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Research in Developmental Disabilities



How could Theory of Mind contribute to the differentiation of social adjustment profiles of children with externalizing behavior disorders and children with intellectual disabilities?



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ABSTRACT

This study compared Theory of Mind (ToM) emotion and belief abilities in 43 children with externalized behavior (EB) disorders presenting low intelligence, 40 children with intellectual disabilities (ID) and 33 typically developing (TD) preschoolers (as a control group), matched for developmental age. The links between their ToM abilities, their level in seven self-regulation strategies as displayed in social problem-solving tasks and their social adjustment profiles (assessed by the Social Competence and Behavior Evaluation, completed by their teachers) were examined. Children with EB presented lower comprehension of causes of emotions and lower self-regulation of joint attention and of attention than children with ID and TD children. In comparison with TD children, lower social adjustment was observed in nearly all dimensions of profiles in both atypical groups. Specifically, children with EB were significantly angrier than children with ID. Although variable patterns of positive correlations were obtained in atypical groups between self-regulation strategies and ToM abilities, the most numerous positive links were obtained in the group with EB. Regression analyses showed that developmental age predicted ToM abilities and certain dimensions of social adjustment profiles in atypical groups. In the ID group, ToM emotions predicted general adaptation, affective adaptation, interactions with peers and with adults and low internalizing problems. In the EB group, general adaptation was predicted by ToM emotions and self-regulation, interactions with peers by ToM beliefs, and a low level of externalizing problems by ToM emotions. Some implications for intervention and perspectives for research are suggested.

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1. Introduction

At preschool age, the most common problem in mental health is “hard to manage” children presenting externalizing behaviors (EB) (aggressiveness, impulsivity, agitation, disobedience or opposition) that result from neurological, developmental, environmental and parenting factors (Owens & Shaw, 2003; Roskam, Kinoo, & Nassogne, 2007; Smeekens, Riksen-Walraven, & van Bakel, 2007). Behavioral problems in preschoolers can be the precursors of long-term antisocial behaviors and mental health problems, so it is important to detect them and intervene at an early stage (Campbell, 2006; Reid, Littlefield, & Hammond, 2008). In addition, according to the diagnostic criteria, children with intellectual disabilities (ID) present deficits in social skills and social adjustment (American Association Intellectual and Developmental Disabilities, 2009).

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They are likely to display behavior problems which affect their social inclusion (Adams & Allen, 2001; Buckley, Bird, & Sacks, 2002; Zion & Jenvey, 2006). They often present poor peer-related social competencies, opposition, anxiety and ADHD (Crnic, Hoffman, Gaze, & Edelbrock, 2004) and they display less social behavior during interactions with peers and withdrawn and isolated behaviors (Baurain & Nader-Grosbois, 2012; Guralnick, 1999; Merrell & Holland, 1997), although there is important individual variability in these social difficulties depending on endogenous and exogenous factors (Crnic et al., 2004; L'Abbé & Morin, 2001). From the structural-developmental approach, maladjusted children display deficits in social cognition or immaturity in their thinking and their social perspective coordination; from the functional approach, they display biases during difficult or problem solving situations (Demorest, 1992). In the structural-developmental approach, social cognition includes Theory of Mind (ToM). This concerns the ability to understand one's own and other people's mental states, to take other people's perspective, to infer what they know, believe or feel, and consequently to behave in adapted way in various social situations (Deneault & Ricard, 2013; Denham et al., 2003; Denham, Zinsser, & Bailey, 2011; Flavell, 1999; Lane, Wellman, Olson, Labounty, & Kerr, 2011; Wellman, 1991). In other words, children who are good at identifying and understanding other people's positive and negative emotions should interact successfully with them, be socially responsive and develop harmonious relationships in daily life. Moreover, when children are able to infer knowledge, intentions and beliefs and to understand false beliefs, this may help them to adopt other people's cognitive perspective and adjust their own behavior.

