The Effect of Theory of Mind Training on Emotional Regulation in Children Aged 4 to 6: A Quasi-Experimental Study

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Abstract: Emotional regulation is a fundamental component of preschool children's social adjustment and mental well-being. Theory of mind is considered a key cognitive mechanism underpinning the development of emotional competence. This study employed a quasi-experimental design to examine the effects of ToM training on emotional regulation in children aged 4 to 6. A total of 75 children from two kindergartens in a city in Sichuan Province, China, were randomly assigned to either the experimental group (n = 38) or the control group (n = 37). the experimental group received an 8-week ToM training intervention (30 minutes per session, twice a week), while the control group received no intervention. the training program focused on emotional recognition, understanding, and regulation, and utilized methods such as situational storytelling, role-play, and interactive games. Emotional regulation was assessed using the Chinese version of the Emotional Intelligence Scale (EIS), and repeated measures ANOVA was conducted to evaluate intervention effects. Results indicated that the experimental group showed significant improvements in emotional understanding ($F = 11.192$, $p =. 001$, $\eta^2 =. 167$) and overall emotional regulation ($F = 8.428$, $p =. 005$, $\eta^2 =. 131$). Although positive trends were observed in emotional perception, regulation, and expression, these changes were not statistically significant. These findings suggest that ToM training can effectively enhance preschool children's emotional understanding and overall emotional regulation. Further research is recommended to refine the intervention design for a more comprehensive improvement in emotional competence among young children.

Keywords: Theory of Mind; Emotional Regulation; Preschool Children; Quasi-Experimental Study

1. Introduction

During early childhood development, emotional regulation has increasingly drawn scholarly attention as a core psychological mechanism underpinning social adaptation. Emotional regulation encompasses not only the recognition, understanding, and expression of emotions, but also the ability to regulate and control emotional responses. It serves as a critical foundation for children's social interaction, behavioral adjustment, and mental well-being (Denham, 2006; Hajal & Paley, 2020; Saarni, 1999; Xie et al., 2021). Prior research has shown that the development of emotional regulation significantly predicts prosocial behavior, academic performance, and the quality of interpersonal relationships in children (Denham et al., 2003; Eisenberg et al., 2005; Sabatier et al., 2017; Xie et al., 2021). However, emotional regulation is not a capacity that develops in isolation; its cognitive underpinnings have increasingly been linked to the maturation of theory of mind.

Theory of mind refers to the ability to understand that oneself and others possess independent mental states—such as beliefs, desires, and emotions—and to use this understanding to predict and interpret behavior (Hughes & Leekam, 2004; Premack & Woodruff, 1978; Baron-Cohen et al., 1993). Developmental psychology research has shown that ToM not only serves as a prerequisite for emotion recognition and understanding but also provides the cognitive foundation for children's self-regulation of emotions (Conte et al., 2019; Pons et al., 2003). When children are able to infer others' mental states, they are more likely to understand emotional responses and the underlying causes of behavior, which in turn enables them to adopt more appropriate coping strategies in social situations (Conte et al., 2019; Mitchell & Phillips, 2015; Shahaeian et al.,

2019). the development of theory of mind—particularly its affective dimension—facilitates children's ability to reflect on their own emotional experiences from a third-person perspective, enhances their metacognitive awareness, and supports effective emotional regulation (Flynn, 2006; Frith & Frith, 2005; Gasser et al., 2022).

In recent years, empirical studies have increasingly highlighted the positive effects of theory of mind training on children's emotional competence. Ornaghi et al. (2014) found that integrating emotional dialogue into theory of mind training significantly enhanced children's emotional understanding and empathic abilities, with the effects persisting for up to six months. Similarly, Lecce et al. (2021) reported that children who underwent theory of mind training were more likely to adopt cognitive reappraisal strategies rather than emotional outbursts when confronted with conflict situations. Rasuli and Chubdari (2015) also observed that theory of mind training significantly reduced impulsive emotional behaviors in children with ADHD, with parents noting marked improvements in both emotional awareness and regulation.

Neuroimaging research has further substantiated these findings. Mazefsky and Herrington (2014) noted that brain regions engaged in theory of mind processing—such as the prefrontal cortex—are also involved in emotional regulation, suggesting that theory of mind training may indirectly enhance emotional regulation by activating overlapping neural mechanisms. In addition, Sabbagh et al. (2006) proposed that theory of mind, executive function, and emotion understanding form an integrated system that collaboratively supports children's socio-emotional development. More recently, Grazzani et al. (2022) found that the more frequently teachers used mental state and emotional vocabulary, the better preschool children performed in emotional regulation tasks, with theory of mind playing a key mediating role in this relationship.

