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Could Social Cognition Training Reduce Externalizing Behaviors and Social Maladjustment in Preschoolers?

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Abstract

Background: Recently, a social cognition training model has been developed and showed significant improvements on social cognition, social adjustment and externalizing behaviors in typically developing preschoolers.

Objectives: Such model has been replicated in the current study in preschoolers with externalizing behaviors to test whether deficits in social cognition could cause deficits in social adjustment and externalizing behaviors in preschoolers. The effects of training in social information processing and Theory of Mind on social cognition, on emotion regulation, on social adjustment and on externalizing behaviors were examined.

Methodology: After a pre-test, 37 children with externalizing behaviors were allocated either to an experimental group, which received 15 sessions of social cognition training in groups of 3-4 children, or to a control group.

Results and conclusion: Through regression analyses, the Theory of Mind indirect, social information processing, emotion regulation and social adjustment measures were significantly predicted by group condition. The hypothesis that difficulties in social adjustment can be caused by deficits in social cognition is discussed.

Keywords: Externalizing behaviors; Social cognition; Emotion regulation; Social adjustment; Training

Introduction

Externalizing behavior (EB) is the most common problem resulting in mental health consultation among children of preschool age. A high level of EB has generally been associated with dysfunction in social cognition and with deficits in social problem solving situations [1,2]. Moreover, children with EB present less social competence and fewer skills in interactions with peers and adults than typically developing (TD) children [3] and are regarded as socially maladjusted [4]. Numerous studies have shown emotion regulation (ER) difficulties in children with psychopathological disorders, including EB problems [5]. Because ER difficulties could explain EB in preschoolers, and EB could predict antisocial behaviors, social maladjustment and mental health problems in later years, it is clearly necessary to detect such difficulties and intervene during the preschool period [6,7].

In developmental psychology, several models have emerged to explain the development of social cognition in connection with the development of social and interactive skills and ER, or to understand how deficits in social cognition could have an impact on social maladjustment in children. In this study, we refer to both the Theory of Mind (ToM) and the Social Information Processing (SIP) model, to test the potential role of deficits in social cognition in preschoolers' problems with social abilities and EB disorders.

Theory of Mind and Externalizing Behavior

Theory of Mind conceptions include the ability to understand one's own and others' mental states, to infer the mental states of others (such as emotions, beliefs, desires, intentions) and consequently to adapt one's behavior to different social situations [8-11]. According to Blandon et al. [12] and Nader-Grosbois, Houssa and Mazzone [3], children who are good at identifying and understanding the positive and negative emotions of others should interact successfully with them, be socially responsive and develop harmonious relationships in daily life. Some empirical studies have identified emotional deficits in children with EB. They have reported deficits in the recognition of emotions [13-15], but also in the understanding of causes and consequences of emotions [16] in children with EB. Such deficits correspond to impaired ToM emotions – which is classified as an affective mental state. Yet these deficits are postulated as responsible for social adjustment difficulties [17].

Concerning intentions, children with EB problems display difficulties in interpreting other people's behavioral intentions [18]. Moreover, when children are able to infer knowledge, intentions and beliefs and to understand false beliefs – which are classified as cognitive mental states – this may help them to take account of other people's cognitive perspective and adjust their behavior accordingly. Some authors have identified deficits in the understanding of beliefs [19-21] in children with EB. Finally, Hughes [22] has reported heterogeneous links between EB in children and social understanding of distinct mental states (emotions, beliefs and intentions).

Social Information Processing and EB

This model details in five steps how children use SIP in order to act in a social situation. Firstly, they encode other people's social cues (1), and interpret social cues (2) before clarifying goals (3). After that, they access or build a response (4), and they make a response decision (5) [4]. Deficits in EB children have been postulated in each of the five steps of SIP [4,23-25], and these deficits become worse with time [26]. In particular, in critical social situations (e.g. when provoked), children may have problems in identifying social cues (step 1), interpreting them (step 2), attributing intentions appropriately, or distinguishing good from bad (step 3). They may also develop less prosocial responses (step 4), or judge aggressive behaviors more favorably (step 5) [27]. Furthermore, these difficulties may be responsible for social maladjustment: as aggressive children with distorted SIP are regularly rejected by their peers, they

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have less opportunity for positive social interactions [28]. Deficits in social problem solving are also postulated [1].

Training in Social Cognition Competences in Children

The literature shows that, whether a developmental approach (ToM) or a functional approach (SIP) is taken, improving social cognition abilities could be effective. In studies of ToM training, the purpose is to improve social skills through discussion of mental states (emotions and/or beliefs), using materials such as puppets, emotion cards, interactive games, stories for perspective-taking games, interactions focusing on mental states, etc. After the training, children's level of socio-emotional competences has been found to increase [29-34].

The goal of SIP training is to improve children's abilities in social problem solving and their ability to generate alternative solutions in critical social situations. An improvement in social problem solving was obtained after a training program in which children discussed stories about peer interaction and performed related activities [35], but also after children had been involved in role playing (using videos, pictures, posters, critical social situations, etc.) [31,36].

