



Are Emotion Regulation Strategies Different among 3–6–Year–Old Aggressive Children? Evidence from China

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Abstract

Background: During the long-time home quarantine due to COVID-19, preschool-age children can be easily stricken by negative emotions, which give rise to aggressive behaviors. Aggressive behaviors are of different types at the preschool stage. We aimed to investigate the differences of emotion regulation strategies among children age 3–6 yr old with different aggression types and explore the relationship between emotion regulation strategies and aggressive behaviors.

Methods: The aggressive behaviors of 1,187 children sampled (event sampling method) from 5 kindergartens in five cities in Henan Province of China were observed on the spot in 2020. Three aggression types (i.e., physical, verbal, and indirect) were selected to conduct a questionnaire survey on emotion regulation strategies and discuss the differences among aggressive children in emotion regulation strategies.

Results: Children of different genders are significantly different in aggressive behaviors and problem solving, as well as children at different age levels in self-comfort, passive reaction, and negative regulation strategies. Significant interaction exists between gender and aggression but not in negative regulation strategy; significant interaction also exists between age and aggression but not in cognitive reconstruction, substitutive activity, and aggressive behavior. Significant differences exist among children of different aggression types in positive and negative regulation strategies. The discrimination accuracy of emotion regulation strategies for aggression types is 66.5%.

Conclusion: Significant differences exist among 3-6-yr-old aggressive children in emotion regulation strategies, and emotion regulation strategies can effectively distinguish aggressive children of different types.

Keywords: Children; Aggressive behaviors; Emotion regulation strategy; Discriminant analysis

Introduction

During the COVID-19, national governments suggested reducing outdoor activities of the general public and preventing the spread of the epidemic employing home quarantine. According to a study (1), the COVID-19 epidemic resulted in the closure of educational institutions in over 191 countries and regions worldwide. 94% of the

world's students (about 1.6 billion) were affected. In low- and middle-income countries, the proportion is as high as 99% (1). Preschool children are more prone to negative emotions and then aggressive behaviors because of the long-time home quarantine. Such aggressive behaviors can be different at the preschool stage. Therefore,

exploring the differences of different aggressive behaviors in emotion regulation strategies can effectively avoid aggressive behaviors from the perspective of strategy.

As an intentional behavior tendency and pattern causing physical and mental harms to others (2), aggressive behavior will put children under an adverse status during peer interaction and have a direct bearing on their peer relationships (3) and social adaptation (4). Early-stage aggressive behavior is divided into physical, verbal, and indirect aggressions (5), which are quite different at different age levels, where physical aggression is significantly severer than verbal and indirect aggressions in junior class, verbal aggressions grow greatly in middle class, and the number of various aggressive behaviors in senior class is significantly larger than those in junior and middle classes. As age increases, the aggression frequency between children of the same gender is higher than that between children of different genders. As for the manner of aggression, boys mostly take physical aggression, whereas girls prefer verbal and relationship aggressions (6). Aggressive children are screened out mainly through self-reporting, teacher assessment, peer nomination, and direct observation. The convergence validity of studies can be improved using multiple judgment methods (7).

With in-depth study on aggressive behaviors, people have gradually recognized the close relationship between aggressive behaviors and emotion regulation (8). Emotion regulation is an individual process of controlling and regulating emotional cognition (9), experience, and external behavioral expression (10), and aggressive behaviors are significantly correlated with it (11). The emotional management ability of aggressive children is significantly weaker than normal children and less aggressive children (12). The use of individual emotion regulation strategy is a forceful manifestation of emotion regulation ability (13). Moreover, positive regulation strategy has a significant negative correlation with aggressive behaviors, whereas negative emotion regulation has a significant positive correlation with aggressive behaviors (14). Further research results regarding

emotion regulation strategies indicated that the higher the individual reaction level is, the less probable it will take positive regulation strategies (e.g., cognitive regulation and substitutive activity), and the more probable it will adopt negative regulation strategies (e.g., emotion abreaction) (15, 16). However, they are not significantly different in neutral strategies (e.g., seeking for support and self-comfort) (17).

The relationship between aggressive behaviors and emotion regulation strategies has been discussed in the existing studies. However, early-stage aggressive behaviors of children are divided into different types, such as physical, verbal, and indirect aggressions. Then, what are the differences among children of different aggression types in emotion regulation strategies, and how do emotion regulation strategies influence aggressive behaviors? These problems are still lack of targeted study. Also, the questionnaire method (teacher or parent) (7) and self-reporting method (18) have been mainly used to screen out aggressive children. These methods can only simply distinguish aggressive children from non-aggressive ones but fail to divide children of different aggression types.

