

## Research Article

# Competitive Contexts Reduce Children's Motivation to Tell White Lies Based on Big Data Analysis

Yunrui Sun <sup>1,2</sup> Yong Lyu <sup>1,3,4</sup> and Jing Ma <sup>5,6</sup>

<sup>1</sup>Faculty of Psychology, Tianjin Normal University, Tianjin 300000, China

<sup>2</sup>Tianjin Normal University Jingu College, Tianjin 300000, China

<sup>3</sup>Key Research Base of Humanities and Social Sciences of the Ministry of Education, Academy of Psychology and Behavior, Tianjin Normal University, Tianjin 300000, China

<sup>4</sup>Tianjin Social Science Laboratory of Students' Mental Development and Learning, Tianjin 300000, China

<sup>5</sup>School of Psychology, Shaanxi Normal University, Xi'an, 710000 Shaanxi, China

<sup>6</sup>Shaanxi Provincial Key Research Center of Child Mental and Behavioral Health, Shaanxi, China

Correspondence should be addressed to Yong Lyu; [ly6312@163.com](mailto:ly6312@163.com)

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There is a growing interest in the wireless technology to complement the traditional model-driven design approaches with data-driven machine learning- (ML-) based solutions. Telling a white lie is a distinct type of prosocial behavior, because in terms of the nature of lies, it is a lie but its motivation is to benefit someone else. It is unclear how children behave when they are caught in a conflict between prosocial motivation and the psychological cost of losing in a competition. Big data analysis can improve work efficiency, make analysis work more organized, and make analysis results more accurate. So the purpose of this study was to investigate the motivation of children to tell white lies by using big data analysis to examine the effects of different competitive situations on white lie behavior among 6- to 11-year olds. A final-round-of-game paradigm was used to elicit prosocial white lies in children under varying competitive conditions. These were explored in two studies. In the study, two groups of children ( $N = 177$ ,  $M_{\text{age}} = 104.41$  months,  $SD = 1.74$ , 50.8% boys) participated in either baseline conditions or a competition against others. More children tended to tell the truth in the others-competition context group, and boys tended to be more truthful. These findings show that a decision of whether to tell a white lie is influenced by the psychological cost to children.

## 1. Introduction

From a very early age, children are taught to be honest, as lying has negative consequences [1, 2]. However, parents also explicitly or implicitly teach children to hide the truth or to actively deceive to make others feel better [3, 4]. Accordingly, children are socialized into telling white lies if they think honesty is not the best way of communicating. A white lie is a special type of prosocial behavior, which is different from a black lie (told to conceal a mistake or avoid punishment). White lies are told to avoid causing negative emotions for the listener or for the benefit of others [5]. However, although white lies are well-intentioned, the behavior is not without a hidden agenda from the liar. In this regard, white lies are committed because it benefits (or protects) the other, while also

only costing the liar a small price [5–7]. White lie behavior is a violation of basic social moral standards, while maintaining the basic principles of interpersonal communication [8–10]. The use of white lies promotes the establishment and maintenance of more positive social connections between people [4, 11–14], and a discussion on white lies provides new perspectives on the study of communication skills in the socialization process of children [3, 4].

Erat and Gneezy categorized white lies based on the changes in benefits for both parties (liar and recipient) [7]. White lying occurs in two contexts. One is when it benefits the liar's own and others' interests, at the same time. The other context is when it benefits others at the risk of harming the liar's own interests. In other words, in the second context, once a white lie is told, the child will be caught in an

interpersonal context in which the cost to self-interest conflicts with the interests of others. Previous studies have focused on white lies in interpersonal situations with no cost conflict [12, 14, 15]. Popliger et al. studied children's white lie behavior in a context in which there is a conflict between prosocial motivation and material costs by using a disappointing-gift paradigm. They found that children were more likely to tell a white lie in a low-cost context than in a high-cost context [9]. Nagar et al. also demonstrated that induced empathy only predicted 7- to 11-year-old children's prosocial lying and sharing behavior in a low-cost context [6]. However, induced empathy does not necessarily produce more prosocial lies in a high-cost context. The costs in the above studies were tangible and material. The current study intended to explore how children choose when they face interpersonal conflicts between prosocial motivations and intangible psychological costs.