These programs involve various training techniques such as conversations about false beliefs, explanations of correct responses, differentiated immediate feedback on performance in task, etc. However, the most widely used technique across those programs is the generalization of concepts, which seems effective with preschoolers [37]. These studies have reported positive effects of training programs in social cognition competences (ToM or SIP) in different populations: TD preschoolers [33,38], at-risk preschoolers with low socio-economic status [29,30], and preschoolers with EB problems [32,36,39]. In a preliminary experimental study, we examined the respective effects of a one-shot ToM training session and SIP training session separately in TD preschoolers [40]. In a 45-minute training session, we used various materials and applied the techniques outlined above. The ToM experimental group showed significantly more improvement than the control group in their abilities in ToM emotions and in social problem solving, while the SIP experimental group showed significant improvements in their abilities in ToM beliefs and also in social problem solving.

No study has ever investigated the effects of training combining ToM (including more mental states than just "emotions" or "beliefs") and SIP models, on ToM and SIP abilities, on ER and on social adjustment in preschoolers with EB. In a previous study, Houssa and Nader-Grosbois [37] examined the effects of SIP and ToM training sessions on TD preschoolers. After the training sessions, improvements in social cognition measures were found, especially in the SIP task. Based on these results, and on the training programs reported above, we know that SIP and ToM abilities are "trainable" and that they potentially interact with each other.

Objectives of the Study

In the present study, we assess the potential role of deficits in social cognition in preschoolers' problems with social abilities and EB problems in order to understand better how deficits in social cognition could have an impact on social maladjustment (Figure 1). To test this hypothesis, we measure the effectiveness of an experimental training program in ToM and SIP on the level of social cognition competences in preschoolers with EB. Furthermore, we examine the potential impact of this training on their ER and on their social (mal) adjustment profiles as perceived by their parents in their everyday relationships.

We predicted that children who received a training would have significantly better abilities in ToM and SIP in post-test in comparison with their abilities in pre-test. A positive difference between pre- and post-test was also expected for ER and social adjustment. Finally, we predicted significant differences between experimental and control groups in post-test for ToM and SIP measures, and also for ER and social adjustment. MANOVAs and regression analysis helped to test these hypotheses.

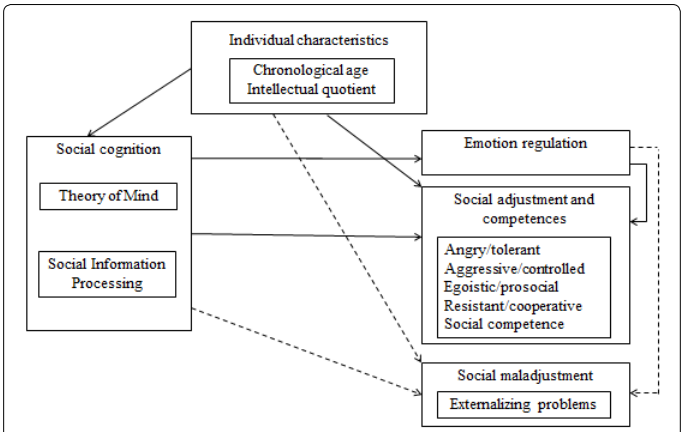

Figure 1: A priori model of social cognition, emotion regulation, and social adjustment and their links in children with externalizing behavior problems.

→: positive links with abilities in social cognition, emotion regulation or social adjustment;

- →: positive links with low levels of social maladjustment.

Method

Participants

The participants were 37 children (21 boys and 16 girls) between 2 years and 11 months and 5 years and 11 months old (*M* age=48.9 months, SD=9.8 months). The level of education of the mothers was indicated on a seven-point scale from low (elementary school not completed) to high (university) with a mean of 5.47 (SD=1.48) (5 corresponded to "3 years Graduate school" and 6 was equivalent to "5 years Graduate school"); for the fathers, the mean was 5.00 (SD=1.53). The family's monthly income was indicated on a nine-point scale from low (0-500 euros) to high (4000 euros or more), and the mean was 7.57 (SD=1.69) (7 corresponding to 3000-3500 and 8 corresponding to 3500-4000 euros a month). The participants were all Caucasian and they native language was always French. The participants were recruited through the efforts of pediatricians, schools and the media. Parents who had problems with their child's behavior - and who wanted to participate - had to fill in an online questionnaire which included the Child Behavior Checklist [41]. Our inclusion criterion was a raw score of 21 or higher (corresponding to the "borderline" or "pathological" level in the CBCL). Children were excluded if they showed developmental delay or intellectual disabilities. Information letters and consent forms for the child's participation were given to parents.

Instruments

Measures of individual characteristics.

Wechsler Intelligence Scales – third edition [42]: These scales were used to check if children had an overall score of around 10, which was a criterion for their inclusion in the sample. They distinguish between the verbal and the non-verbal intellectual quotient (IQ). The verbal IQ permits to be sure that children had a level of language sufficient to understand instructions during testing and training sessions. In the

present study, the verbal IQ was obtained from the "information" scale, while the performance IQ was obtained from the "block design" scale. In terms of validation, the inter-correlations calculated between raw scores on all scales were high. We included children with a global score between 5.5 and 14.5 (1.5 SD). This global score was the mean of the two subscales.