Thus, this study planned to screen out children of different aggression types through field observation of aggressive behaviors to conduct a questionnaire survey on emotion regulation strategies adopted by aggressive children and explore the following questions: 1. How do gender, age, and aggression or non-aggression influence emotion regulation strategies? 2. What are the differences among children of different aggression types in emotion regulation strategies? 3. To what degree can emotion regulation strategies distinguish children of different aggression types? By discussing these questions, this study can provide a theoretical basis for supporting children of different aggression types in taking emotion regulation strategies.

Materials and Methods

Participants

Event sampling method was used to collect aggressive behaviors. To guarantee sampling repre-

sentativeness, the aggressive behaviors of 1,187 3–6–yr–old children from 36 classes in 5 kindergartens in each of five cities—Shangqiu, Sanmenxia, Xinyang, Anyang, and Xuchang—at the east, west, south, north, and middle of Henan Province in China were observed on the spot in 2020. This study was approved by Ethics Committee of East China Normal University.

The observation was implemented when the children were in their kindergarten class engaging in all types of activities, which were divided into indoor and outdoor scenarios. According to the division of aggression types, the children who did over the mean number of physical, verbal, and indirect aggressive behaviors were divided into

physical, verbal, and indirect aggression groups, which were jointly called aggression group, and the division of aggressive behaviors showed good structural validity(5). Thereafter, the children, the number of whom was consistent with the number of children in the aggression group, without aggressive behavior were randomly selected as the non–aggression group. A total of 96 aggressive children and 95 non–aggressive children were enrolled, and the detection rate of aggressive children was 8.1%. After participant screening, grouping effectiveness was verified by inquiring teachers, peers, and parents. The finally determined quantity of the subjects is shown in Table 1.

Table 1: Descriptive statistics of subjects (N=191)

Age (yr)	Gender	Aggression type				Total
		Physical aggression	Verbal aggression	Indirect aggression	Non–aggression	
3–4	Male	10	8	1	14	33
	Female	2	3	7	17	29
	Total	12	11	8	31	62
4–5	Male	12	5	1	12	30
	Female	3	4	4	21	32
	Total	15	9	5	33	62
5–6	Male	12	9	4	16	41
	Female	4	4	3	15	26
	Total	16	13	7	31	67
Total		43	33	20	95	191

Before the observation, the five observers were trained for five days, followed by two–day pre-observation to ensure the consistency and effectiveness of the observation results. After the training was completed, the observation of each class lasted 7 days, and the concrete arrangement was as follows. The observers spent 1 or 2 days in familiarizing with the kindergarteners and objective class environment and establishing a natural and relaxing relationship with the teachers and children. A formal observation was conducted on days 3, 4, 5, and 6. A questionnaire survey was conducted on emotion regulation strategies of the screened children on day 7. When the formal observation started, the five observers were required to observe aggressive behaviors of children in a junior class of one kindergarten for one

day. A total of 24 aggressive behaviors commonly recorded were acquired, and the consistency of the five observers in discriminating the aggression mode reached 99%.

Research tools

1) Children’s aggressive behavior observation scale

The aggressive behavior observation scale was used in this study, and it was concretely divided into two major parts (5). The first part includes kindergarten, class, serial number, name, gender, and observation site. The second part is a recording of the dimensionality of aggressive behaviors, including genders of the aggressor and the aggressed, aggression mode (i.e., physical, verbal, indirect, and others), appearance features of the

aggressor, whether the aggressed fought back, behavior cause (i.e., initiative and reaction), and stop mode (i.e., self-stop and stopped by others).

2) Emotion regulation strategy scale

The Preschool Children’s Emotion Regulation Strategy Questionnaire was used in this research (13). The emotion regulation strategy was divided into two major parts and eight dimensionalities: positive regulation strategy (cognitive reconstruction, problem solving, substitutive activity, seeking for support, and self-comfort) and negative regulation strategy (passive reaction, emotion abreaction, and aggressive behavior) (13). This questionnaire accorded with the practical living context of children, and the strategy division was more concrete and detailed. The questionnaire contained 48 items with a 5-score system, where 1=never, 2=occasional, 3=sometimes, 4=often, and 5=always. The parents were asked to evaluate according to children’s real situation based on full understanding. The Cronbach’s alpha coefficient of the entire questionnaire was 0.773 which was obtained via SPSS (Chicago, IL, USA) 24.0.

