1.88 | 1.0 | 1.67±1.92 | 0.273 | 2.0 | 1.85±1.66 | 1.0 | 1.83±1.78 | 0.825 | 0.489 | 0.260 |
| 2. IOS Scale | 7.0 | 6.14±1.21 | 7.0 | 6.31±1.19 | 0.020 | 6.0 | 5.81±1.45 | 6.0 | 5.82±1.46 | 0.914 | 0.061 | 0.046 |
| 3. IRI-PT scale | 13.0 | 13.05±4.12 | 16.5 | 15.11±5.30 | 0.000 | 16.0 | 14.97±3.68 | 16.0 | 15.10±4.70 | 0.320 | 0.547 | 0.000 |

a) Wilcoxon signed-rank test $p < 0.05$

b) Mann-Whitney U test: comparison between the intervention and control groups for baseline

c) Mann-Whitney U test: comparison between the intervention and control groups after the intervention

Abbreviation: SASC, Social Anxiety Scale for Children
FNE, Fear of Negative Evaluation
SAD, Social Avoidance and Distress
IOS, Inclusion of Other in the Self
IRI-PT, Interpersonal Reactivity Index-Perspective-Taking

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| Variable | Intervention group (N=122) | | | | Comparison of within groups | Control group (N=128) | | | | Comparison of within groups | Comparison of between groups | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Baseline | | After intervention | | | Baseline | | After intervention | | | Baseline | After | Difference |
| | Median | Mean±SD | Median | Mean±SD | $p^a$ | Median | Mean±SD | Median | Mean±SD | $p^a$ | $p^b$ | $p^c$ | $p^d$ |
| 1. SASC | 5.0 | 5.38±4.26 | 4.0 | 4.67±1.46 | 0.004 | 4.0 | 4.73±3.42 | 4.0 | 4.61±4.04 | 0.163 | 0.399 | 0.822 | 0.185 |
| FNE | 3.0 | 3.56±2.97 | 3.0 | 3.00±3.04 | 0.000 | 3.0 | 2.88±2.39 | 3.0 | 2.78±2.66 | 0.368 | 0.109 | 0.800 | 0.085 |
| SAD | 1.0 | 1.82±1.88 | 1.0 | 1.67±1.92 | 0.273 | 2.0 | 1.85±1.66 | 1.0 | 1.83±1.78 | 0.825 | 0.489 | 0.260 | 0.602 |
| 2. IOS Scale | 7.0 | 6.14±1.21 | 7.0 | 6.31±1.19 | 0.020 | 6.0 | 5.81±1.45 | 6.0 | 5.82±1.46 | 0.914 | 0.061 | 0.002 | 0.046 |
| 3. IRI-PT scale | 13.0 | 13.05±4.12 | 16.5 | 15.11±5.30 | 0.000 | 16.0 | 14.97±3.68 | 16.0 | 15.10±4.70 | 0.651 | 0.000 | 0.547 | 0.000 |

d) Wilcoxon signed-rank test $p < 0.05$

e) Mann-Whitney U test: comparison between the intervention and control groups for baseline

f) Mann-Whitney U test: comparison between the intervention and control groups after the intervention

g) Mann-Whitney U test: comparison between intervention and control groups for differences between baseline and after intervention

Abbreviation: SASC, Social Anxiety Scale for Children
FNE, Fear of Negative Evaluation
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P.35

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Correction: Our findings suggested that this educational intervention may promote the formation of social PT ability among children. It is noteworthy, however, that the score of the IRI-PT scale was significantly lower for the intervention group at baseline, hence it is possible that the score was likely to increase compared to the control group. It is necessary to accumulate more data for the effectiveness of the intervention, but previous studies have confirmed that the intervention can promote the development of children's PT ability[45,46]. Therefore, the implications of these findings are of great importance and can inform policy related to school-based interventions that aim to increase PT ability and promote social-cognitive development in children.

P.36

Error: Our results indicated that a series of the educational intervention had a profound influence on the development of children's social anxiety and PT ability, as well as on their interpersonal closeness. The findings suggested that educational interventions can decrease social anxiety and improve interpersonal closeness, and increase PT ability among children. Moreover, interaction and communication with the elderly in intervention activities can enhance intimacy between primary school-aged children and the elderly and promote the development of positive attitudes towards the elderly.

Correction: Our results indicated that a series of the educational intervention could influence on the development of children's social anxiety and PT ability, as well as on their interpersonal closeness. The findings suggested that educational interventions could decrease social anxiety and improve interpersonal closeness, and increase PT ability among children. Moreover, interaction and communication with the elderly in intervention activities could enhance intimacy between primary school-aged children and the elderly and promote the development of positive attitudes towards the elderly.

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Original Article

# Effectiveness of health education programme of primary school-aged children in the urban area of China

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## Abstract

**Objective**: To evaluate the effectiveness of a health education programme for school-aged children's social anxiety, interpersonal closeness and perspective-taking (PT) ability in an urban area of eastern China.

**Methods**: This study was a non-randomized controlled trial. A total of 257 school-aged children in fourth to sixth grades from a primary school were recruited, aged between 9 and 12 years. They were assigned by their classes in each grade to the intervention ($N = 128$) and control ($N = 129$) groups and completed anonymous self-reported questionnaires. Data were collected before and after interventions. Changes in children's social anxiety, interpersonal closeness, and social cognition and behaviors were measured using different assessment scales.