## 2. Literature Review

Within an educational environment, competition often occurs in the daily learning and living environment of primary school students [16]. While a fierce sense of competition has gradually spread to primary and middle schools, students placed under its invisible pressure may feel motivated to employ strategies to win and avoid losing. Furthermore, most primary school students learn and begin to have a strong sense of competition within this environment [17, 18]. A number of experimental studies have shown that competition promotes more selfish behaviors in resource dilemma tasks and can lead to unethical behaviors [19, 20], such as cheating [21–23]. Moreover, many studies have demonstrated that lower competitive motivation is related to prosociality, such as altruistic behaviors [24, 25]. The reason why competition leads to various negative actions is closely related to students' clearly defined goals, desire to undertake an additional challenge, and motivation to achieve [17, 26]. Therefore, competition not only becomes a type of psychological motivation strategy that reflects self-worth and ability but also plays a role in evaluating the performance of students relative to others [16, 26].

To examine why competition leads to a decrease in prosocial behavior, Rigdon and D' Esterre introduced the concept of "priming effect" [27]. They posited that when notions related to competition, such as scored, won, outshines, defeated, unbeatable, higher, dominated, determined, trophy, goal, and unstoppable, are primed, individuals are much more motivated to win a competition. Competition stimulates children's achievement motivation. Therefore, they define success as surpassing others [28]. Fear of failure is an escape-oriented achievement motivation because failure means that important goals are threatened [29]. Once an individual fails in a competition, there are negative psychological consequences, such as anxiety, humiliation, and shame. Fear of failure, as a motivational structure, may interfere with the generation of prosocial will. Therefore, people are more likely to be driven by goals to win.

Shields and Bredemeier proposed conceptual metaphors to explain competition [30]. When individuals explain com-

petition through using the conceptual metaphor of contest-is-war, the purpose of competition is to win, and the winner will receive material or spiritual rewards. Competition will be transformed into competition with others [30–33]. Considering that hard work followed by failure would be indicative of low ability, while a sense of higher interest and enjoyment is induced in cases of victory, students put more effort into competitive environments; and in determining performance, students in competitive environments reported higher levels of perceived competence and sense of self-worth [18, 26]. As such, competition can provide them with an opportunity to prove and cultivate their ego [30]. Funk et al. further confirmed that usually competition participants unconsciously use conceptual metaphors to explain the goals and objectives of the competition [34]. The competitor, who puts on a mask of invincibility, elevates winning or self-aggrandizement above all other goals and values [30, 33]. Therefore, according to the theory of conceptual metaphor in competition, children will prioritize more material or spiritual rewards.

Furthermore, competition involves social comparisons. Festinger's social comparison theory considers that the drive for self-evaluation and the necessity for this evaluation to be based on comparison with others motivate people to minimize discrepancies between themselves and others and to protect their own advantages [35]. This drive leads to competitive behavior. Garcia et al. presented a social comparison model of competition to verify whether social interactions and comparisons are indispensable links in competition and eventually produce it [36]. In an others-competition context, individuals often exhibit a challenge-seeking motivation pattern; they tend to associate success with high talent, and these individuals are motivated to demonstrate superior abilities. According to the above theory of competition, we hypothesized that facing the psychological cost of competition and prosocial willingness, children will prioritize those whose interests have a greater impact. They showed that more competition was brought about by higher similarity between two individuals. Individuals protect themselves from competition caused by an invisible threat that they would be replaced by an individual similar to them. Therefore, confronted with a similar individual, children often increase competitiveness by exhibiting a challenge-seeking approach to demonstrate superior abilities. Moreover, Zhu et al. found that competition for limited resources tends to undermine one's prosociality [37]. When others acquire more resources, the jealousy is more likely to lead to competition. Furthermore, in competitive contexts, people's perspective leads them to do whatever it takes to prevent themselves from being eliminated. According to the social comparison theory of competition mentioned earlier, we hypothesized that in order to maintain a superior relative position when comparing oneself with others, children will prioritize those whose interests have a greater impact.

Many studies have shown that gender is an important factor affecting competition. In the competition for resources, boys are generally more competitive and have a greater preference for competitive situations than girls. In cooperative competitive games, boys' competitive behavior

is enhanced [38, 39]. It could be seen that boys were more competitive than girls. Hence, in this context, we proposed the hypothesis that girls tell white lies more than boys in different competitive contexts. Regarding the choice of participants' age, according to Piaget's theory, children should have at least the following abilities to produce "real" competitive behaviors first, they should have an understanding of fighting for an object or event and believe that they can fight for it, and at the same time, they should understand that others are also fighting for the same objective. Second, they should understand the rules of winning or losing and be able to distinguish between the two. Thus, children's competitive behavior begins with the inevitable comparison with the competitor, and they do not display a real sense of competitive behavior until the ages of five and six. As children grow older, the object of competition shifts from others to themselves. Therefore, this study selected primary school children from grades one to five to examine the influence of different competitive situations on their white lies in two separate studies.