GFI=0.90 and RMSEA=0.12 were calculated using LISREL 8.7. Therefore, this questionnaire was of good reliability and validity.

Results

Difference comparison of gender, age, and aggression or non-aggression in emotion regulation strategies

A 2×3×2 multifactor analysis of variance (ANOVA) was performed with gender (2: male and female), age (3: 3–4, 4–5, and 5–6 yr old), and aggression or non-aggression (2: aggression and non-aggression). The results are presented as follows.

1) Gender and aggression or non-aggression interaction analysis

The results in Fig. 1 show that gender and aggression or non-aggression presented significant interaction in negative regulation strategies ($F=4.270, P=0.040, \eta^2=0.023$).

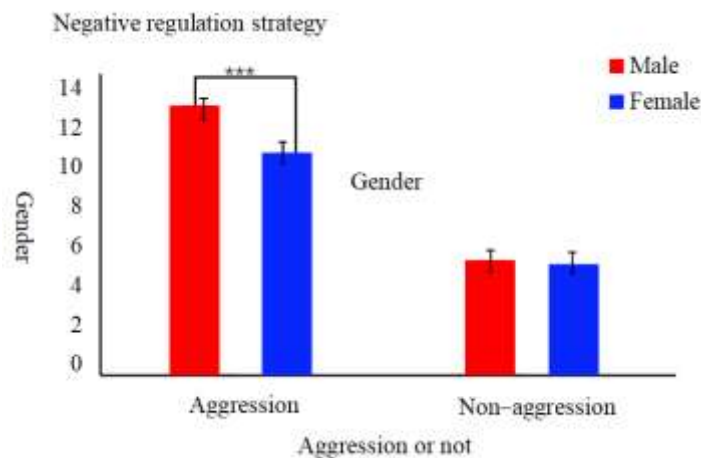


Fig. 1: Interaction graph between gender and aggression or non-aggression in aggressive behaviors

Based on the simple effect verification results, the level of aggressive boys in negative regulation strategies was significantly higher than that of girls ($MD=5.45, P=0.000$), whereas no significant gender difference was observed in the non-aggression factors ($MD=-0.50, P=0.108$).

2) Gender and aggression or non-aggression interaction analysis

Significant interaction occurred between age and aggression or non-aggression in cognitive reconstruction ($F=6.341, P=0.002, \eta^2=0.066$), substitutive activity ($F=7.363, P=0.001, \eta^2=0.076$), and aggressive behaviors ($F=5.155, P=0.007,$

$\eta^2=0.054$) (Fig. 2). The simple effect verification results showed that among non-aggression factors, the cognitive reconstruction level of 4-5-yr-old children was higher than that of 3-4-yr-old children ($MD=-3.08, P=0.002$), and that of 5-6-yr-old children was higher than that of 3-4-yr-old children ($MD=-3.35, P=0.000$); however, 4-5 and 5-6-yr-old children showed no significant difference. As a non-aggression factor, the substitutive activity level of 5-6-yr-old children was higher than that of 4-5-yr-old children ($MD=-2.31, P=0.022$), and that of 5-6-yr-old

children was higher than that of 3-4-yr-old children ($MD=-3.67, P=0.000$) (Fig. 3). However, no significant difference existed between 3-4-yr-old and 4-5-yr-old children. The aggressive behavior level (aggression factor) of 5-6-yr-old children was higher than that of 4-5-yr-old children ($MD=-2.84, P=0.004$), and that of 5-6-yr-old children was higher than that of 3-4-yr-old children ($MD=-3.19, P=0.001$); whereas no significant difference was observed between 3-4-yr-old and 4-5-yr-old children (Fig. 4).