The heuristic model of social competencies, developed by Yeates et al. (2007) and by Nader-Grosbois and Fiasse (2011), combining structural-developmental and functional approaches, could be useful in guiding the study of specific characteristics to do with social information processing (including Theory of Mind and social problem solving), social interactions and perceptions of social adjustment, and of the links between these processes in atypically developing children, in order to better understand their social (mal)adjustment. Although children with EB and with ID present social maladjustment, no study has ever compared their social cognition, their understanding of distinct mental states or their ToM during the symbolic developmental period, or examined the extent to which their ToM could predict their respective strengths or weaknesses in socio-adjustment profiles. First, this study compares children with EB and with ID and typically developing (TD) children with respect to their specific characteristics in ToM beliefs (cognitive mental state), ToM emotions (affective mental state) and socio-emotional problem-solving; and with respect to their social (mal) adjustment profiles as perceived by their teachers in their relationships in daily life. Second, the study investigates whether and how their social (mal)adjustment profiles are linked to and predicted by their ToM abilities, socio-emotional problem-solving and self-regulation.

1.1. *Specific ToM and social cognition characteristics in children with EB*

Some studies have suggested that ToM could provide a partial explanation of EB in children and have postulated deficits in their understanding of mental states, notably of beliefs (Capage & Watson, 2001; Fahie & Symons, 2003; Happé & Frith, 1996; Renouf, Brendgen, Séguin, et al., 2010; Renouf, Brendgen, Parent, et al., 2010; Walker, 2005) and of causes and consequences of emotions (Hughes, Dunn, & White, 1998). Deficient emotion recognition has been observed in children with EB (Marsh & Blair, 2008; Speltz, DeKlyen, Calderon, Greenberg, & Fisher, 1999). In social information processing models developed in the functional approach, deficits in children with EB were postulated in the encoding, identification and interpretation of social cues, access to appropriate responses, the selection of goals and of social responses, the response decision and behavioral enactment (Crick & Dodge, 1994; Dodge & Crick, 1990; Dodge & Pettit, 2003; Fontaine & Dodge, 2009; Harvey, Fletcher, & French, 2001; Mize & Pettit, 2008), or in social problem-solving (Pettit, Dodge, & Brown, 1988). However, few studies have been conducted on social information processing in preschoolers with EB (Castro, Veerman, Koops, Bosch, & Monshouwer, 2002).

Positive significant links have been emphasized between the executive functioning of preschoolers with EB (attention, memory, inhibition, control of impulsivity, or self-regulation) and either their ToM beliefs (Fahie & Symons, 2003; Hughes et al., 1998; Hughes, Cutting, & Dunn, 2001; Lansford et al., 2006; Perner, Kain, & Barchfeld, 2002) or their ToM emotions (Hughes et al., 1998; Speltz et al., 1999). Recently, in children with EB and low intelligence presenting a mean developmental age of 5½ years, Nader-Grosbois and Fiasse (2011) observed a great variability in levels of ToM beliefs and emotions, and found positive significant links between these ToM abilities and self-planning and self-regulation of joint attention during socio-emotional problem-solving. Some authors have drawn attention to the fact that both ToM and executive functioning are positively linked with the level of social skills or negatively linked with social behavioral in children with EB presenting reactive aggressive behavior, oppositional defiant disorder (ODD), or hyperactivity-impulsivity and attention deficit (ADHD), or who are “rejected” by peers (Badenes, Estevan, & Bacete, 2000; Capage & Watson, 2001; Fahie & Symons, 2003; Happé & Frith, 1996; Lansford et al., 2006; Renouf, Brendgen, Séguin, et al., 2010). By contrast, other studies have emphasized that a higher level of ToM beliefs does not necessarily lead to positive social skills, including empathic and prosocial behaviors, or to less externalizing behavior, in “hard to manage” preschoolers (Astington & Jenkins, 1995; Hughes, White, Sharpen, & Dunn, 2000; Hughes et al., 2001; Repacholi, Slaughter, Pritchard, & Gibbs, 2003). Some authors have warned against approaching children with EB or aggressive children as a homogeneous group presenting a lack of socio-cognitive skills (Gini, 2006; Hughes & Leekam, 2004; Jolliffe and Farrington, 2006; Sutton, Smith, & Swettenham, 1999a, 1999b), as they may use their ToM abilities in their social interactions in a negative way in order to manipulate or bully others (called the Theory of “Nasty Minds” by Happé and Frith, 1996, or “Machiavellian ToM” by Repacholi et al., 2003). According to Hughes (2011, pp. 125–140), there are heterogeneous links between social understanding of distinct mental states (emotions, beliefs, intentions) and antisocial behaviors in children.