**Results**: Overall, 122 interventions and 128 controls participated in the trial. Significant differences for the intervention group were found between before and after interventions in the scores of social anxiety, interpersonal closeness, and PT ability (all $p < 0.05$), while the scores for the control group were roughly unchanged.

**Conclusion**: This health education programme was effective for decreasing the Chinese school-aged children's social anxiety, improving their interpersonal closeness, as well as increasing their PT ability.

**Key Words:** primary school-aged children, social anxiety, interpersonal closeness, perspective-taking, health education programme

## Introduction

Mental health problems of children and adolescents have attracted increasing concern in China in recent years[1–6]. Epidemiological investigations on a large scale in China have found 10–30% of children and adolescents with mental health problems[1–3,7], and academic stress emerges as the primary predictor of mental health problems[3]. The academic stress that most Chinese children and adolescents face may be attributed to the increasing demand for higher education coinciding with the limited available positions in higher education institutions[2,4,6], and is mainly from high expectations among parents and teachers for school performance, exam pressure, strict school discipline, minimal free time, and peer competition. Previous survey among 2400 Chinese students of different ages in different cities and provinces of China found that academic pressure and high parental expectation resulted in 76.2% of these students with a bad mood and 9.1% of them with feelings of despair[6]. An investigation of 2191 Chinese children aged 9 to 12 years from urban and rural areas found that most of the children (81%) largely worried about exams, and more than 60% of them were afraid of punishment by teachers and parents[8]. These studies have confirmed the negative impact of academic stress on Chinese children, which is the significant association with anxiety, depression, and behavioral problems among children[2,6,8,9].

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With the increase of stress, the incidence of social anxiety disorders in Chinese children shows an increasing trend[10]. Social anxiety is an emotional state that children often experience and one of multiple psychological and behavioral problems in children[11]. A large-scale survey of children aged 4 to 16 years in China showed that the prevalence of children's behavioral problems ranged from 6.3% to 16.0%, while the incidence of children's emotional disorders ranged from 10.5% to 21.0%, especially higher in urban areas compared to rural areas[12]. Furthermore, a two-year longitudinal investigation in China found that more than 15% of children experienced social anxiety symptoms[4]. Social anxiety disorders have been found to significantly impact on the physical and mental health of children, possibly contributing to increased risk for different mental health problems[13,14]. These influences might persistently impact on later childhood and adulthood[4,15], which emphasizes the importance of a better understanding of the development of social anxiety disorders throughout childhood. Previous studies have reported that socio-demographic, family environment, and psychosocial factors were associated with children's anxiety symptoms[4,16–20], some of which can be as the predictive factor that largely affects the risk of increased social anxiety in children[4].

In addition, along with socio-economic development and urbanization in China, the traditional family structure has changed significantly[21], and the family structure is dominated by only child. Previous study found that young only children are more likely than those with siblings to have egocentric tendencies[22]. In particular, there remains a deep-rooted 'child-centred' value in China, which emphasizes parenting in family life. Consequently, many Chinese children are commonly described as egocentric, which can significantly affect their development of interpersonal closeness, social cognition, and behaviors. Moreover, Chinese children interact less frequently with their older relatives with the change in the roles of older adults in families today. It has become increasingly difficult for children to develop a positive attitude towards and intimacy with the elderly, which will largely affect intergenerational relationships and social skills of children. Therefore, many children experience challenges with interpersonal sensitivity, poor adaptation, and emotional dysregulation[4,6,23]. Given these trends, children's mental health has become an important educational issue in China, which should be concerned in the whole society.

Previous studies have already been conducted school-based health education programmes to decrease the adverse effects of children's mental health conditions[24–29], in which the effectiveness of these health programmes is confirmed. Health education programmes are often designed to target social perspective-taking (PT) ability, self-centeredness, cognitive behavior, and socialization of school-aged children and adolescents for reducing the risk and harmful effects of children's mental health problems[26–29]. Systematic reviews of previous studies on early intervention and targeted prevention indicated that most health programs mainly targeted adolescents[26], and specifically focused on one aspect of these mental health problems[28,29]. Furthermore, a health education programme involves complex intervention processes, which need specific guidelines to be reported and assessed. In recent years, only a few studies have conducted school-based health education programmes, which are tailored to primary school-aged children of different regions in China, for mental health problems[4,6,8]. Therefore, more studies are needed to explore the effectiveness in reducing the risk and harmful effects of mental health problems through adopting appropriate health education programme to intervene and train primary school-aged children in urban regions of China.

In the present study, we address this gap by design a health education programme for primary school-aged children in an urban area of China. The purpose of this programme is to ultimately help children decrease social anxiety, raise the ability to convey own feelings and opinions to others, and strengthen the development of interpersonal closeness, social cognitions, and behaviors among the children. We also assess the effectiveness of the health programme and then offer scientific evidence for health authorities and families to perform necessary interventions in the process of children's growth.