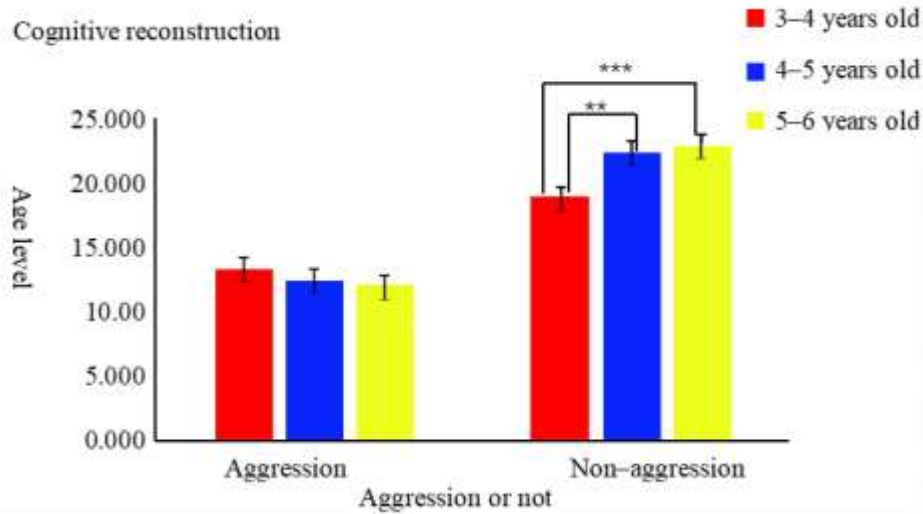


Fig. 2: Interaction graph between age and aggression or non-aggression in cognitive reconstruction

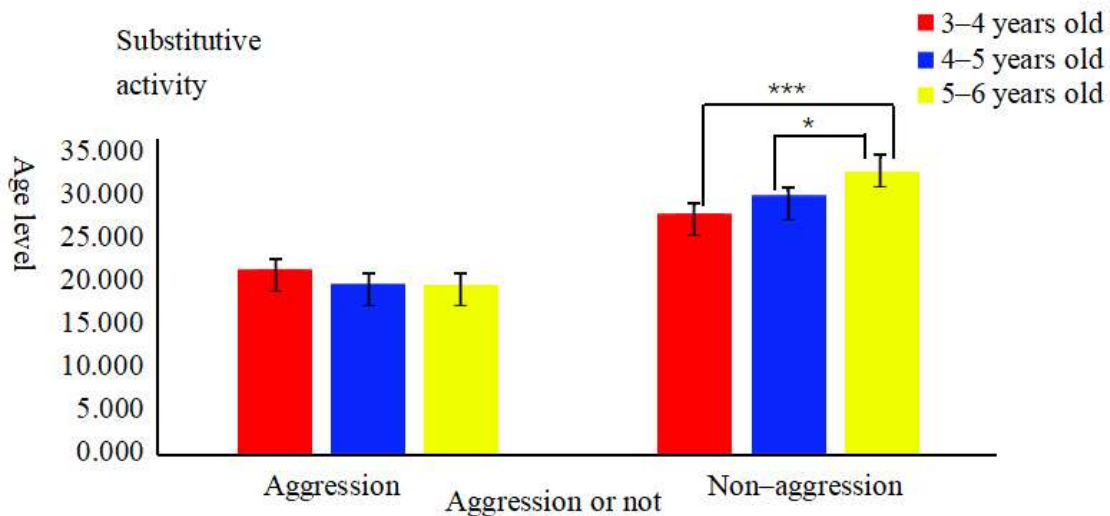


Fig. 3: Interaction graph between age and aggression or non-aggression in substitutive activity

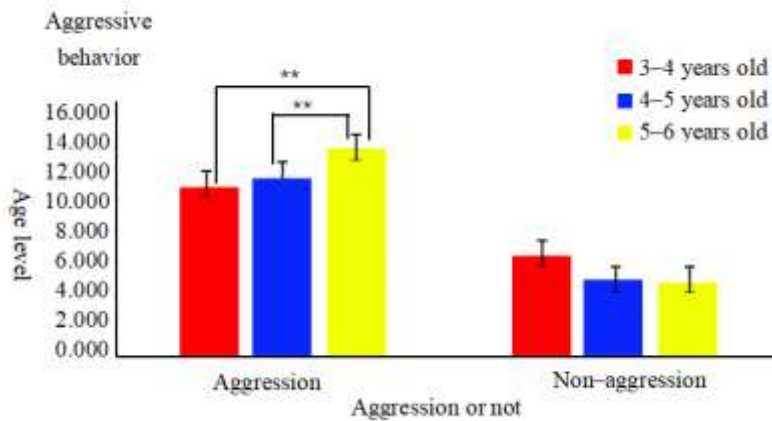


Fig. 4: Interaction graph between age and aggression or non-aggression in aggressive behaviors

Difference comparison of children of different aggression types in emotion regulation strategies

Four types of children (i.e., physical, verbal, indirect, and non-aggressive) were taken as the

grouping variables and the total score of emotion regulation strategy and scores of its dimensionalities as dependent variables to conduct a multifactor ANOVA (Fig. 5).