Child Behavior Checklist [41]: The CBCL includes items to assess emotional and behavioral problems in children. In this study, we only used items related to EB to ensure that children were borderline (21-24) or pathological (>25) on the EB scale. The "Aggressive behavior" subscale and the "Attention problems" subscale of the CBCL were summed to determine the "Externalizing behavior" score for each child. Internal consistency (α=0.63-0.86) and test-retest reliability (r=0.85) were satisfactory.

Colorado childhood temperament inventory [43]: This questionnaire measures the temperament of children aged 1-6 years and is completed by caregivers. It includes 25 items: five for each factor of temperament (emotionality, sociability, activity, soothability and attention span persistence). Internal consistency (α=0.73-0.88) and test-retest reliability (r=0.43-0.80) were satisfactory.

Measures of theory of mind

Theory of mind task battery [44]: The Theory of Mind Task Battery is composed of 15 test questions in 9 tasks. This direct measure consists of short situations presented in a story-book format. The early tasks in the ToM Task Battery evaluate mental states separately (emotions, beliefs, desires, intentions, perspective-taking, etc.), but subsequent tasks combine mental states (e.g. inference of desire-based emotion). This battery has been validated through test-retest reliability (r=0.87), internal consistency (α=0.75) and external correlation [45].

Theory of mind inventory – french version [46]: The ToMI measures caregivers' perceptions of the ToM abilities of children aged 2 to 12. This questionnaire consists of 39 statements assessing a large variety of mental states: emotions, beliefs, desires, intentions, attention, perception, thinking, pretense play. The validation of the French version matched that of the original version. Internal consistency (α=0.94) and test-retest reliability (r=0.86) are very significant [47].

Measure of social information processing

Tâche de résolution de problèmes sociaux - Social problem solving task [48]: This task is used to estimate the capacity of children to judge whether or not other people's social behavior is appropriate, and to determine the extent to which their judgment is based on a knowledge of conventional and/or moral rules. It consists of showing subjects 14 pictures, presenting five appropriate and nine inappropriate social behaviors displayed by a character in social situations. Three questions are asked. Firstly, the child is asked whether the social behavior is appropriate or inappropriate; the maximum score here is 28 points (judgment score). The second question assesses the identification of the target behavior in the situation. The child has to identify what is good or not good in the picture; the maximum score here is 14 (identification score). Finally, the third question (reasoning score) estimates the extent to which the judgment is justified by reference to social rules. Three levels of response are proposed for this question. The maximum score for this third question is 98 and 140 for the total score. The validation was performed with typically developed children and children with intellectual disability. The inter-judge agreement was 98% congruent [49].

Measure of emotion regulation

Emotion regulation checklist-french version [50,51]: This questionnaire assesses adult's perception of children's ER abilities in daily life. It includes 24 items in two scales; Emotion Regulation and Lability/Negativity (emotion dysregulation). Data of the French validation of this questionnaire matched those of the original version and revealed good internal consistency, with a Cronbach's alpha for the Lability/Negativity subscale of 0.82 and for the ER subscale of 0.72. The correlation between these two scales is significant and negative (r=-0.66, p <0.001).

Measures of social adjustment

Echelles d'adaptation sociale pour enfants - Social adjustment scales [52]: The questionnaire measures adults' perceptions of children's socio-emotional adjustment competencies in daily life. It includes items relating to social competencies (No ToM), but also items relating to children's mental states understanding capacities and perspective-taking abilities (ToM). The validation of this questionnaire was performed on 327 children. The two subscales had good internal consistency: Cronbach's alpha was 0.77 for the "ToM subscale", and 0.79 for the "No ToM subscale".

The social competence and behavior evaluation [53,54]: The SCBE assesses the social and affective abilities required for social adjustment in children aged from 2.5 to 6 years and is used to identify potential externalizing or internalizing problems. The questionnaire includes 80 items divided into eight basic subscales and four global SCBE components. It is important to note that for each subscale and global component, the higher the score, the less behavioral/affective difficulties the child has. In the present study, we decided to use four basic subscales (i.e., angry-tolerant, aggressive-controlled, egoistic-prosocial, resistant-cooperative) and two global components (social competence and externalizing problems) which seem relevant to EB children. The French version of the SCBE was validated on a sample of 800 preschoolers, and demonstrated good properties with a high inter-judge agreement, high internal consistency, good test-retest correlations, and no correlation with social desirability.

Measure of behavior

Conners parents rating scale [55]: This questionnaire assesses parents' perception of their child's hyperactivity, inattention, impulsivity and conduct disorders. It is composed of 48 items. Hyperactivity, impulsivity and conduct disorder factors are calculated as the sum of the respondents' ratings of the relevant observed behaviors. T-scores are then calculated. This questionnaire presents high correlations between factors (from 0.46 to 0.57), and there is no significant difference between mothers' and fathers' ratings.

Training Sessions

In this study, we used the training program of Houssa and Nader-Grosbois [37]. In the experimental group, children received training in SIP and ToM competences. Sessions were constructed with reference to a theoretical background and on the basis of a hierarchical progression (from simple to complex abilities). The first 7 sessions dealt with ToM competences; the 7 following sessions dealt with SIP competences; the final session integrated all of the concepts in the training. An Appendix 1 presents the objectives, activities and the techniques used (Appendix 1).