Over the course of childhood, thanks to the development of socio-cognitive and language skills, children may display their aggressiveness in different ways (Björkqvist, Österman, & Kaukiainen, 1992). In the literature, different forms and functions of aggression have been distinguished: physical and relational aggression (Martin, 2010), direct versus indirect aggression, and proactive versus reactive aggression (see the reviews in Renouf, Brendgen, Séguin, et al., 2010; Renouf, Brendgen, Parent, et al., 2010). Direct aggression is essentially physical (fighting, biting or kicking others); indirect aggression is usually verbal and subtle (manipulation, exclusion, bullying). Proactive aggression is deliberately planned and aimed at victimizing peers; reactive aggression corresponds to negative reactions when the child is frustrated or annoyed, or when the child perceives provocations in social interactions. Some studies have shown that ToM (essentially beliefs) is positively linked with proactive aggression and indirect aggression (with prosocial behavior playing a moderating effect); but negatively linked with reactive aggression, and not linked with direct aggression (Gini, 2006; Hughes et al., 2000; Renouf, Brendgen, Séguin, et al., 2010; Renouf, Brendgen, Parent, et al., 2010). Given the heterogeneous behavioral symptoms in children with EB and the different forms and functions of aggressiveness, studies should differentiate distinct types of social or asocial profile more accurately in order to establish how ToM could play a role in social (mal)adjustment in these children (as suggested by Deneault & Ricard, 2013). Moreover, gender differences appear in the link between ToM beliefs and social interactions with peers: girls are more intuitive, determine others' intentions more easily and solve social problems more effectively; while boys are more likely to engage in verbally aggressive or physically disruptive behavior (Walker, 2005).

1.2. Specific ToM and social cognition characteristics in children with ID

Recent studies have emphasized delayed development of ToM emotions and a deficit in ToM beliefs in children with ID in comparison with typically developing (TD) preschoolers matched for developmental age, and have shown the impact of developmental age and language level on their ToM abilities (Abbeduto & Murphy, 2004; Alevriadou & Giaouri, 2011; Charman & Campbell, 2002; Thirion-Marissiaux & Nader-Grosbois, 2008a, 2008b; Williams, Wishart, Pitcairn, & Willis, 2005). However, the relation between executive functioning and development of ToM in children with ID has not been specifically explored, although some weaknesses in executive functioning have been identified, in comparison with TD children matched for chronological and mental age (see details in Danielsson, Henry, Messer, & Ronnberg, 2012). Only recently, Nader-Grosbois, Fiasse, and Baurain (2011) have emphasized in children with ID (mean developmental age of 5½ years) presenting great variability in levels of ToM beliefs and ToM emotions, the presence of positive significant links between both these ToM abilities and self-planning, between ToM beliefs and self-regulated attention and joint attention, and between ToM emotions and self-evaluation.