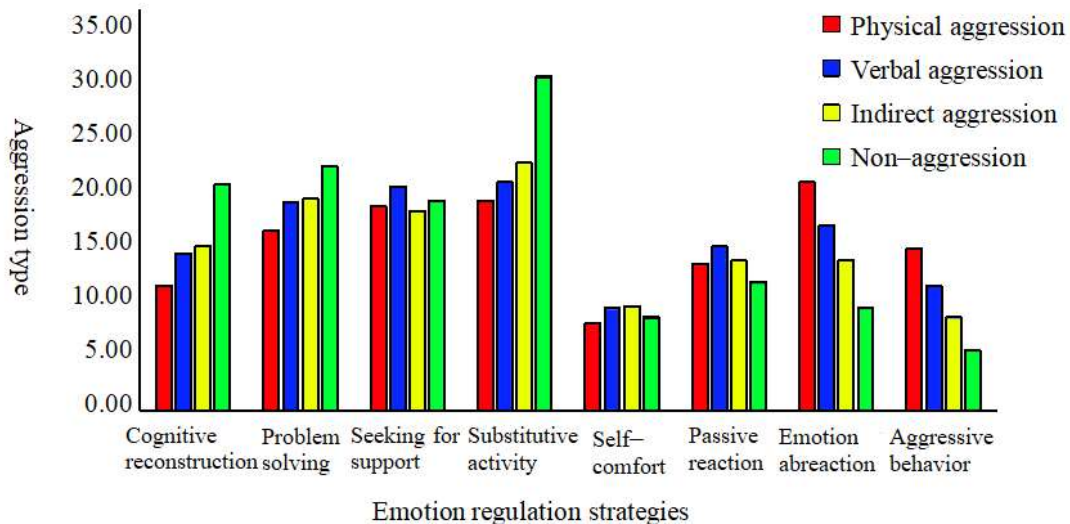


Fig. 5: Difference chart of children of different aggression types in emotion regulation strategies

1) Difference comparison in positive regulation strategies

Different types of children were significantly different in positive regulation strategies ($F=36.758$, $df=3$, $N=191$, $P=0.000$, $\eta^2=0.371$). The level of non-aggression group was higher than those of the other three groups (i.e., physical, verbal, and indirect aggressions, and the average differences were 28.274, 18.037, and 16.458, respectively. The

levels of verbal and indirect aggression groups were significantly higher than those of the physical aggression group, and the average differences were 10.237 and 11.816, respectively.

Specifically, the cognitive reconstruction ($F=62.504$, $df=3$, $N=191$, $P=0.000$, $\eta^2=0.501$) level of the non-aggression group was remarkably higher than those of physical, verbal, and indirect aggression groups, where the average dif-

ferences were 10.840, 7.759, and 6.155, respectively; those of verbal and indirect aggression groups were higher than that of the physical aggression group, and the average differences were 3.080 and 4.685, respectively. The problem solving ($F=16.849$, $df=3$, $N=191$, $P=0.000$, $\eta^2=0.213$) level of the non-aggression group was higher than those of physical and verbal aggression groups (average differences: 5.587 and 3.072, respectively). No significant difference was observed in the seeking for support dimensionality ($F=1.445$, $df=3$, $N=191$, $P=0.231$, $\eta^2=0.023$). The substitutive activity ($F=43.854$, $df=3$, $N=191$, $P=0.000$, $\eta^2=0.413$) level of the non-aggression group was significantly higher than those of physical, verbal, and indirect aggression groups, where the average differences were 10.832, 9.249, and 7.558, respectively, and that in indirect aggression group was significantly higher than that of the physical aggression group (average difference: 3.274). Differences existed in the self-comfort dimensionality ($F=3.139$, $df=3$, $N=191$, $P=0.027$, $\eta^2=0.048$). However, the subsequent multiple test results indicated that every two among the four groups reached significant difference levels.