The first basis for the training method was the program of Howlin and colleagues [56]. This developmental-structural program establishes a progression in the understanding of mental states in several components, including understanding of emotions and of beliefs. Each component is divided into five successive levels. These levels and the acquisition criteria for the understanding of emotions are: (1)

photographic facial recognition, (2) schematic facial recognition, (3) situation-based emotions, (4) desire-based emotions, (5) belief-based emotions. For the understanding of beliefs, the levels are: (1) simple perspective taking, (2) complex perspective taking, (3) seeing leads to knowing, (4) true belief/action prediction, (5) false belief [57].

The second basis for the training method was the different steps of the SIP model [4]. This functional approach describes five steps in helping children to think about and resolve social problems (Introduction).

The third inspiration for the training method was the levels of justification in the "social problem solving task" [48]. In the social problem solving task, Barisnikov and colleagues differentiate three levels of justification with increasing complexity: *(1)* the descriptive level (children describe observed facts), (2) the inter-subjective level (the justification shows a position linked to social consciousness), (3) the conceptual level (children stand back from the context and make reference to a social rule or convention).

According to the child's level (evaluated in pre-test session), the experimenter tried to elicit a more complex level of justification (by using the proximal zone of development conceptualized by Vygotsky [58]) by asking questions and giving feedbacks. In ToM sessions, questions were about the protagonist's emotions, desires and beliefs. For example, questions were "how feel Sarah when her father has to leave?" and "why she feels like that?". In SIP sessions, the experimenter questioned the child to check if he/she understood what happened, asked if he/she could explain it and asked questions like "how Simon will react?", "is it a good thing or a bad thing for Simon to do that?" and "if you did that, do you think the other child would like you?". Finally the experimenter asked if they had had a similar experience themselves, then how they reacted/would have reacted.

Children were in subgroups (3 or 4 children) to maximize conversational exchange among children. As some researchers [38,40,59] have suggested, they were able to help each other by completing each other's answers or correcting them, inducing socio-cognitive conflict which might help them with their thinking and highlighting the existence of various points of view on the same situation. Furthermore, to ensure that each child had a speaking time, a speaking slot (indicated by an object) was applied.

Activities involved in the ToM and SIP sessions included sequences of play, the use of pictures, video extracts, the handling of objects, puppets, story reading, etc. Different types of material were included in each session, to ensure that they were adapted to the children's individual styles of perceptive and socio-perceptive processing, selective attention capacity, cognitive inhibition attention, and fatigue and were able to stimulate their interest and motivation. This variety of materials can help children to generalize and to apply what they have learned in new situations. In summary, different types of materials/activities were used as well as different styles of support.

Each session ended with a story dealing with an emotion, its causes and consequences, or with a false belief or a social problem solving situation (provocation, ambiguity, mockery, etc.). Reading stories to children and talking about the protagonists' mental states and emotions seems to increase their social cognition level [35,59,60]. We decided to read the story at the end of the session because this was regarded as an integrative stimulation and helped us to highlight each concept addressed during the session.

Various techniques were applied in each session, including feedback, encouragement and explanations from experimenters of the right answer given by the child. More precisely, open-ended questions were asked about the eliciting situations to induce conversations and child's justification about the situation and their responses. Feedback was also provided after each response, as well as an explanation of the correct or expected response. In fact, correct answers led to positive feedback, while incorrect answers elicited explanations about the correct response (differentiated immediate feedback on the performance). To promote the generalization of concepts, experimenters presented some general principles and reminded the children of the one related to the task (such as the social rules that could be applied in this social situation). Thanks to children's responses and conversations, experimenters can make connections with real life events.

Some techniques are specific for either the ToM sessions or the SIP sessions. In ToM sessions, we used open-ended questions about social situations linked with emotions and beliefs, the repetition of tasks, the reading of narrative and pictorial stories, the denomination of deceptive objects, and conversations or discussions between experimenter and the children from questions or scenarios about beliefs, false beliefs, emotions in using terms related to mental states. The techniques specific for the SIP sessions were open-ended questions about critical social situations, the identification of emotional and social cues, the selection of the best solution in relation to critical social situations, the identification of alternative solutions in relation to critical social situations, and conversations or discussions between experimenter and the children from questions about critical social situations in using terms related to social problem solving.

Procedure

The research consisted of three phases: pre-test, training and post-test. For the pre-test session, three different tests were initially administered by an experimenter across two sessions for each participant (lasting 20 to 30 minutes according to the participant's attention and availability). The tests were: two subscales of the WPPSI-III, the ToM Task Battery and the RES. Total administration time was approximately 50 minutes. All tests were administered individually in counterbalanced order and in a quiet room. During the pre-test, parents completed the CCTI, the ToMI, the EASE, the ERC, the SCBE and the CPRS.

20 children were allocated to the control group, which was a waiting list (after the post-test session, for ethical reasons, these children received an intervention) and 17 other children constituted the experimental group. Children from the experimental group participated in biweekly training sessions of 45 minutes for 8 weeks in small groups. Sessions were administered by the two same experimenters for each group. At the end of the intervention, children were assessed in a post-test session (same baseline as in pre-test, except for IQ) by another experimenter. Again, parents completed questionnaires (ToMI, EASE, ERC and SCBE).