In summary, to date, research on the relationship between competition and lies has primarily focused on antisocial lies. It was confirmed that competition causes more antisocial lies [19, 27]. Our study was the first to explore whether children are willing to pay a psychological price to tell white lies in different types of competitions. To compare white lie decision-making in children in different competitive contexts, using an improved version of the final-round-of-game paradigm [10], we aimed to explore the following research question "Will children change their prosocial decision-making in different competitive situations and conflicts of prosocial will?"

### 3. Methodology

**3.1. Participants.** The study participants were 180 children between ages 6 and 11 ( $M_{\text{age}} = 104.04$  months,  $SD = 1.76$ , 50.8% boys). A power analysis (G Power 3.1) [40] was run to calculate sample size, which showed that 180 participants were sufficient for an effect size ( $\eta^2p$ ) of 0.1, with significance at the 5% level and power ( $1-\beta$ ) of 0.8. The children were all Han Chinese from families of all walks of life within a large city in Eastern China. All participants gave written informed consent before being enrolled in the experiment, which was obtained from their parents or legal guardians prior to the beginning of the study. Participants were randomly assigned to one of two conditions, with 90 in each. Three children were excluded because they failed to maintain semantic leakage control. Therefore, the final sample consisted of 177 children ( $M_{\text{age}} = 104.16$  months,  $SD = 1.74$ ; 50.8% boys): 57 aged 6–7 years ( $M_{\text{age}} = 79.2$  months,  $SD = 0.49$ ; 54.4% boys), 60 aged 8–9 years ( $M_{\text{age}} = 103.80$  months,  $SD = 0.48$ ; 50.0% boys), and 60 aged 10–11 years ( $M_{\text{age}} = 128.04$  months,  $SD = 0.51$ ; 58.3% boys). They were all from the same primary school, and written informed consent was obtained from their parents before being enrolled. The study was approved by the research ethics committee in the Academy of Psychology and Behavior at the Third

Affiliated Primary School of Tianjin Normal University, China. A total of 89 children ( $M_{\text{age}} = 104.76$  months,  $SD = 1.76$ , 49.4% boys) were assigned to an others-competition condition. The other 88 children ( $M_{\text{age}} = 104.16$  months,  $SD = 1.76$ , 52.3% boys) were assigned to a baseline condition.

**3.2. Design and Procedure.** The study used a 2 (context: others-competition, baseline)  $\times$  2 (gender: boy, girl) between-participants design. We hypothesized that children in the baseline condition were more likely to tell the white lie than in the others-competition condition (H1a); girls are more likely to tell white lies than boys (H1b).

Before the start of the experiment, the game rules and precautions were explained to every child. The procedure was carried out by two researchers, each of whom played one of two roles: experimenter 1 (E1) and experimenter 2 (E2). Children were tested individually. They played a board game with E1. A die with six different photos on each side (Penguin, orange, pig, watermelon, potato, and peach) was used. There was also a playing board containing a grid with 36 photos (six copies of each photo). Both players had six tokens and they took turns rolling the die to determine where they needed to place the pieces. The winner of each round received a token. Both of them rolled the die and raced to place pieces until no other matching photo remained on the board (see Figure 1). Before the final round, E1 performed an action that varied according to the experimental conditions.

The others-competition condition comprised the following steps. E1 introduced the game to the children, practiced twice, and then started the experiment. In Step 1, E1 told the child: "Now, you and I are going to start this board game. There will be four rounds, and one of the players receives a token for each round they win. Your classmate is also playing a game with another experimenter in another classroom. You will compete with your classmate (randomly naming one of the students in the child's class); whoever gets the most coins is the winner." In Step 2, the rounds were rigged so that the child won the first two and lost the third. Before the last round of the game, E1 said to the child, "So far you've won two rounds and lost one. You did a good job. Now, you have another chance to win. Your classmate, who wins the most in your class, has won three times. If you win the last time, you will surpass him/her and become the final winner!" For Step 3, in the fourth round (final round), E1 told the child that they had to leave for a short while, and E2 would take over and continue the game. The game outcome was rigged by E2, deliberately allowing the child to win the final round so that he/she could surpass his/her classmate's performance. However, after the game, E2 asked the child to report that E2 had won so that E2 could win one token.