Although existing research supports the association between theory of mind and emotional regulation at multiple levels, several limitations remain. First, most studies have focused on the role of theory of mind in emotional recognition and understanding, while relatively few have examined its influence on regulatory abilities—particularly mechanisms such as impulse control and self-soothing (Imuta et al., 2016). Second, the bidirectional relationship between theory of mind and emotional competence has yet to be systematically explored, especially through longitudinal studies targeting the critical developmental window between ages 3 and 6. Third, empirical research that integrates theory of mind training into children's emotional education and evaluates its intervention effects remains scarce. Fourth, the majority of existing studies have been conducted with Western samples, revealing a lack of cultural adaptation and contextual relevance in training design, which limits the applicability of findings to children in China—particularly those in less-developed western regions.

In response to these gaps, the present study draws on developmental psychology, social cognitive theory, and emotion regulation theory to investigate the pivotal role of theory of mind in the development of emotional regulation among children aged 4 to 6. A systematic theory of mind training program was developed to enhance children's abilities in emotional recognition, understanding, and regulation. the training incorporates situational storytelling, the introduction of mental state vocabulary, role-playing, and interactive games to guide children in understanding others' mental states, identifying emotional expressions, and practicing emotion regulation strategies in context.

This study adopts a pretest–posttest control group design. Children in the experimental group will receive theory of mind training twice a week, with each session lasting 30 minutes, over a period of eight weeks. the control group will not receive any intervention and will continue to participate in regular kindergarten activities. Emotional regulation will be assessed across three dimensions: emotional recognition, understanding, and regulation. Additional data will be collected through teacher behavior observations and quantitative analysis of task performance.

It is anticipated that, following the intervention, children in the experimental group will outperform those in the control group across all dimensions of emotional regulation. Improvements in theory of mind are expected to significantly facilitate the use of effective emotional regulation strategies, thereby demonstrating the value of theory of mind training as an early intervention for supporting

socio-emotional development in young children.

2.Research Method

2.1 Participants

Participants in this study were recruited from two public kindergartens in Z City, Sichuan Province, China. Using a cluster random sampling method, 80 children aged 4 to 6 years were initially selected to complete the pretest. During the posttest phase, five children were excluded due to absence or physical discomfort, resulting in a final sample of 75 valid participants included in the analysis—38 in the experimental group and 37 in the control group.

Children in the experimental group ranged in age from 48.10 to 71.50 months (M = 59.18 months, SD = 4.60), with 20 boys and 18 girls. the control group ranged from 47.30 to 70.30 months of age (M = 58.83 months, SD = 5.21), including 18 boys and 19 girls. Based on the median split of age in months, children were categorized into two age groups: the 4-year-old group (48.00–59.99 months) included 36 children (M = 54.43 months, SD = 3.15; 18 boys and 18 girls), and the 5-year-old group (60.00–71.99 months) included 39 children (M = 63.84 months, SD = 3.42; 20 boys and 19 girls).

All participants were right-handed native Mandarin speakers with normal intelligence, vision, hearing, and physical health. None had any known behavioral problems or prior experience with training related to emotional regulation or theory of mind. Ethical approval was obtained from the participating kindergartens, and written informed consent was collected from parents. Teachers actively supported the implementation process. Upon completion of the study, each child received a small gift as a token of appreciation for their participation.

2.2 Experimental Design

This study employed a 2 (Group: Experimental vs. Control) × 2 (Time: Pretest vs. Posttest) mixed factorial design. Group was treated as a between-subjects variable, and time of testing as a within-subjects variable. Neither the experimental group nor the control group had received any form of theory of mind or emotion-related training prior to the intervention. the interval between pretest and posttest was approximately two months. To minimize testing effects, two parallel sets of equivalent tasks were used in the pre- and post-assessments to evaluate emotional recognition, emotional understanding, and emotional regulation.

Children in the experimental group received a structured theory of mind training program consisting of six modules: emotion recognition, desire understanding, visual perspective-taking, false-belief reasoning, emotion regulation strategies, and integration of mental states. the training was delivered in small groups of 6 to 8 children, with two sessions per week, each lasting 30 minutes, over a total of 8 weeks, for a cumulative total of 16 sessions. the training methods combined storytelling, role-playing, guided use of mental-state vocabulary, and situational games.

The control group did not receive any training and continued with their regular kindergarten-based curriculum and activities.