Data Analysis

First of all, independent sample *t*-tests were conducted to check the equivalence between groups in pre-test. Then, to measure the effectiveness of the intervention, a repeated measure ANOVA was conducted on each measure with pre- and post-test scores in each case as a within-group factor and groups (experimental or control group) as a between-participants factor. Finally, we conducted some multiple regression analyses to examine which variables contributed to children's social cognition and social adjustment.

Results

Between group comparisons in pre-test

Table 1 presents means and standard deviations for descriptive variables in the pre-test session. Participants were allocated to one of the two groups (control or experimental). There were 20 children in the control group and 17 children in the experimental group. Groups could be considered as equivalent in pre-test because for all measures (including direct and indirect measures), *t*-test comparisons revealed no significant difference between groups.

Pre-/post-test comparisons by group

As shown in Table 2, there are significant differences between pre- and post-test for the score in RES, direct measure in SIP, and for the scores of two scales of SCBE (resistant-cooperative and externalizing problems), in both groups. The two groups show better performances in the post-test session than in the pre-test session. Furthermore, only within the experimental group were there significant differences in the scores of ToM measures, in the scores of three scales of SCBE (angry-tolerant, egoistic-prosocial and social competence), in ER, and in all scales of social adjustment (EASE-No ToM, EASE-ToM and EASE-total).

Also, a repeated measure ANOVA was conducted on each measure with pre- and post-test scores in each case as a within-group factor and groups (experimental or control group) as a between-participants factor. This analysis revealed significant time per group interactions with scores in emotion regulation (ERC), in the angry-tolerant and social competence scales and in social adjustment (all scales) in favor of the experimental group. Finally, we found a marginal time per group interaction with the score in the indirect ToM measure.

Multiple regression analysis

To investigate whether the training sessions contribute to children's social cognition, ER, social adjustment and social competences, a hierarchical multiple regression analysis was conducted, after controlling for the pre-test results and individual characteristics. In Model 1, pre-test results were entered; in Model 2, pre-test results and

		Control group (n=20)	Experimental group (n=17)	
	Variables	*M* (SD)	*M* (SD)	*t*
	Sex (% Male)	70%	41.2%	1.79
	CA (in months)	49.20 (10.71)	48.59 (8.96)	-0.19
	IQ	97.89 (23.53)	91.07 (30.27)	-0.73
Temperament	Emotion	17.80 (3.34)	18.53 (3.95)	0.56
	Activity	19.65 (3.18)	17.65 (3.59)	-1.72
	Sociability	16.88 (4.03)	16.12 (4.08)	-0.55
	Attention	14.00 (3.84)	12.59 (4.36)	-1.00
	Soothability	12.82 (3.05)	11.82 (3.32)	-0.91
Externalizing behavior	Hyperactivity	70.37 (10.79)	71.56 (14.90)	0.27
	Conduct problems	65.00 (10.93)	69.56 (14.95)	1.04
	Impulsivity	65.37 (9.23)	63.56 (9.54)	-0.57
	CBCL - EB	29.80 (5.43)	30.53 (6.13)	-0.38

Note: CA: Chronological Age; IQ: Intellectual Quotient; CBCL: Child Behavior Checklist; EB: Externalizing Behavior.

Table 1: Demographic and individual characteristics: Mean scores and standard deviations for each group in pre-test and between-group comparisons.

		Control group			Experimental group				
		Pre-test	Post-test	△	Pre-test	Post-test	△	Analysis (F)	
Variables		***M* (SD)**	***M* (SD)**	***t***	***M* (SD)**	***M* (SD)**	***t***	**Group by time interaction**	**Partial Eta²**
Socio-affective profile	Angry-Tolerant	16.66 (5.91)	18.72 (4.88)	1.65	16.23 (5.20)	21.59 (6.50)	7.21***	5.5*	0.24
	Aggressive-Controlled	26.90 (6.57)	29.09 (6.49)	1.68	28.71 (8.61)	31.71 (6.07)	1.99	0.28	
	Egoistic-Prosocial	22.30 (4.93)	23.26 (5.23)	0.81	22.48 (7.99)	25.41 (7.33)	2.37*	1.35	
	Resistant-Cooperative	21.60 (4.99)	23.74 (5.53)	2.61*	22.63 (4.70)	25.56 (7.29)	2.02*	0.12	
	Social competence	111.15 (17.87)	109.01 (17.42)	-0.59	108.22 (16.12)	117.82 (16.20)	2.45*	5.48*	0.08
	Externalizing Problems	43.00 (9.20)	49.93 (10.96)	3.28**	47.01 (13.57)	52.00 (13.43)	2.28*	0.41	
ToM	ToM task Battery	6.45 (2.14)	7.35 (2.64)	1.76	6.65 (2.50)	8.41 (3.28)	4.15*	1.62	
	ToMI	14.12 (2.46)	14.20 (2.18)	0.14	13.55 (2.27)	14.92 (2.37)	2.84*	3.17[a]	0.09
SIP	RES total	49.32 (15.83)	61.76 (18.89)	2.81*	41.24 (20.63)	58.53 (19.74)	4.47***	1.47	
Emotion regulation	ERC Dysregulation	2.67 (0.30)	2.61 (0.32)	-1.19	2.67 (0.40)	2.47 (0.43)	-3.01**	2.28	
	ERC Regulation	3.11 (0.36)	3.01 (0.35)	-1.10	2.99 (0.36)	3.23 (0.35)	3.18**	8.70**	0.06
Social adjustment	EASE total	0.65 (0.12)	0.62 (0.15)	-0.94	0.64 (0.13)	0.71 (0.11)	5.23***	9.32**	0.06
	EASE no ToM	0.70 (0.14)	0.67 (0.17)	-0.83	0.69 (0.13)	0.77 (0.12)	3.62**	7.82**	0.08
	EASE ToM	0.60 (0.13)	0.57 (0.15)	-0.99	0.59 (0.14)	0.66 (0.12)	3.61**	7.35**	0.03