2) Difference comparison in negative regulation strategies

Different types of children showed significant differences in negative regulation strategies ($F=55.608$, $df=3$, $N=191$, $P=0.000$, $\eta^2=0.471$). The levels of physical, verbal, and indirect aggression groups were higher than that of the non-aggression group, where the average differences were 21.690, 15.689, and 9.045, respectively. The level in the physical aggression group was significantly higher than that of the indirect aggression group, with an average difference of 12.645.

Concretely speaking, the passive reaction ($F=7.443$, $df=3$, $N=191$, $P=0.000$, $\eta^2=0.107$) levels of physical and verbal aggression groups were significantly higher than that of the non-aggression group, with average differences of 1.819 and 2.855, respectively. The emotion abre-

action ($F=51.716$, $df=3$, $N=191$, $P=0.000$, $\eta^2=0.453$) levels of physical, verbal, and indirect aggression groups were higher than that of the non-aggression group, with average differences of 11.002, 7.216, and 4.195, respectively. The level of the physical aggression group was significantly higher than that of the indirect aggression group, with an average difference of 6.807. The aggressive behavior ($F=72.525$, $df=3$, $N=191$, $P=0.000$, $\eta^2=0.538$) levels of physical, verbal, and indirect aggression groups were higher than that of the non-aggression group, with average differences of 8.870, 5.618, and 2.900, respectively. The level of the physical aggression group was remarkably higher than those of verbal and indirect aggression groups (average differences: 3.252 and 5.970, respectively).

Discriminant analysis of emotion regulation strategies for aggression types

1) Discriminant analysis of eight dimensionalities of emotion regulation strategy for aggression types

Except for seeking for support, the other seven independent variables could effectively distinguish children's aggression types, where two discriminant functions reached significant levels. For the first function, $\lambda=1.753$, Wilks' $\Lambda=0.300$, and chi-square value=221.384*** ($P<0.001$); and for the second function, $\lambda=0.168$, Wilks' $\Lambda=0.826$, and chi-square value=35.069** ($P<0.01$). The results of re-predicted and grouped are presented in Table 2.

2) Discriminant analysis of positive and negative regulation strategies for aggression types

Two discriminant functions were generated during the discrimination of aggression types through positive and negative regulation strategies, where only one reached a significant level, with $\lambda=1.309$, Wilks' $\Lambda=0.428$, and chi-square value=158.734*** ($P<0.001$), and what was closely related to it was negative regulation strategy. The results of re-predicted and grouped are presented in Table 3.

Table 2: Classification accuracy crosstab of emotion regulation strategies for aggression types

<i>Aggression type</i>	<i>Actual classification sample</i>	<i>Classification of discriminating and prediction results</i>			
		<i>Physical aggression</i>	<i>Verbal aggression</i>	<i>Indirect aggression</i>	<i>Non aggression</i>
Physical aggression	43	28 (65.1%)	11 (25.6%)	4 (9.3%)	0 (0.0%)
Verbal aggression	33	5 (15.2%)	16 (48.5%)	9 (27.3%)	3 (9.1%)
Indirect aggression	20	2 (10.0%)	3 (15.0%)	11 (55.0%)	4 (20.0%)
Non-aggression	95	2 (2.1%)	4 (4.2%)	17 (17.9%)	72 (75.8%)
Total prediction accuracy=66.5%					

Table 3: Classification accuracy crosstab of positive and negative emotion regulation strategies for aggression types

<i>Aggression type</i>	<i>Actual classification sample</i>	<i>Classification of discriminating and prediction results</i>			
		<i>Physical aggression</i>	<i>Verbal aggression</i>	<i>Indirect aggression</i>	<i>Non aggression</i>
Physical aggression	43	27 (62.8%)	7 (16.3%)	8 (18.6%)	1 (2.3%)
Verbal aggression	33	11 (33.3%)	9 (27.3%)	9 (27.3%)	4 (12.1%)
Indirect aggression	20	2 (10.0%)	4 (20.0%)	9 (45%)	5 (25%)
Non-aggression	95	3 (3.2%)	5 (5.3%)	15 (15.8%)	72 (75.8%)
Total prediction accuracy=61.3%					

Discussion

Difference analysis and discussion of aggressive and non-aggressive children in emotion regulation strategy