Some studies have highlighted that weaknesses in ToM beliefs in children with ID are linked with their low social abilities (Abbeduto & Murphy, 2004; Jervis & Baker, 2004; Thirion-Marissiaux & Nader-Grosbois, 2008c); and that their weaknesses in ToM emotions are linked with low social skills (Turk & Cornish, 1998), with the presence of internalizing problems (Thirion-Marissiaux & Nader-Grosbois, 2008c) and with their less social behavior during social interactions in different dyadic play contexts (cooperative, competitive with peers, or neutral with an adult) (Baurain & Nader-Grosbois, 2013). By contrast, other authors have failed to find any significant link between social abilities in children with ID and their understanding of emotions (Williams et al., 2005) or their ToM beliefs (Charman & Campbell, 2002). In addition, a recent study has reported that the self-perception of social acceptance in children with ID and in TD preschoolers could mediate the relation between their abilities in ToM (emotions and beliefs) and their social adjustment (Fiasse & Nader-Grosbois, 2012). Baurain and Nader-Grosbois (2013) also observed a developmental delay in socio-emotional problem solving in children with ID in comparison with TD children, and emphasized that socio-emotional problem solving abilities were positively linked with their behavior toward social rules in dyadic interactions with a peer and an adult while playing a game.

In this literature, although difficulties are reported in the development of ToM and in social adjustment in children with EB and children with ID, no study has ever compared these two groups using similar and multidimensional methods of assessment of distinct components of the understanding of emotions and of beliefs, and of social (mal)adjustment dimensions. Usually, authors have used only a limited number of ToM tasks and different measures of social skills or inabilities, and have performed analyses using global scores, without differentiating specific social (mal)adjustment profiles. As suggested by Deneault and Ricard (2013, p. 92): "... in order to further examine the relationships between social cognition and social adjustment, and given that different dimensions of social adjustment were found to relate emotion and false belief understanding, the instrument measuring children's adjustment to others should provide multiple indices of this adjustment. Moreover, these indices should be analyzed separately in order to see which specific dimensions of social adjustment are related to social cognition". In addition, in order to determine specific guidelines for efficient prevention and intervention in childhood for these groups (as suggested in the model of Social-Emotional Learning, SEL; Denham et al., 2012), we need a better understanding of how their respective characteristics in terms of ToM, social problem-solving and self-regulation could lead to specific features in their social (mal)adjustment profiles.

2. Objectives of the study

First, this study aimed to compare ToM emotions, ToM beliefs and socio-emotional problem-solving in children with EB (mainly of the oppositional type) presenting low intelligence and in children with ID, and to examine the extent to which their developmental age and self-regulation are linked with their ToM level (see Fig. 1).