Note: △=post-test/pre-test difference. ToM: Theory of Mind; SIP: Social Information Processing; RES: Social problem solving task; ERC: Emotion Regulation Checklist; EASE: Social Adjustment Scales; *p≤0.05, **p≤0.01, ***p=0.00, [a]=p=0.08.

Table 2: Within group comparison: Means and standard deviations on pre-test, post-test in socio-affective profile, ToM and SIP measures, emotion regulation, social adjustment, and their difference for each group and *t*-test score for the pre-test/post-test difference.

individual characteristics (IQ and temperament factors) were entered; in Model 3, pre-test results, individual characteristics and group condition were entered. It is relevant to note that as a preliminary, we tested the impact of three scores of the CPRS (hyperactivity, conduct problems and impulsivity) as predictors; however, they turned out to have no explanatory value.

Predictors of ToM measures in post-test

As shown in Table 3, distinct independent predictors explain scores on ToM measures. For the ToMI, predictors in Model 3 marginally predicted 5% of the variance of the ToMI in post-test. Pre-test result in ToM Task Battery and group condition were the only significant predictors in Model 3.

Predictors of SIP measure in post-test

For the RES, predictors of Model 3 accounted for 10% of the variance. The variables which made a contribution in Model 3 were the pre-test result in RES and group condition.

Predictors of emotion regulation and dysregulation in post-test

Model 3 explained 18% of the variance for ER. Pre-test results in ER, emotion and group condition were the only variables which made a contribution. In emotion dysregulation, the group condition entered in Model 3 was non-significant.

Predictors of social adjustment and of social competences in post-test

Model 3 explained the post-test result in social adjustment moderately well. As for the ToMI and the RES, pre-test result and group condition were the only variables which made a contribution. Model 3 explained the post-test result on the social competences scale moderately well, while the "angry/tolerant" subscale of the SCBE was also predicted by Model 3. For both scales, pre-test result and group condition were the variables which made a contribution in Model 3 (Table 4).

On the basis of these results, the Figure 2 corresponds to a posteriori model of social cognition, emotion regulation and social adjustment and their links in children with externalizing behavior problems in the experimental group.

Discussion

The present study was carried out to evaluate the potential role

	ToM								SIP			
	ToM Task Battery				ToMI				RES			
Predictors	**β**	**ΔR²**	**Tot R²**	***F***	**β**	**ΔR²**	**Tot R²**	***F***	**β**	**ΔR²**	**Tot R²**	***F***
Model 1Pre-test results	0.65***	0.43***	0.43***	21.70***	0.75***	0.56***	0.56***	34.13***	0.58**	0.33**	0.33**	13.10**
Model 2 Pre-test results	0.62**	0.03	0.46	2.82	0.66***	0.12	0.68	6.50	0.66**	0.18	0.51	3.02
IQ	0.12				0.04				0.03			
Emotion	0.02				0.20				0.01			
Activity	0.13				0.04				0.07			
Sociability	0.01				0.03				0.39*			
Attention	0.14				0.09				0.23			
Soothability	0.04				0.34*				0.10			
Model 3Pre-test results	0.52**	0.05	0.51	2.88	0.62***	0.05[a]	0.73[a]	6.86[a]	0.69***	0.07[b]	0.58[b]	3.33[b]
IQ	0.16				0.03				0.04			
Emotion	0.04				0.22				0.01			
Activity	0.21				0.08				0.21			
Sociability	0.03				0.02				0.45*			
Attention	0.06				0.17				0.34			
Soothability	0.08				0.37**				0.14			
Group condition	0.26				0.24[a]				0.32[b]			
	Outcomes											
	Emotion regulation				Emotion dysregulation				Social Adjustment			
Predictors	β	ΔR²	Tot R²	*F*	β	ΔR²	Tot R²	*F*	β	ΔR²	Tot R²	*F*
Model 1 Pre-test results	0.53**	0.28**	0.28**	11.10**	0.64***	0.41***	0.41***	20.20***	0.64***	0.41***	0.41***	20.41***
Model 2 Pre-test results	0.41*	0.12	0.40	2.24	0.61**	0.09	0.50	3.25	0.59**	0.12	0.53	3.73
IQ	0.08				0.10				0.13			
Emotion	0.31				0.02				0.02			
Activity	0.21				0.26				0.30			
Sociability	0.25				0.06				0.21			
Attention	0.00				0.21				0.06			
Soothability	0.10				0.08				0.10			
Model 3 Pre-test results	0.44*	0.18**	0.58**	3.87**	0.62**	0.03	0.53	3.05	0.55***	0.18**	0.71**	6.68**
IQ	0.08				0.10				0.15			
Emotion	0.34*				0.00				0.05			
Activity	0.11				0.23				0.21			
Sociability	0.25				0.07				0.22			
Attention	0.12				0.26				0.18			
Soothability	0.15				0.06				0.04			
Group condition	0.45**				0.18				0.45**			

Table 3: Distinct independent predictors scores on ToM measures.