The baseline condition comprised the following steps. Step 1, in which E1 told a child that they would play four rounds of the game, with one of the players receiving a token for each round that they won. In Step 2, the rounds were rigged so that the child would win the first three. Before the last round of the game, E1 said to the child, "You've



FIGURE 1: Example image of board game.

won three rounds. You did a good job. Now, you have another chance to win. Step 3 consisted of the fourth round (final round), in which E1 told the child that they had to leave for a short while, with E2 taking over and continue the game. The outcome of the game was rigged by E2, deliberately allowing the child to win the final round. However, after the game, E2 asked the child to report that E2 had won so that E2 could win one token.

After the child agreed or disagreed with E2's request, E1 returned to the room and asked the child who won the final game. Based on previous studies [10], to deceive another successfully, lie-tellers must avoid inconsistencies between answers. E1 went on asking the child: "How many tokens did you have left?" (i.e., semantic leakage control). E1 then gave the "winner" tokens. We coded the result as a white lie only if the child maintained semantic leakage control by saying that E2 had won the final game and replied that they got the tokens that they deserved for losing the last round. The code for a white lie was 1 point; otherwise, if the child told the truth or failed to maintain semantic leakage control, 0 was used. If the child lied to E1, E1 would tell E2 that they should not have asked the child to lie and that the token should belong to the child. E2 then paid back the token to the child and thanked the child for being kind, explaining to them that the purpose of using white lies is to comfort a sad partner, and there is no need to tell lies after the sad partner has left.

#### 4. Results

Preliminary analyses showed that age variables had no significant effect on children; therefore, they were excluded from subsequent analyses. The white lie rates broken down by condition and gender groups are shown in Table 1. As indicated in the table, 22.7% of boys told a white lie in the others-competition condition compared with 41.3% who told a white lie in the baseline condition. The white lie rates broken down by group are 31.5% for the others-competition condition and 47.7% for the baseline condition (see Figure 2).

We then conducted a binary logistic regression analysis with telling a white lie (0 = truth, 1 = whitelie) as the predicted variable, and gender, condition, and gender-by-condition interaction as the predictor variables. Gender was entered as the first step, condition as the second step, and the gender-by-condition interaction as the final step.

While the first step with gender was significant, the  $\chi^2$  test was used to further determine the difference between genders. The results showed that the gender difference was statistically significant ( $\chi^2_{\text{gender}} = 4.11, p < 0.05$ ). The percentage of boys (32.2%) telling white lies was lower than that of girls (47.1%), with  $B = 0.63$ , Wald (1) = 4.07,  $p < 0.05$ , and odds ratio = 1.90, which suggests that the odds of the girls telling white lies were 1.90 times higher than those for the boys. To determine the difference between conditions in children's white lie behavior, the  $\chi^2$  test was also used. The results showed that the conditions differed with statistical significance in terms of white lie behavior ( $\chi^2_{\text{condition}} = 4.90, p < 0.05$ ). Of interest was whether children would rather help others to cheat in the baseline condition than in the others-competition condition. Specifically, children in the baseline condition were significantly more likely to tell the white lie than in the others-competition condition,  $B = 0.73$ , Wald (1) = 5.21,  $p < 0.05$ , and odds ratio = 2.07, which suggests that the odds of children in the baseline condition telling a white lie are 2.07 times higher than for those in the others-competition condition. The gender-by-condition interaction term was not significant,  $B = -0.28$ , Wald (1) = 0.19,  $p = 0.67$ . The full model is shown in Table 2.

#### 5. Discussion

The present study investigated the motivation of children to tell white lies by examining the effects of others- and baseline situations on white lie behavior among 6- to 11-year olds. We used a final-round-of-game paradigm in which participants had to decide whether to help others pretend to have won the game, with the price of doing so being the participant facing failure. The findings indicated that more children tended to tell the truth in the two competitive situations than in the baseline condition, showing that competing with others significantly reduces children's prosociality. Furthermore, girls were more likely to tell white lies than boys. Our findings add to the growing evidence that children tell white lies in accordance with utilitarian philosophical views, by measuring the consequences and the cost [3, 6, 9, 41].