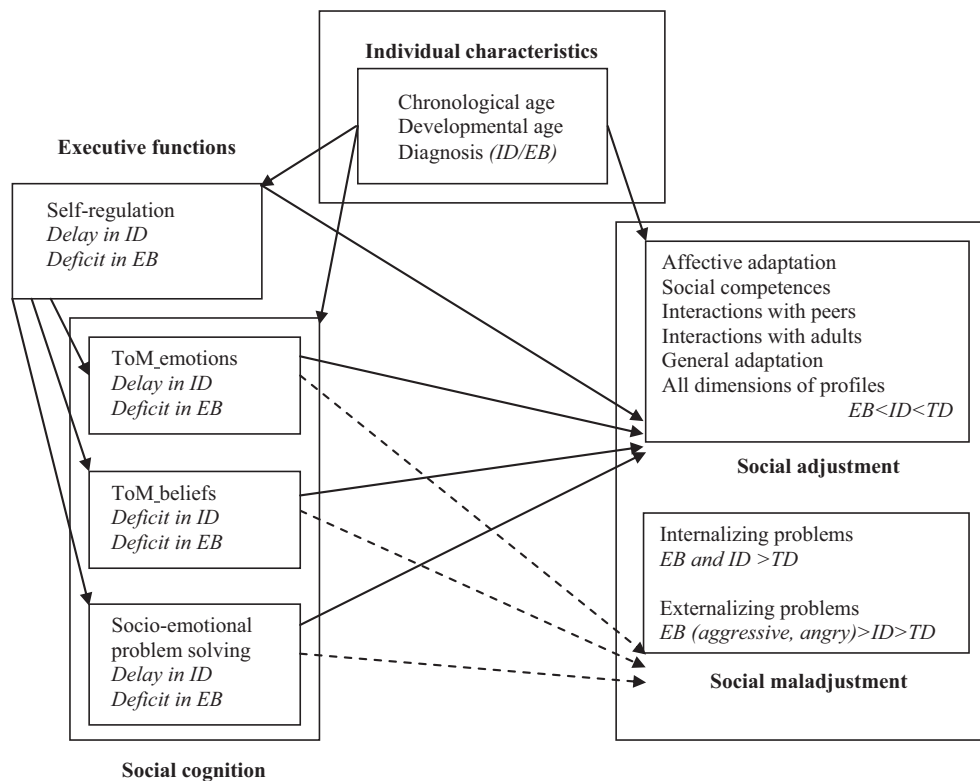


Fig. 1. A priori model of social cognition, self-regulation, social adjustment and their links in children with externalizing behavior disorders and children with intellectual disability, in comparison with typically developing children. ID: children with intellectual disability, EB, children with externalizing behavior disorders; TD: typically developing children; \longrightarrow : positive links with abilities in social cognition, self-regulation or social adjustment; $-\ - - \blacktriangleright$: positive links with low levels of social maladjustment.

- In comparison with TD children of a similar developmental age, we predicted that children with EB would display deficits in ToM emotions and beliefs, in socio-emotional problem-solving and in several strategies of self-regulation; and that children with ID would display delays in ToM emotions, in socio-emotional problem-solving and in self-regulation and deficits in ToM beliefs.
- We predicted that developmental age and self-regulation would be positively linked with ToM level and abilities in socio-emotional problem solving in both atypical groups.

Second, we examined specific strengths or weaknesses in these children's social adjustment profiles and the extent to which their ToM abilities or inabilities and their self-regulation could predict their social (mal)adjustment (see Fig. 1).

- In comparison with TD children, we predicted lower social adjustment in all dimensions of profiles in both atypical groups. More specifically, we predicted more externalizing problems and more aggressive and angry behavior in children with EB than in children with ID and TD children. In other words, it was expected that children with EB would present more direct and indirect, proactive and reactive aggression than children with ID. We also predicted more internalizing problems in children with ID than in TD children.
- For the two atypical groups, we predicted that ToM emotions, ToM beliefs and self-regulation respectively would be positively linked with their social adjustment abilities, and with lower levels of externalizing or internalizing problems. More specifically, we predicted that each atypical group would display different significant links between ToM emotions or ToM beliefs and the targeted specific dimensions in social adjustment profiles: isolated-integrated, angry-tolerant, aggressive-controlled, egoistic-prosocial and resistant-cooperative.

3. Methods

3.1. Participants

The participants were 43 children with EB and low intelligence (20 girls and 23 boys), 40 children with ID (20 girls and 20 boys) and 33 TD children (16 girls and 17 boys) as a control group. They were recruited mainly from French-speaking Belgian schools. Their teachers identified children who met the inclusion criterion of elementary comprehension and production of spoken French. TD preschoolers were in ordinary preschool classes. Participants with EB (oppositional type) were in special classes (type 3) adapted specifically for children diagnosed as presenting behavior disorders. Participants

Table 1

Means and standard deviation for chronological and developmental ages in years in each group and between-group comparisons.

	TD children (<i>n</i> = 33)	Children with EB (<i>n</i> = 43)	Children with ID (<i>n</i> = 40)	<i>F</i> (<i>df</i>)
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	
Chronological age	4.6(.7)	7(2.5)	9.8(2.8)	5.02(2)***
Global developmental age	5(1.2)	5.4(1.3)	5.3(1.3)	.29(2)
Verbal developmental age	5(1.2)	5(1.5)	5.3(1.4)	.26(2)

M: mean; *SD*: standard deviation. ID: with intellectual disability; EB: with externalizing behavior disorders; TD: typically developing children.