2.3 Experimental Materials and Measures

2.3.1 Theory of Mind Training Materials

Children in the experimental group received a theory of mind training program specifically developed by the researchers based on principles from developmental psychology, social cognitive theory, and emotion regulation theory. the program consisted of six modules, focusing sequentially on: emotion recognition, desire understanding, visual perspective-taking, false-belief reasoning, emotion regulation strategies, and mental state integration. Each module contained 2 to 3 lessons, and each lesson followed a three-phase instructional structure: story-based introduction, situational enactment, and real-life application. A variety of instructional tools were used throughout the sessions, including role-play cards, situational picture cards, emotion wheels, and real-life story worksheets.

The training was delivered in small group settings, with 6 to 8 children per group. Lesson content centered on helping children understand others' mental states and express and regulate their own emotions. Activities included role-playing, guided use of mental-state vocabulary, social situation dialogues, and self-reflective emotional discussions. All training sessions were piloted on a small scale and reviewed by subject matter experts to ensure developmental appropriateness for 4- to 6-year-old children, as well as to confirm their engagement value and practical operability.

2.3.2 Emotional Regulation Assessment

Children's emotional regulation abilities were assessed using the Chinese version of the Emotional Intelligence Scale (EIS), originally developed by Schutte et al. based on the emotional intelligence theory proposed by Mayer and Salovey (1990). the Chinese adaptation was translated and validated by Professor Wang Caikang at South China Normal University, and has demonstrated good reliability and validity. the Cronbach's alpha coefficient for the Chinese version is 0.83, indicating high internal consistency and suitability for evaluating emotional abilities in children.

The EIS consists of 33 items rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree), with items 5, 28, and 33 being reverse scored. the scale includes four dimensions: emotional perception, emotional understanding, emotional expression, and emotional regulation. These subscales collectively assess an individual's capacity to recognize, comprehend, and regulate both their own and others' emotions. Higher total scores indicate stronger emotional regulation abilities.

Given that the participants were preschool children, all items were linguistically simplified and adapted to ensure age-appropriate comprehension and testing feasibility. During the formal assessment, researchers conducted individual interviews with the children, guiding them item by item to ensure understanding and accurate responses. Prior to the main study, a pilot test was conducted with a small sample, and two experts in child psychology reviewed the instrument for content appropriateness. the results confirmed its high comprehensibility and strong cultural and developmental suitability for preschool-age children.

3. Results

To evaluate the intervention effects of theory of mind training on preschool children's emotional regulation abilities, this study measured five key indicators for both the experimental and control groups before and after the intervention: emotional perception, emotional understanding, emotional expression, emotional regulation, and overall emotional regulation score. Descriptive statistics for these variables are presented in Table 1.

Table 1:Pre-test and Post-test Scores (M ± SD) of Emotional Competence Dimensions in the Experimental and Control Groups

Group	Time	Emotional Perception	Emotional Understanding	Emotional Expression	Emotional Regulation	Total Emotional Regulation Score
Experimental	Pretest	43.25 ± 1.20	34.85 ± 7.20	16.55 ± 5.10	24.35 ± 0.74	123.00 ± 3.50
Experimental	Posttest	45.15 ± 1.10	39.05 ± 6.60	18.45 ± 3.30	25.98 ± 0.65	132.65 ± 3.10
Control	Pretest	45.82 ± 1.40	40.55 ± 6.50	18.10 ± 3.85	25.95 ± 0.78	134.42 ± 3.90
Control	Posttest	46.10 ± 1.18	39.15 ± 8.10	18.45 ± 3.25	26.10 ± 0.69	133.80 ± 3.45

From an overall perspective, the experimental group demonstrated notable improvements across all dimensions from pretest to posttest. In particular, significant group × time interaction effects were observed for emotional understanding ($F = 11.192$, $p =. 001$, $\eta^2 =. 167$) and total emotional regulation score ($F = 8.428$, $p =. 005$, $\eta^2 =. 131$), indicating that theory of mind training was highly effective in enhancing children's ability to understand others' emotions and improving their overall emotional regulation capacity.

For emotional regulation ability specifically, although the experimental group showed a degree of improvement (increasing from M = 24.35 to M = 25.98), the group × time interaction effect did not reach statistical significance ($F = 2.352$, $p =. 131$, $\eta^2 =. 040$), suggesting that this aspect of emotional competence did not exhibit a significant difference within the duration of the intervention. Similarly, the interaction effect for emotional expression was not significant ($F = 1.987$, $p =. 164$, $\eta^2 =. 034$). Despite a posttest increase in the experimental group, a parallel rise in the control group suggests potential influences from developmental trends or overlapping measurement effects.