## Materials and Methods

### 1. Study design

The present study was a non-randomized controlled trial aiming to assess the effectiveness of a health education programme targeting primary school-aged children. The preliminary permission for the investigation conducted in the school was obtained from school administrators after introducing the purpose of the survey and the credentials of the researchers. Then, school-aged children in six classes, including 2 classes in grades 4, 5 and 6, respectively, were recruited from a primary school. Once enrolled, according to the class, we assigned all children in one class of each grade to an intervention group, and the other class to a control group. Each group contains three classes of grades 4, 5 and 6 to match the sample size and conveniently manage and organize

Table 1. Demographics of all primary school-aged children recruited in the survey

| | Intervention group (N=128) | | | Control group (N=129) | | | *p* |
|---|---|---|---|---|---|---|---|
| | N (%) | Male | Female | N (%) | male | female | |
| Grade | | | | | | | |
| Fourth | 41(32.0) | 20(15.6) | 21(16.4) | 43(33.3) | 24(18.6) | 19(14.7) | |
| Fifth | 43(33.6) | 26(20.3) | 17(13.3) | 44(34.1) | 24(18.6) | 20(15.5) | |
| Sixth | 44(34.4) | 25(19.5) | 19(14.8) | 42(32.6) | 26(20.2) | 16(12.4) | |
| Total | 128 | 71(55.5) | 57(44.5) | 129 | 74(57.4) | 55(42.6) | 0.802 |

investigation activities during the surveying process. In addition, six research assistants were recruited from a college to help conduct the survey through a series of interview activities.

## 2. Participants

For the present study, 257 primary school-aged children were chosen from a primary school in Jinan City of eastern China, aged from 9 to 12 years. Of these, 128 (71 male and 57 female) were assigned to the intervention group and 129 (74 male and 55 female) were assigned to the control group (Table 1). Prior to conducting the investigation, we provided a detailed introduction and explanation of the purpose and methods of the survey to all children and asked them to complete the questionnaires if they agreed to participate in this survey.

To calculate the necessary sample size, the G-power 3.1.7 programme was used, which is free and has been widely used in social and behavioral research[30]. In the G-power 3.1.7 programme, an effect size of 0.5, an $\alpha$ of 0.05 and a power of 0.95 were commonly used to assess the sample size during analyzing the difference between two independent group[30]. In the present study, the difference between before and after the intervention for the intervention and control groups was analyzed using paired data. In total, the present study required 110 participants per group to achieve an effect size of 0.5, a power of 0.95 and an $\alpha$ of 0.05. Given the sample size ($N = 257$), the present study was sufficiently powered.

## 3. Constitution of the education programme contents using conceptual frameworks

The contents of the health education programme were based on two conceptual frameworks, which are the Voices of Love and Freedom (VLF) programme[31] and the intergenerational programme (IGP)[32]. According to the VLF programme, primary school-aged children have the capacity to be schooled in managing their emotions toward developing important social competencies at an early age, which may well provide supports to resolving the lack of moral ethics, social skills, sensitivities toward others, and classroom violence of primary school-aged children. The VLF program has been confirmed which has a positive influence on the cognitive aspects of social skills of primary school-aged children[33]. Social skills, such as perspective-taking, empathy, and responsible decision-making, allow primary school-aged children to develop healthy relationships with their peers and teachers, and then have positive effects on their psychological health. On the other hand, the IGP involves organized interactions between school-aged children and the elderly for facilitating cooperation and exchange among them[32,34]. According to the IGP, contact and communication between members of younger and older age groups can reduce negative attitudes and increase positive attitudinal change, which in turn foster the benefits for school-aged children and the elderly.

By combining the frameworks of the VLF and IGP, we designed a health education programme for primary school-aged children in an urban area of China and attempted to help them reduce the risk and harmful effects of mental health problems and improve their abilities to understand each other and to resolve interpersonal conflicts. In the present study, we carried out two times the educational interventions for the intervention group, and conducted two times self-reported questionnaires for the intervention and control groups. Then, three measurement scales were used to evaluate the effectiveness of the education programme. Detailed information regarding the interventions and measurement scales is provided below. Outcomes of the education programme were expected to include four components of children's benefits (Figure 1).