*** $p < .001$.

with ID were in special classes (types 1 and 2) adapted for children presenting mild and moderate intellectual disabilities respectively.

Participants with EB and with ID had all been diagnosed by a centre for psychological and medical care on the basis of standardized intellectual, social and medical assessments before being assigned to these specific specialized classes. The children's records included information about their diagnoses and the reasons why they had been assigned to their specific class. The school director and the teachers have access to these records. All this information was used to select our samples.

As presented in Table 1, the mean chronological ages in the group with EB ($M = 7$ years, $SD = 2.5$) and the group with ID ($M = 9.8$ years, $SD = 2.8$) were significantly higher than in the TD group ($M = 4.6$ years, $SD = 0.7$), $F(2) = 5.02$, $p < .001$. The mean global developmental age did not differ between the group with EB ($M = 5.4$ years, $SD = 1.3$), the group with ID ($M = 5.3$ years, $SD = 1.3$) and the TD group ($M = 5$ years, $SD = 1.2$), $F(2) = .29$, ns. Moreover, the mean verbal developmental age did not differ between the group with EB ($M = 5$ years, $SD = 1.5$), the group with ID ($M = 5.3$ years, $SD = 1.4$) and the TD group ($M = 5$ years, $SD = 1.2$), $F(2) = .26$, ns. The groups were matched for their global developmental age and their verbal developmental age.

3.2. Instruments

3.2.1. Differential scales of intellectual efficiency-revised edition (EDEI-R, Perron-Borelli, 1996)

These scales were used to match the participants for global developmental age. They distinguish between verbal developmental age and non-verbal developmental age. The verbal developmental age was calculated by means of scores on five scales: vocabulary in picture naming, vocabulary in word definition, knowledge, social understanding and conceptualization. The non-verbal developmental age was calculated by means of scores on four scales: classification of pairs of pictures, classification of three pictures, category analysis and practical adaptation.

3.2.2. ToM emotions tasks (Nader-Grosbois & Thirion-Marissiaux, 2011)

Inspired by and adapted from tasks proposed in the literature about causes and consequences of the four basic emotions (Cutting & Dunn, 1999; Denham, 1986; Dunn, Brown, & Maguire, 1995; Harris & Pons, 2003; Hughes & Dunn, 1998; Schultz, Izard, & Bear, 2004; Thommen, Suarez, Guidetti, Guidoux, Rogé, & Reilly, 2010), three tasks were conceived and validated for use with TD preschoolers and atypically developing children or adolescents (with ID, autism or EB).

- (1) *The preliminary task of facial emotional expression (FEE) recognition*. This concerned four basic emotions (joy, sadness, anger and fear). Correct recognition was a necessary condition for the child to be set ToM emotions tasks.
- (2) *The causes of emotions task*. This task included four similar beginnings of scripts ("three friends go on a picnic in the forest", illustrated by two pictures). The end of each script (a third picture) varied in order to elicit an appropriate response according to the emotional coloring in the script: joy (friends eat picnic); sadness (picnic canceled because of rain); fear (fierce dog approaches the picnic); anger (picnic is ruined by two friends). For each script, firstly, the experimenter recounted the script (the faces of the protagonists being left blank) and secondly, the participant was asked to make an emotion attribution to the main protagonist by pointing to the most appropriate of the four FEEs. The response to each emotional script was scored between 0 and 1.5 points according to the participant's justification (0 = false FEE, non-justified or incoherent justification; 0.5 = false FEE, coherent justification; 1 = correct FEE, non-justified or incoherent justification; 1.5 = correct FEE, coherent justification). The maximum score was 6 points in this task.
- (3) *The consequences of emotions task*. This task included four different scripts illustrated by two pictures, each including: joy (receiving a gift); sadness (a pet's death); fear (imagining monsters in bedroom at night) and anger (conflict between friends). For each script, firstly, the experimenter recounted the beginning of the script (two pictures), specifying the protagonist's emotion, and secondly, the participant was asked to choose the protagonist's behavior to finish the script, by selecting one of three pictures. These illustrated a socially adjusted behavior, a socially maladjusted behavior, or a neutral behavior. The response to each emotional script was scored between 0 and 1.5 point according to the participant's justification (0 = socially maladjusted or neutral behavior, non-justified or incoherent justification; 0.5 = socially maladjusted or neutral behavior, coherent justification; 1 = socially adjusted behavior, non-justified or