The study has found that under different competitive conditions, there are significant differences in the number of boys and girls telling lies and the truth. In the competition, the number of boys telling white lies was fewer than that of girls. This result is consistent with that of a previous study [42]. Competition causes a significant correlation between competitiveness and masculinity, desire for self-realization, and high levels of self-esteem. Boys make more competitive choices than girls in social dilemmas between groups. Moreover, Han found that boys' prosocial behavior was predicted more by pride, whereas that of girls was predicted more by empathy [43]. Prosocial behavior was positively correlated with emotional understanding in girls, but not in boys [44]. The white lie situation triggered empathy in the girls, while the competitive situation triggered pride in the boys. The reasons for this phenomenon may be cultural. In a typical Chinese family, parents expect more of boys and focus on teaching them how to succeed, while

TABLE 1: Percent of children classified as truth tellers, by age group and condition.

	Male			Female			Total		
	<i>n</i>	White lie-teller	$M_{age}$ ( <i>SD</i> )	<i>n</i>	White lie-teller	$M_{age}$ ( <i>SD</i> )	<i>n</i>	White lie-teller	$M_{age}$ ( <i>SD</i> )
Others-competition condition	44	22.7%	103.91 (1.83)	45	40.0%	105.60 (1.70)	89	31.5%	104.76 (1.76)
Baseline condition	46	41.3%	100.69 (1.87)	42	54.8%	107.71 (1.55)	88	47.7%	104.16 (1.76)

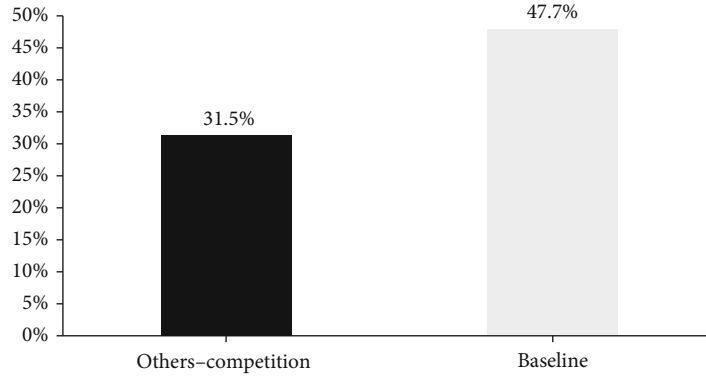


FIGURE 2: Percentage of children who told the white lie in each condition.

TABLE 2: Results of binary logistic regression on children's white lie telling behavior.

Variable	Model 1 df = 1			Model 2 df = 2			Model 3 df = 3		
	<i>B</i>	SE	OR	<i>B</i>	SE	OR	<i>B</i>	SE	OR
Constant	-0.74	0.23	0.48**	-1.14	0.29	0.32***	-1.22	0.36	0.29**
Gender									
Male		Reference			Reference			Reference	
Female	0.63	0.31	1.88*	0.67	0.32	1.95*	0.82	0.48	2.27
Condition									
Others-competition					Reference			Reference	
Baseline				0.73	0.32	2.07*	0.87	0.47	2.34
Gender × control									
Female × baseline							-0.28	0.64	0.76
-2 log likelihood		233.46			228.14			227.95	
Cox & Snell's $R^2$		0.02			0.05			0.05	
Nagelkerke's $R^2$		0.03			0.07			0.07	

the education of girls is more protective. Moreover, boys play more competitively, while girls play cooperatively. Furthermore, this gender difference may come from gender stereotypes acquired in childhood. Boys are often portrayed as powerful and competitive, while girls are often portrayed with qualities such as being more emotional and compassionate. Children internalize social stereotypes of gender roles into their own cognition of gender roles [45].

Competing with others will reduce children's prosociality, which is consistent with previous studies [20, 24, 29, 37]. The main reason is that failing in a competitive context would reduce participants' self-efficacy. Competition has an impact on children's sense of self-efficacy [16]. In the others-competition context, children's sense of judgment of

personal capacity to perform a specific and prospective task might be threatened, and competitive settings create very different incentives to win than noncompetitive settings. Individuals usually show a motivational pattern of seeking challenges, and they tend to associate success with high talent, being motivated to display superior ability. Thus, they define success as outperforming others [28]. Therefore, children were more likely to expect success to have a relatively more positive evaluation of their own performance. However, competition leads children to protect themselves from the potentially insidious actions of their competitors. In line with this reasoning, we deem that this reduces the probability of children telling white lies in others-competition contexts. The competitive priming effect might