The interaction results in Fig. 1 suggested that the number of aggression factors of boys was greater than that of girls, which might be associated with the differences of emotion regulation strategies and aggressive behaviors in gender (19, 20). Boys are more aggressive than girls (5), which results from the negative strategies. The interaction results in Fig. 2 and 3 showed that among the non-aggression factors, the cognition reconstruction and substitutive activity levels of 4–5 and 5–6-year-old children were significantly higher than those of 3–4-year-old children, which might be ascribed to the development of emotion regulation strategies. According to the existing research, the frequency for children to use positive regulation strategies will increase with age; thus, the abilities of 5–6-year-old children to take

advantages of two positive regulation strategies—cognitive reconstruction and substitutive activity—were stronger than those of 3–4 and 4–5-year-old children. As shown in Fig. 4 (interaction results), the number of aggression factors of 5–6-year-old children was significantly greater than those of 3–4- and 4–5-year-old children, because the body movement and verbal expression abilities of 5–6-year-old children were quite developed in comparison with 3–4-year-old children, and their aggression mode and frequency were both high at this stage (5). Therefore, relative to 3–4-year-old children, the aggressive behavior level of 5–6-year-old children was higher.

Difference analysis and discussion of children of different aggression types in emotion regulation strategies

The difference analysis results in Fig. 5 showed that the positive regulation level (i.e., cognitive reconstruction, problem solving, and substitutive activity) in the non-aggression group was higher

than that in the aggression group, and the negative strategy level (i.e., passive reaction, emotion abreaction, and aggressive behavior) in the aggression group was significantly higher than that in the non-aggression group, manifesting that emotion regulation strategy was one of the factors influencing children's aggressive behaviors (14). From another perspective, this finding explained the negative corresponding relationship between high aggression level and low emotion regulation level (20). However, no significant difference was observed between non-aggression and indirect aggression in the aspect of problem solving. Existing research indicates that children of indirect aggression have high level of psychological theory (21). Encountering any conflict, they will take all types of strategies to solve problems; however, these strategies are realized through indirect aggression. Therefore, later-stage intervention can be realized using information processing (15) and peer interaction (18) for indirectly aggressive children.

The children in different groups had no significant differences in two neural strategies (i.e., seeking for support and self-comfort), which indeed followed the general development laws of children. At authoritative orientation stage, preschool children will listen to opinions of authoritative sources when encountering a problem or conflict, which may explain children's complaining behaviors to some extent. Complaining behavior is a method used by children to seek for support from teachers to solve conflicts (22). Hence, by scientifically handling the complaints, teachers can also effectively reduce aggressive behaviors, which is consistent with the existing research results (15).

Discriminant analysis and discussion of emotion regulation strategies for aggression types

From the discriminant analysis results in Table 1 and 2, the weight of aggressive behaviors was large in the entire function. As the aggressive behaviors contained physical and verbal aggressions in the strategies, aggressive behaviors accounted for a certain proportion in the prediction of physical and verbal aggressions through emotion

regulation strategies. Furthermore, this result might be related to choices made by the subjects; that is, some children adopted physical and verbal aggressions, but in the subject selection group, these children were classified into a group with high frequency. Therefore, the physical and verbal aggression groups were misjudged. Nevertheless, no children of physical aggression were classified into the non-aggression group, and its discriminating accuracy reached as high as 75.8%. This result fully verified that aggressive and non-aggressive children could be effectively distinguished through emotion regulation strategies. As indirect aggression was hidden and could not be easily observed in daily life (5), the parents might neglect some behaviors when filling in the questionnaires. Meanwhile, children might perform verbal aggression by making use of a third person; thus, verbal and indirect aggression groups might be mixed. In a word, except for two neutral strategies (i.e., seeking for support and self-comfort), all positive regulation strategies could exert significant effects on distinguishing non-aggressive children, whereas negative regulation strategies could remarkably predict children adopting physical aggression (14). Thus, emotion regulation strategies could be used to distinguish aggression types to some extent. The children of verbal and indirect aggression groups could hardly be judged through emotion regulation strategies. Instead, they should be guided to the point according to their concrete performance in different contexts to reduce their aggressive behaviors.

Conclusion

Significant differences exist among children of different genders and ages in emotion regulation strategies. Significant interaction exists between gender and aggression or non-aggression in the negative regulation strategy, and between age and aggression or non-aggression in cognitive reconstruction, substitutive activity, and aggressive behavior. Children of different aggression types are significantly different in emotion regulation strategies.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interest.

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