incoherent justification; 1.5 = socially adjusted behavior, coherent justification). The maximum score was 6 points in this task.

Both ToM emotions tasks were scored out of a total of 12 points.

3.2.3. ToM beliefs tasks (Nader-Grosbois & Thirion-Marissiaux, 2011)

Five tasks (see Appendix A for description) estimated the subject's understanding of the mental state "belief": (1) *The deception skills test* (Oswald & Ollendick, 1989), (2) *the change of representation task* (Flavell, Everett, Croft, & Flavell, 1981), (3) *the appearance-reality task* (Flavell, 1986), (4) *the unexpected content task* (Perner, Leekam, & Wimmer, 1987), (5) *the change of location task* (Wimmer & Perner, 1983). Five ToM beliefs tasks were scored out of a total of five points (one point for each task).

3.2.4. Socio-emotional problem-solving tasks

A preliminary task of identification and recognition of expressions of four basic emotions in four pictures was administered before eight socio-emotional problem-solving tasks (divided into four tasks involving predicting emotions and well adjusted behaviors according to the situations, and four tasks involving matching situations, emotions and well adjusted behaviors; see details in Appendix B). The overall performance in socio-emotional problem-solving was scored by adding up the points awarded for correct answers and justifications in each task (max score = 24 points).

3.2.5. The grid of self-regulation in socio-emotional problem-solving

This validated grid is used to observe and analyze self-regulatory strategies of children in problem-solving situations (Nader-Grosbois, 2007; Nader-Grosbois, Normandeau, Ricard-Cossette, & Quintal, 2008), through a macroscopic analysis of behaviors displayed by the child. Seven self-regulatory strategies were distinguished: self-identification of objective, self-planning, joint attention, behavior regulation or request, self-attention, self-motivation and self-evaluation (see Appendix C). For each task, the prevailing behavior displayed by the child in the session guided the marking. The score given graded the level of the child's self-regulation for each strategy: none scored 0; (–) low scored 1; (/) moderate scored 2; (+) high scored 3. These scores were used to calculate scores for each specific regulatory strategy per child, for each socio-emotional problem-solving task per emotion (from 0 to 3), for both types of tasks per emotion (from 0 to 6), for both types of tasks for the four emotions (from 0 to 24), and for overall regulation for the tasks (of the total of the scores in all seven strategies in all tasks for the four emotions, from 0 to 168).

3.2.6. The socio-affective profile (PSA, Dumas, Lafrenière, Capuano, & Durning, 1997, French version of the Social Competence and Behavior Evaluation scale, SCBE, LaFrenière & Dumas, 1995)