weaken the altruistic competition mechanism [27]; for example, concepts of transcendence, success, and invincibility may give the winner a good reputation. As a whole, this research examined children's propensity for white lies in different competitive situations and further explored the motives behind these white lies. This research explores children's prosocial decision-making when facing a conflict between "pro-social motivation" and "the psychological cost of obtaining victory." Children would fully weigh the cost thereof before they tell a white lie. If the cost is too high to bear, they may not choose to tell a white lie. When faced with the moral conflict between prosocial aspirations and self-interests, some children chose to tell the truth due to their own interests, but they expressed their willingness to lie when faced with E2's request. This inconsistency between the two answers reflected that children had a sensitivity to the situation when they told a white lie, and they could fully consider the situational factors of the opponent's presence and the opponent's absence. The willingness behind this phenomenon is worthy of being the subject of future discussion.

A final-round-of-game paradigm was adapted to elicit prosocial white lies in children under varying competitive conditions. The reason why each round of the game only prepared tokens for the winner without preparing material rewards was to eliminate the influence of the value of the latter on children's lying behavior. In the baseline group, the experimenter simply accompanied the children in the game and did not prompt them to compare the total number of tokens of the game participants. Even so, there is an unconscious game relationship in each game round in the baseline group; however, others-competition condition was established on the baseline level, to a certain extent, to ensure the rigor of the experimental conditions.

Although this study has achieved some meaningful conclusions, there are still some shortcomings. First, in this research, the setting of the competition object is only a verbal statement; there is no setting of the real situation of the two groups of others-competitions. Competitive experiments made by others randomly named one of the students in the child's class. When competing with others, the gender of the competitor and the relationship with the child might become interfering factors. Second, we found that the psychological cost of losing in a competition is what prevents children from telling white lies. However, individual differences should also be examined. Factors that may make a difference are temperament, personality, and empathy. Current studies have shown that certain personality characteristics of individuals are highly correlated with their prosocial behaviors, and the affinity, pleasantness, and openness aspects of the Big Five personality traits can predict individual prosocial behaviors. Empathy should be associated with greater prosociality [46, 47]. This study did not exclude the factor of individual empathy characteristics. Altruists are more likely to be prosocial in a competitive context.

Cartwright and Menezes found that the intensity of competition can have an important influence on whether or not people cheat [21]. There are more cheating behaviors in intergroup competition than in interindividual competition [48]. Subsequent research can examine children's

motives for white lies in these two competitive contexts. It is assumed that intergroup competition reduces children's white lie behavior compared with interindividual competition; hence, researchers should further explore the real reason for this psychological cost, such as the increase in the value of team spirit or the fear of being excluded from the group. In group situations involving competition between groups, an anonymous mechanism is used to diminish the negative impact in a competitive context. We can speculate that if there is no significant difference between the number of children who lie in the anonymous group and the real-names group, it means that the decrease of prosocial lies in children is caused by the value of team spirit in intergroup competition. On the contrary, if there is a significant difference between the two groups, children tell more white lies in the anonymous group than in the real-names group. This indicates that the real motivation of children to tell white lies stems from the fear that doing so will bring some negative effects for them, such as exclusion from the inner group. Thus, the issue that will reduce the psychological cost of inner-group pressure on children when participating in group competition as an anonymous person will be worth exploring in future research. The issue also provides insights for researchers to better understand the connection between motivation and behavior in the context of white lies.

## 6. Conclusion

This paper presented an experimental study on the effects of different competitive situations on white lie behavior among 6- to 11-year olds. We aimed to measure the effect of competition on white lies. Competition may add a psychological cost to children's lying. The results confirmed our hypothesis, that is, the incidence of children's white lies is reduced when they are competing with others. It was found that while E2 begged the child to hide the truth for him, when E1 returned and asked who had won the last round of the game, most of the children said they did when they had competed with another person. Comparisons with the baseline condition indicate that competition appears to attenuate children's helping responses toward others. Moreover, the results of the study show that girls tend to tell the white lie more under competitive conditions than boys, which indicates a stronger achievement orientation for boys compared with girls.

## Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Ethical Approval

The study was approved by the research ethics committee in the Academy of Psychology and Behavior at Tianjin Normal University, China. All participants gave written informed consent before being enrolled in the experiment, which was obtained from their parents or legal guardians prior to the beginning of the study.

## Conflicts of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Authors' Contributions

SYR, LY, and MJ designed and performed the experiment. SYR performed the statistical analysis and edited the manuscript. All authors read and approved the final version of the manuscript for submission.

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