	Outcomes							
	Social Competences				Angry/Tolerant			
Predictors	**β**	**ΔR²**	**Tot R²**	***F***	**β**	**ΔR²**	**Tot R²**	***F***
Model 1Pre-test results	0.76***	0.49***	0.49***	28.39***	0.65***	0.42***	0.42***	20.93***
Model 2 Pre-test results	0.85***	0.11	0.60	4.99	0.60**	0.08*	0.50*	3.24*
IQ	0.10				0.03			
Emotion	0.15				0.25			
Activity	0.28				0.11			
Sociability	0.06				0.19			
Attention	0.03				0.08			
Soothability	0.29				0.08			
Model 3 Pre-test results	0.77**	0.10**	0.70**	60.56**	0.59**	0.09**	0.59**	3.93**
IQ	0.08				0.04			
Emotion	0.12				0.23			
Activity	0.20				0.18			
Sociability	0.09				0.18			
Attention	0.09				0.01			
Soothability	0.22				0.12			
Group condition	0.35**				0.32*			

Notes. β = regression coefficient, ΔR²=R squared change, Tot R²=Total R squared, *$p<0.05$, **$p<0.01$, ***$p\leq0.00$, [a]$p=0.07$, [b]$p=0.09$

Table 4: Outcomes of distinct independent predictors scores on ToM measures.

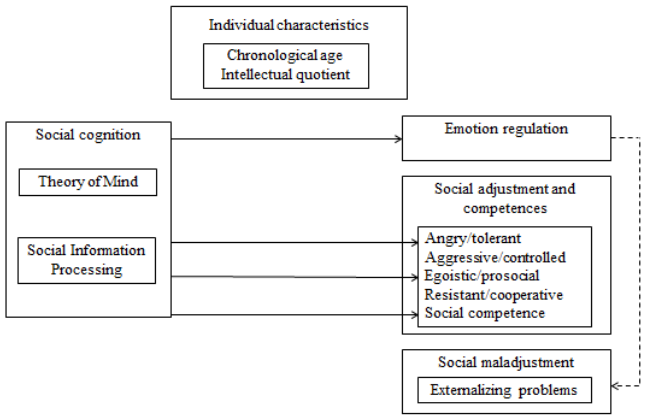

Figure 2: A posteriori model of social cognition, emotion regulation and social adjustment and their links in children with externalizing behavior problems in the experimental group.

→: positive links with abilities in social cognition, emotion regulation or social adjustment;

- -→: positive links with low levels of social maladjustment.

of deficits in social cognition in preschoolers' problems with social abilities and EB disorders in order to better understand how deficits in social cognition could have an impact on social maladjustment in children. To be able to assess this, we tested the effectiveness of a social cognition intervention on social cognition competences and on both ER and social adjustment.

As predicted, we found positive effects of training in social cognition in all measures. The pre- and post-test comparisons showed that there are significant differences between these two points for all measures in the experimental group. In the control group, the difference between the two points was only significant for the social problem solving measure. Repeated measure analysis showed that training sessions led children to be perceived as having more mental states understanding capacities and perspective taking abilities (EASE-ToM) and to a lesser extent, as having better ToM abilities (ToMI).

For direct measures of social cognition, analysis did not show a group by time interaction; but contrary to the control group, the experimental group had a significant improvement between pre- and post-test for ToM abilities. Concerning SIP abilities, the experimental group improved more than the control group between the two points (the experimental group's improvement was 12.35%, while the control group's was 8.85%). Because there was an interval of approximately 3 months between pre- and post-tests, results in direct measures could be partly due to children's spontaneous development in both groups.

The *Emotion-Based Prevention program* [30], the *Promoting Alternative Thinking Strategies curriculum* [33] and *Dinosaur School* [39] are three long-term programs which have shown positive effects on emotion knowledge, social problem solving and ER. Furthermore, in a recent study with a similar design to the present study - but with TD preschoolers - Houssa and Nader-Grosbois [37] found positive effects of a training program in social cognition on a SIP direct measure (RES). The difference in results between our two studies on this variable could probably be partially explained by the age of children and by the distinct populations. The preschoolers with EB in the current study were younger than the TD preschoolers in the previous study. The TD preschoolers thus had a more advanced level of ToM and SIP in pre-test in comparison with the preschoolers with EB in the present study. Thus, although the results between these two studies are not completely comparable, children seem to benefit differently from the same training according to their initial levels in ToM and SIP. Furthermore, we know that the RES refers to the SIP model [4], proposing a functional approach to social problem solving. Unfortunately, in the present study, we were not able to determine which level(s) was deficient in children. A possible hypothesis could therefore be that, unlike preschoolers with EB, TD preschoolers do not have specific problems at one or more steps. Because the separate levels of the SIP model are not clearly distinguished in the RES assessment, we were not able to work specifically on one potentially deficient step of the SIP.