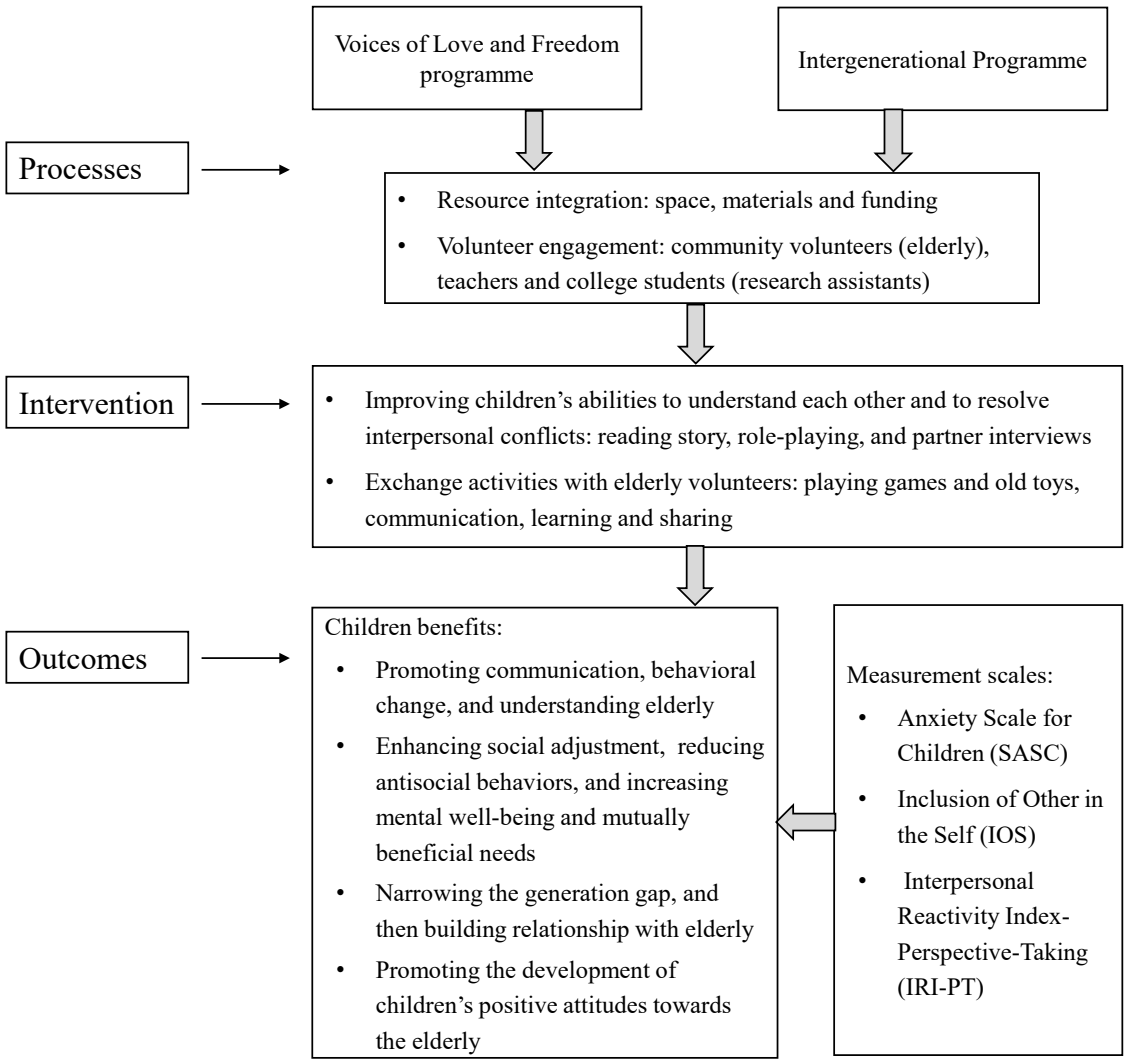


Figure 1. Concept framework of the health education programme

#### 4. Measurement

To assess the effect of the intervention conducted in the present study, three assessment scales were used. The scales are briefly described below.

We used the Social Anxiety Scale for Children (SASC)[35] to evaluate children's social anxiety. The SASC is a 10-item self-reported measure and each item is scored on a 3-point scale, which ranges from 0 (not at all) to 2 (all the time). Two distinct SASC subscales have been identified, including the fear of negative evaluation (FNE) and social avoidance and distress (SAD) scales. The score of each item is summed to derive a total score, for which the lowest and highest values are 0 and 20, respectively. Higher total scores indicate higher levels of social anxiety. Ma (1993)[36] first used the Chinese version of the SASC scale to evaluate children's social anxiety in China. Subsequent studies developed the norm of the SASC in urban China, and have confirmed the reliability and validity of the SASC Chinese version in assessing social anxiety among children living in urban China[4,10,37,38]. In this study, we used the Chinese version of SASC to conduct the survey, and the reliability of the scale was assessed using Cronbach's alpha ($\alpha$). The values of the Cronbach's $\alpha$ for two investigations before and after interventions were 0.809 and 0.887, respectively. Thus, the SASC scores appeared to have acceptable reliability.

The Inclusion of Other in the Self (IOS) scale is a pictorial assessment of interpersonal closeness and attempts to capture the respondent's views of a relationship[39]. The scale can be completed quickly and has shown

Table 2. The contents outline of the health education programme

| Items | Contents |
|---|---|
| **First time (Sep. 28, 2017; 60 min)** | |
| 1. Connection: import (25 min) | 1) Teacher's encouragement: warming up<br>2) Sharing stories of teachers who experienced special/dangerous things in life and related experiences that they dealt with them in those situations<br>3) Taking about school-aged children's thoughts when they could face the experiences mentioned above and their treatment process<br>4) Sharing children's own experiences and treatment process with each other |
| 2. Reading and Discussion (15 min) | 1) Reading a story, which required children to understand different points of view of characters in a story<br>2) Discussion their learning |
| 3. Practice for fostering social perspective-taking ability (15 min) | 1) ABC of role-playing<br>2) Partner interviews<br>3) Fostering the social perspective-taking ability |
| 4. Expression for promoting social skills (5 min) | 1) Children summarize learnings through the activities mentioned above<br>2) Children record learnings, thoughts, and experiences in the diary |
| **Second time (Nov. 3, 2017; 60 min)** | |
| 1. Games to promote exchange (15 min) | 1) Playing a game named 'common interest through finding card' between children and the elderly<br>2) Looking for their common interest to increase a sense of intimacy with each other |
| 2. Sharing activities to enhance mutual understanding (10 min) | 1) Using children's pictures taken during different periods to share happy time with the elderly<br>2) Sharing the life experiences of the elderly with children |
| 3. Common activities to foster mutual understanding (20 min) | 1) Teaching children how to play old toys played in the elderly's childhood<br>2) Playing old toys together |
| 4. Games to deepen exchange and improve interpersonal interaction skills (10 min) | 1) Constitutive group encounter – Game: guess first game (i.e., Scissors, stones, cloth games)<br>2) A praise game, in which the children needed to put forward the advantages of each other, and praised each other |