In terms of emotional perception, both groups showed slight gains, but the group × time interaction effect was also nonsignificant ($F = 0.923$, $p =. 341$, $\eta^2 =. 016$), implying that this ability may be more reliant on developmental maturity and less responsive to short-term intervention.

In summary, theory of mind training exerted a positive impact on children's emotional understanding and overall emotional regulation, with particularly strong effects in cognitively driven aspects of emotion processing—such as

causal reasoning about emotions and perspective-taking.

4. Discussion

This study found that theory of mind training significantly improved emotional understanding and the overall emotional regulation abilities of children aged 4 to 6, with a significant group × time interaction effect observed for the emotional understanding dimension. These results are consistent with previous findings and further confirm that the preschool period is a critical stage for the rapid development of emotional understanding (Cao et al., 2023; Xie et al., 2021). From a neurodevelopmental perspective, the ages between 4 and 6 represent a period of rapid structural and functional brain development. the gradual maturation of the prefrontal cortex is closely linked to the enhancement of executive functions (Noroña-Zhou & Tung, 2020). As a key neural region involved in both theory of mind and emotional regulation, the prefrontal cortex provides a biological foundation for children's development of emotional understanding. This neurological basis may help explain the significant training effects observed in this study.

From the perspective of cognitive development mechanisms, theory of mind training—through story-based scenarios and role-play activities—helped children enhance their ability to identify and interpret others' emotional states (Conte et al., 2019; Sabatier et al., 2017; Gupta, 2022). As children engaged in repeated reasoning about the relationships between beliefs, desires, and emotions, they developed stronger skills in emotional causal reasoning. This, in turn, enabled them to understand the causes and contexts of emotional experiences more accurately, which is crucial for both social interaction and emotion regulation (Dollar & Calkins, 2019; Thümmler et al., 2022). Previous research has shown that emotional understanding plays a vital role in children's peer interactions, social adjustment, and individual development (Conte et al., 2019; Eisenberg et al., 2005; Hajal & Paley, 2020). the findings of this study offer new empirical support for these conclusions.

However, the study did not observe significant training effects in the domains of emotional regulation and emotional expression. Emotional regulation involves complex cognitive control processes that require individuals to flexibly adjust their cognitive and behavioral responses in the face of emotional stimuli (Hughes & Leekam, 2004). For children aged 4 to 6, executive functions—such as inhibitory control, working memory, and cognitive flexibility—are still under development despite progressing rapidly during this period (Luo et al., 2020). This developmental immaturity may limit young children's ability to effectively apply newly learned emotional regulation strategies to real-life situations. Moreover, the development of emotional regulation is closely related to temperament, family environment, and other contextual factors (Noroña-Zhou & Tung, 2020), none of which were controlled in this study. These uncontrolled variables may have masked the potential impact of the training on emotional regulation skills.

Regarding emotional expression, preschool children's limited verbal abilities may hinder their capacity to accurately convey their emotional experiences (Eisenberg et al., 2005; Thümmler et al., 2022). Although theory of mind training may have enhanced their emotional understanding at the cognitive level, the ability to translate that understanding into clear and appropriate emotional expression may be constrained by underdeveloped language resources or a lack of expressive skills. In addition, socio-cultural contexts significantly influence how children learn the norms of emotional expression (Cole et al., 2004). the present study did not explicitly account for cultural factors that may moderate the effects of training, which could be one reason why no significant improvement was observed in emotional expression abilities.

This study selected participants from Z City in Sichuan Province, which reflects a degree of cultural localization; however, the relatively narrow sample scope may limit the generalizability of the findings to children from other regions in China with differing developmental characteristics (Xie et al., 2021). Additionally, the study relied solely on standardized scale-based assessments, lacking multi-dimensional evaluation methods that might capture more ecologically valid indicators of emotional regulation in naturalistic settings.

In summary, theory of mind training demonstrated significant effectiveness in enhancing emotional understanding among preschool children. However, its effects on emotional regulation and emotional expression may require interventions that are longer in

duration, higher in intensity, and more targeted in content. Future research should consider extending the training period, optimizing training content, and exploring the integration of theory of mind training with other intervention approaches. It is also recommended that future studies expand the sample size and employ multi-dimensional assessment methods to more comprehensively examine the impact of theory of mind training on the development of emotional regulation abilities in early childhood.

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