Through indirectly measured results, we note that, after the intervention, parents clearly and significantly perceived their children as being less angry and egoistic (or more tolerant and prosocial), having more empathy, being more conscious of their emotions, finding it easier to express appropriate emotions in everyday situations, being socially

more adjusted, and having better social relationships (Figure 2). As hypothesized, children in the experimental group were perceived as significantly less irritable and angry after the training session. Although children in the experimental group tended to display less aggression and greater self-control, this change was not significant. This could mean that, in the preschool period, EB more commonly takes the form of anger than aggression. The "angry/tolerant" scale could therefore be more discriminant than the "aggressive/controlled" scale at this period. However, this differentiated result according to distinct initial EB profiles was consistent with observations made by several authors in school-age children, reporting that reactive aggression and proactive aggression are differently linked with ToM [61].

Some empirical studies have suggested that there are different types of EB profile (direct and indirect aggression, proactive or reactive aggression, etc.) that could be linked differently with ToM and SIP abilities [61], and our results could be interpreted in the same way. For instance, reactive aggression is principally correlated with dysfunction in the two first steps of the SIP model (encoding social cues and interpreting them), while proactive aggression is correlated more with deficits in the next three steps of the SIP model (clarifying goals, accessing a response and making a response decision). Moreover, reactive aggression could result from the misreading of other people's intentions, while children with deficits in emotions appear more likely to display anger and aggression with their peers at school [22,26].

In addition, with regard to repeated measure analyses, training sessions also led to an improvement in ER. Our results confirm the hypothesis that gains in ER may lead to a corresponding improvement in social adjustment (Figure 2). ER seems to be a predictor of social adjustment (including relationships with peers and adults) [50,62]. In other words, preschoolers who regulate their emotions correctly are perceived as socially adapted by adults or by their peers [17,63].

Multiple regression analyses showed that, as we expected and as Houssa and Nader-Grosbois [37] and Lecce, Bianco [59] demonstrated, the results were independent of individual differences on personality variables, because the personality variables did not explain the post-test results; which means that training sessions are relevant and could be helpful for children with different personality profiles. Finally, group condition is regularly a significant predictor of the post-test results (for all measures in regression analysis, except for direct measure of ToM and emotion dysregulation). This means that the training had an effect on performance, because we know that the experimental group improved significantly more than the control group in post-test. This result allows us to conclude that the training is effective principally in both emotion and frustration management and social competences, but less in social problem solving.

Concerning the impact on the level of EB, we think that this could be observable in a follow-up session. According to Eisenberg, Fabes [17], social maladjustment is particularly reflected in behavioral problems. As children improve in social adjustment, it is therefore reasonable to think that this will lead to a decrease of EB. Furthermore, the fact that improvements are perceived and reported by parents is a positive point, because we know that when parents perceive their child positively, his/her behavior is more likely to change [31,64].

Conclusions, Limitations and Implications

This study contributes to the knowledge of links between ToM, ER, social competences and social adjustment, showing that improving children's social cognition may help the development of those competences. This is significant because we know that children with good social competences and ER are perceived as being socially well adjusted [17,63]. Furthermore, our results show the importance of evaluating not only social cognition competences, but also ER and social adjustment abilities, using discriminative instruments. In particular, it is essential to detect and differentiate distinct profiles of EB at preschool age. We have seen the relevance of differentiating between "angry" and "aggressive" profiles, using the SCBE scales. However, as the SCBE scales do not differentiate profiles according to diagnostic criteria for EB (introduction), in order to obtain information about oppositional and agitated profiles we used the CPRS, as differentiated profiles could guide prevention and intervention. For example, Yoon, Hughes, Cavell and Thompson [65] have suggested that, to be more effective, interventions should perhaps differ according to the type of aggression in children. Although some studies show differentiated effects according to children's profiles, our study do not follow the same pattern, given that we did not reported differentiated effects depending on CPRS scores. This highlights the lack of precise and discriminative measures to evaluate EB profiles in preschoolers. In addition, we believe that the training of ER must be taken into account because we identified a positive effect even without having given training in this aspect.

However, our research presents some limitations. First, there is a potential bias because parents of children from the experimental group knew that they were trained. However, parents did not know the nature of the training (understanding of mental states and social problem solving). Second, we did not have direct observations of children in their preschool environments. Third, another limit could be the approach we used in our training. We know that a multifactorial approach could be more effective (running sessions for parents as well as sessions for children). A new study may evaluate the impact of an intervention on both parents' and children's competences to see whether it is higher.

Nevertheless, our results show that providing training in social cognition abilities in the preschool period leads to positive changes in social competences, ER and social adjustment. Early interventions that address difficulties in these areas may have lifelong benefits [31]. Those findings could also help professionals and parents by providing them with some basis for early training exercises than could enhance social competences, social adjustment, ER, and peer or adult relationships. This will benefit preschoolers who are at high risk of developing school-related problems and behavioral problems.

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