minimal susceptible to social desirability bias. Moreover, it is suitable for various populations and research environments[39]. The scale contains seven figures, each consisting of two circles with the identical area. In each figure, one circle refers to the self, and the second circle refers to the 'other' in the relationship. Respondents can select a figure, in which the overlapping degrees of two circles can best describe their relationship with the relevant person. For example, if there is no relationship between a respondent and a person, the first figure would be selected naturally, in which the two circles are disjoint. In contrast, if there is very close relationship between a respondent and a person, the last figure would be selected naturally, in which the two circles almost completely overlap. The seven figures are arranged from low to high overlapping degree, scored from 1 to 7. Higher score, i.e., higher degree of overlapping circles indicates higher intimacy, which is usually regarded as closeness[39].

The Interpersonal Reactivity Index (IRI) is a multi-dimensional approach for assessing empathy[40]. It is a 28-item self-reported measure, with each item rated on a 5-point Likert scale varying from "Does not describe me well" to "Describes me very well". The scale consists of four 7-item subscales including the fantasy, perspective-taking (PT), empathic concern, and personal distress scales. This study used the PT scale to assess children's PT ability, which is defined as the ability to consider the states of the hypothetical perception, cognition, or emotion of others[41]. The scale has been widely used to study Chinese children's PT ability, and these studies have confirmed the reliability and validity of the PT Chinese version[42-46]. The score of each item is summed to derive a total score, for which the lowest and highest values are 0 and 28, respectively. Higher PT scores indicate better social functioning as well as with higher self-esteem[47]. In this study, the values of the Cronbach's $\alpha$ for two investigations before and after interventions were 0.679, and 0.862, respectively.

### 5. Educational intervention

Prior to conducting the intervention, all school-aged children in the intervention and control groups completed the self-reported questionnaires during class time on September 11 2017. The education programme content is provided in Table 2. During the surveying process,

each class had a research assistant, who organized survey activities and was responsible for introducing and explaining the items of the task instructions until children clearly understand how each test and activity was taken. Research assistants also ensured the safety of children and the elderly and provided individual help for them who experienced difficulties in the replying questionnaire and the intervention activities during the surveying process. After the survey, research assistants were responsible for collecting the self-reported questionnaires and the items used in the intervention activities. The researcher was fully responsible for organizing and coordinating the entire investigation activities, and maintained contact with school administrators to ensure the smooth completion of the entire investigation. Before conducting the intervention programme, the researcher trained all research assistants how to carry out the survey activities and deal with the problems that may be encountered during the surveying process.

Subsequently, the intervention programmes were respectively carried out during class time on September 28 and November 3 2017, which lasted approximately 60 minutes at one time. For the intervention group, children in each class were divided into four or five subgroups, and two intervention sessions were carried out for each subgroup (Table 2). The 13 elderly aged 65 years or older were recruited from the community and participated in the second intervention session. During the same time, the control group did not participate in any intervention activities but participated in the regular learning arrangement of the school. Although the control group did not conduct any intervention activities, it is possible that items we investigated in the present study may change during the surveying progress, since primary school-aged children are in the growth stage, in which they can learn and grow a lot in their daily classes and lives. Intervention was conducted only for the intervention group, in addition to the regular learning arrangement of the school.

Each intervention session involved four subcategories (Table 2). The first session was composed of intervention import, reading and discussion, social perspective-taking ability, and social skills. The second session included exchange, sharing activities, common activities, and games. For each subcategory, different educational methods were used, including quiz games, role-playing, and group discussions, which are effective for children[48].

### 6. Data collection

Data collection was conducted after obtaining informed parental consent, in which anonymous self-reported questionnaires were distributed to 257 school-aged children of grades 4–6 from a primary school. In the surveying process, each child was numbered for collecting questionnaires before and after the intervention. Baseline data were collected on September 11 2017 before the intervention, while data were collected for two groups after the intervention on November 3 2017.

### 7. Data analysis

Statistical analyses were performed using IBM Statistical Package of Social Sciences (SPSS) version 22 for Windows. A $p$-value of less than 0.05 was regarded as statistically significant. Descriptive analyses such as mean, median and standard deviation (SD) were used to describe the characteristics of the intervention and control groups.

Prior to analysis, the normality of the collected data was examined by obtaining the skewness, kurtosis and Shapiro-Wilk test. Our analyses found that the values of skewness and kurtosis were 0.846 and 0.436, respectively, while the significance level for the Shapiro-Wilk test was 0.001. This implies that the collected data is not a normal distribution. Table 1 shows the characteristics of each group before implementing the investigation. We used Fisher's exact test to compare the gender differences between the intervention and control groups. The Wilcoxon signed-rank test was implemented to analyze the change in outcome variables in each group, while the Mann-Whitney U test was employed to compare the differences in outcome between the intervention and control groups.

### 8. Ethical considerations

The present study received approval from the Ethics Review Committee of Tokyo Medical and Dental University (Approval No. M2016–319). We have registered this trial with UMIN-CTR clinical trial (UMIN000026458). For primary school-aged children recruited in this survey, we provided with verbal and written information on the purpose and methods of the survey to their parents and asked them to bring the information to their parents. The parents were asked to provide written assent. Then, we obtained informed consent to participate in this investigation from their parents.

## Results

The study participation flow chart is shown in Figure 2. Of all primary school-aged children participated in the survey, 56.4% were boys and 43.6% were girls. After the intervention, six children (4.7%) in the intervention

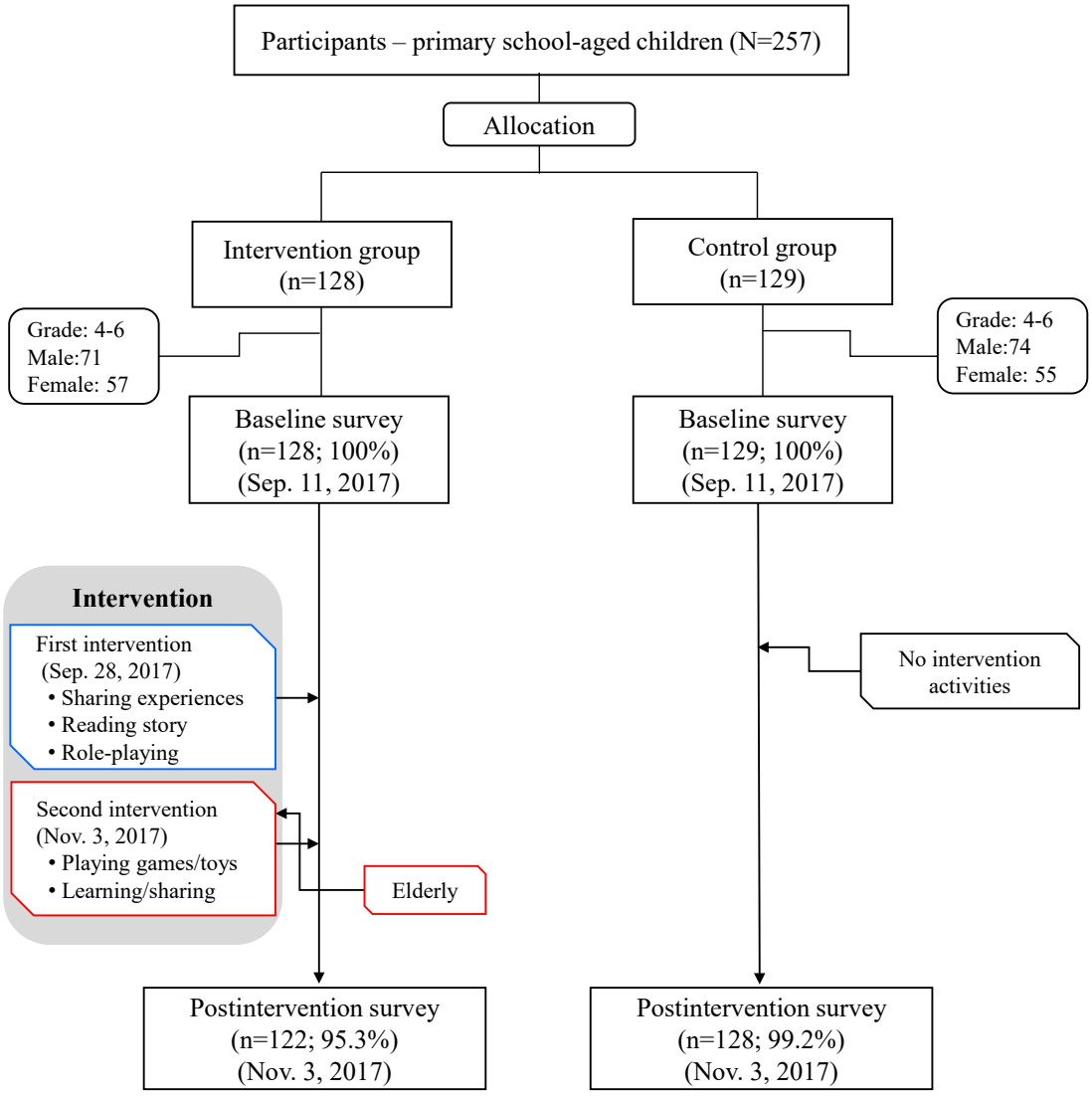


Figure 2. Trial flow chart of the participants in the intervention and control groups

group and one child (0.8%) in the control group did not participate in the survey. In total, 122 students (95.3%) in the intervention group and 128 (99.2%) in the control group completed all questionnaires. As shown in Table 1, there was no significant difference in genders between the intervention and control groups ($p = 0.802$).

The statistics of assessment scales' scores for the intervention and control groups are presented in Table 3. A comparison of the intervention group and the control group at baseline did not show any statistically significant differences in scores of three scales ($p > 0.05$; Table 3). After the intervention, there was statistically significant differences in scores of the IOS and IRI-PT scales ($p < 0.05$), although it was not statistically significant in scores of the SASC, FNE, SAD. Among the intervention group, there was significant differences in scores of the SASC, IOS, and IRI-PT scales pre- and post-intervention (Table 3 and Table 4), with marked statistical significance ($p < 0.05$). In contrast, no significant differences in the scores of the SASC, IOS and IRI-PT scales for the control group were observed before and after interventions (Table 3). These findings revealed that the educational intervention had a positive influence on reducing social anxiety, improving interpersonal closeness, and increasing PT ability among primary school-aged children.

Table 3. Values in measurements for the intervention and control groups before and after interventions

| Variable | Intervention group (N=122) | | | | Comparison of within groups | Control group (N=128) | | | | Comparison of within groups | Comparison of between groups | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Baseline | | After intervention | | | Baseline | | After intervention | | | Baseline | After intervention |
| | Median | Mean±SD | Median | Mean±SD | $p^a$ | Median | Mean±SD | Median | Mean±SD | $p^a$ | $p^b$ | $P^c$ |
| 1. SASC | 5.0 | 5.38±4.26 | 4.0 | 4.67±1.46 | 0.004 | 4.0 | 4.61±3.42 | 4.0 | 4.61±4.04 | 0.163 | 0.399 | 0.897 |
| FNE | 3.0 | 3.56±2.97 | 3.0 | 3.00±3.04 | 0.000 | 3.0 | 2.88±2.39 | 3.0 | 2.78±2.66 | 0.368 | 0.109 | 0.733 |
| SAD | 1.0 | 1.82±1.88 | 1.0 | 1.67±1.92 | 0.273 | 2.0 | 1.85±1.66 | 1.0 | 1.83±1.78 | 0.825 | 0.489 | 0.260 |
| 2. IOS Scale | 7.0 | 6.14±1.21 | 7.0 | 6.31±1.19 | 0.020 | 6.0 | 5.81±1.45 | 6.0 | 5.82±1.46 | 0.914 | 0.061 | 0.046 |
| 3. IRI-PT scale | 13.0 | 13.05±4.12 | 16.5 | 15.11±5.30 | 0.000 | 16.0 | 14.97±3.68 | 16.0 | 15.10±4.70 | 0.320 | 0.547 | 0.000 |

a) Wilcoxon signed-rank test $p < 0.05$
b) Mann-Whitney U test: comparison between the intervention and control groups for baseline
c) Mann-Whitney U test: comparison between the intervention and control groups after the intervention
Abbreviation: SASC, Social Anxiety Scale for Children
FNE, Fear of Negative Evaluation
SAD, Social Avoidance and Distress
IOS, Inclusion of Other in the Self
IRI-PT, Interpersonal Reactivity Index-Perspective-Taking

Table 4. Comparison of the IRI-PT score in different grades for the intervention and control groups before and after interventions

| Group | Grade | Before Intervention | | After Intervention | | *p* |
|---|---|---|---|---|---|---|
| | | Median | Mean±SD | Median | Mean±SD | |
| Intervention group | 4 | 12.0 | 11.85±4.69 | 15.0 | 13.39±5.78 | 0.015 |
| | 5 | 13.0 | 13.88±3.56 | 17.0 | 15.97±4.64 | 0.004 |
| | 6 | 13.0 | 13.34±3.89 | 18.5 | 15.98±5.09 | 0.001 |
| Control group | 4 | 14.0 | 13.70±4.59 | 14.0 | 14.00±4.73 | 0.902 |
| | 5 | 16.0 | 15.00±4.23 | 16.5 | 14.89±5.16 | 0.884 |
| | 6 | 16.0 | 15.57±2.94 | 18.0 | 16.52±3.77 | 0.180 |

Wilcoxon signed-rank test $p < 0.05$

## Discussion

The present study examined the feasibility and effectiveness of implementing a health education intervention programme for reducing the risk of children's social anxiety disorders in a primary school in an urban area of China. Our results found that the educational interventions for school-aged children resulted in significant and desirable effects for social anxiety for the intervention group, compared to those for the control group. Social anxiety disorder comprises one of the most prevalent anxiety disorders in the process of children's growth[11], and exerts a crucial role in the development of maladaptive social behavior of children. It is characterized by a strong and irrational fear of embarrassment in social situation or performance[49], which can significantly affect the physical and mental health of children[4,13,14]. It is noteworthy that the development of children's mental health and the formation of children's social behavior is long-term and multi-faceted processes[4,13,14]. In the present study, the education interventions were conducted over a short-term period, which is a relatively short duration in the context of the mental health development of school-aged children. Consequently, our analysis indicated that there was no significant difference in the mean score of the SAD in the SASC scale for the intervention group before and after interventions compared to that of the FNE. This implies that education interventions require the long-term implementation to help reduce social anxiety in school-aged children. Overall, the educational interventions conducted in the present study were feasible and effective for decreasing social anxiety in school-aged children. Therefore, our results can assist in family, school, and health authorities to decrease the risk of the development of elevated social anxiety through implementing necessary interventions when appropriate in the process of children's growth.

Our previous survey in China found that children who have cohabitation experiences with the elderly have higher levels of intimacy with the elderly compared to those without cohabitation experiences[50]; furthermore, a significantly higher percentage of such children were also interested in the life experiences of the elderly people. In the present study, the closeness of the relationship between primary school-aged children and the elderly was assessed using the IOS scale. The combination of learning and sharing activities can foster the relationship and understanding among the elderly and primary school-aged children, which may lead to children viewing the elderly more positively and less negatively. A game called 'looking for common interests' was used to help children identify similar interests with the elderly and to promote a mutual connection. Our findings revealed that the interventions carried out in the present study may effectively increase the closeness or intimacy between primary school students and the elderly. Our results are in good agreement with previous studies[50–52], which highlighted the mutual benefits of the intervention activities between children and the elderly. The implications of our findings are of vital importance, and suggest that it is necessary for primary school students to conduct school-based intervention programmes, which can foster positive attitudes and enhance the intimacy between primary school-aged children and the elderly, and in turn improve intergenerational relationships and social skills of children.

Furthermore, the present study explored the development of PT ability among Chinese primary school-aged children through conducting a series of educational intervention activities, which is assessed using the IRI-PT scale. PT is regarded as the ability to consider or understand a situation from another individual's point of view[41,47]. Children's PT ability is the key to children's social-cognitive development and enables them to predict others' behavior and reactions, thereby promoting positive and more rewarding interpersonal relationships[47]. Higher scores of the PT scale are related to better social functioning as well as higher self-esteem[47]. Therefore, the development of PT ability can significantly impact the socialization process of children. Our analyses revealed an age difference in PT scores, which was consistent with previous studies[45,46,53,54]. Children in the fourth grade had lower PT scores than those in the fifth and sixth grades in both the intervention and control groups. The observed age differences may be due to the varying stages of the children's cognitive development, as younger children may have less knowledge and understanding of others' perspectives. According to PT definition, the development of children's social PT ability involves two basic conditions. Children must be able to suppress egocentrism and also distinguish their own views from those of others, and then they have the ability to use relevant information to understand other people's opinions, thoughts, and emotions[45,46,53–55]. It can be seen that the development of PT ability is gradual and progresses throughout the life course, which is a capacity with a large starting and ending span. Moreover, children in the fourth grade may think mainly in concrete images, and their logical reasoning ability is still at a relatively lower level, compared to those in the fifth and sixth grades. Following a series of the educational intervention designed in the present study, children's PT ability in the intervention group significantly increased compared to that before the intervention. Our findings suggested that this educational intervention may promote the formation of social PT ability among children. Therefore, the implications of these findings are of great importance and can inform policy related to school-based interventions that aim to increase PT ability and promote social-cognitive development in children.

Despite these encouraging findings, the present study had several limitations. Participants were divided into the intervention and control groups by the class, rather than randomly assigned individually. The present study therefore used a non-randomized controlled trial rather than a randomized controlled trial. Therefore, there may introduce bias in the use of non-randomized controlled trial, in which allocation is not actually random, and any observed difference in outcome between the intervention and control groups may be resulted from differences in the characteristics of the two groups rather than the effectiveness of the intervention. Consequently, it is necessary for the future study to use randomized controlled trial to assess the effectiveness of the health education programme. Compared with the development process of children's mental health, our health education programme was carried out only during a short-term period, which may have less influence on improve some symptoms of children's mental health. Therefore, future study could involve a longer period of the intervention time, and then evaluate the long-term effect of the program. It is noteworthy that we only investigated a group of primary school-aged children in an urban area of eastern China. As a result, cross-cultural comparisons with students in other regions of China were not considered. The present study did not address an important issue of similarities or differences among children's development in China. Therefore, future study could consider a comparison of matched samples of primary school-aged

children from different cultures or various regions in China, and should increase the number and duration of interventions to resolve the potential limitation of the present study. In addition, previous study found that variations in severe family dysfunction, quality of life and self-esteem, which can be as predictive factors for childhood elevated social anxiety[4], have largely affected the risk of increased social anxiety in children. Therefore, future work could conduct more interventions focusing on these predictive factors mentioned above to reduce the risk of increased social anxiety in children.

## Conclusion

The present study was designed to conduct the health educational programme to enable primary school-aged children with competence regarding mental health. Our results indicated that a series of the educational intervention had a profound influence on the development of children's social anxiety and PT ability, as well as on their interpersonal closeness. The findings suggested that educational interventions can decrease social anxiety and improve interpersonal closeness, and increase PT ability among children. Moreover, interaction and communication with the elderly in intervention activities can enhance intimacy between primary school-aged children and the elderly and promote the development of positive attitudes towards the elderly.

Overall, these findings are of great importance for the development of children's social-cognition and the formation of children's social behavior in their growing process. In particular, these findings can assist in family and educational and health authorities in the development and implementation of school-based educational interventions that promote healthy childhood development.

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