This assesses social and affective abilities allowing social adjustment in children aged from 2.5 to 6 years and can be used to identify potential externalizing or internalizing problems. Examples of items are: "laughs easily", "hard to console", "participates easily in group", "is not interested when another child invites him or her to play", "asks adult permission to" and "defies the adult when he or she is reprimanded". The questionnaire includes 80 items divided into eight basic subscales: (1) depressive-happy, (2) anxious-secure, (3) isolated-integrated, (4) dependent-autonomous, (5) angry-tolerant, (6) aggressive-controlled, (7) egoistic-prosocial, (8) resistant-cooperative. These are used to compose four global SCBE components: social competence (positive socio-affective behavior in eight scales), internalizing problems (presence of affective difficulties in scales 1–4), externalizing problems (presence of behavioral difficulties in scales 5–8) and general adaptation (all basic scales). Three composite scores could be calculated: affective adaptation (scales 1, 2, 5), interactions with peers (scales 3, 6, 7), and interactions with adults (scales 4 and 8). The instrument thus gives measures of social adjustment and of social maladjustment. The teacher of each participant noted the frequencies of 80 behaviors on a six-point Likert scale (from "never" to "always"). By totaling these frequencies for items corresponding to each basic scale, it is possible to calculate a specific raw score and global and composite raw scores (corresponding to the sum of raw scores in basic scales included in the global and composite SCBE scales respectively). All raw scores were converted into T scores in order to homogenize the results diverging from what was expected on the basis of the participant's gender and the global developmental age (less or more than 4 years). The extent of T scores varied from 30 to 70 points. Scores lower than 38 attested to disorders, while scores higher than 62 attested to specific strengths in the socio-affective profile. These converted scores were used in all statistical analyses.

3.3. Procedure

All participants were tested by three experienced psychology researchers, at school and/or at home. In each school, a meeting was organized in order to inform teachers about the research project and the conditions of participation. The teachers gave the parents information letters about the project and about ethical aspects, and consent forms for the children's participation and for video recording. The parents and the teachers could discontinue their participation whenever they wanted. They signed a consent form for their participation. It was made clear that all information provided would be treated as confidential. This study is part of a wider research project being conducted by Nader-Grosbois's team that has been validated by an Ethics Committee at their Research Institute.

Different tests were administered across several sessions for each participant (lasting 20–40 min according to the participant's attention span). Total administration time varied from participant to participant, but was between 2 and 4 h. EDEI-R was presented before the ToM emotions and ToM beliefs tasks. The tests were administered by the examiner in a quiet and familiar room. In order to proceed to the scoring of ToM emotions and ToM beliefs tasks, and also of the self-regulation strategies operated during socio-emotional problem-solving tasks, these sessions were filmed. SCBE questionnaires were completed by teachers. A summary report on the participants' abilities was sent to their parents and teachers.

4. Results

4.1. Participants' characteristics

The participants' mean chronological, global developmental and verbal developmental ages (and standard deviation) for the three groups are detailed in Table 1.

A one-way ANOVA was applied in order to compare participants' characteristics. As shown in Table 1, the participants of the three groups presented no significant difference in their global developmental age or their verbal developmental age, in spite of the significantly higher chronological age in the groups with ID and with EB than in the TD group.

4.2. ToM emotions and beliefs abilities

Table 2 presents the participants' mean scores and standard deviations in the two ToM emotions tasks and in all ToM beliefs tasks for the three groups.

A one-way ANOVA showed a significant difference between groups only in mean scores in the comprehension of causes of emotions: children with EB and children with ID displayed lower comprehension than those in the TD group. Bonferroni's post hoc tests of multiple comparisons showed that the group with EB had significantly lower scores in comprehension of causes of emotions than the group with ID ($p = .045$); and also lower scores in ToM emotions and in ToM beliefs than the TD group (respectively, $p = .045$; $p = .05$).

4.3. Self-regulation strategies and socio-emotional problem-solving

Table 3 presents mean scores and standard deviations in overall self-regulation, self-regulatory strategies and socio-emotional problem-solving. A one-way ANOVA showed significant differences between groups specifically in self-regulation

Table 2

Mean scores and standard deviation in ToM emotions and beliefs tasks in each group and between-group comparisons.

	TD children ($n = 33$) M(SD)	Children with EB ($n = 43$) M(SD)	Children with ID ($n = 40$) M(SD)	F(df)
Causes of emotions (max 6 points)	4.44(1.16)	3.67(1.33)	3.77(1.47)	3.44(2) [*]
Consequences of emotions (max 6 points)	3.91(1.72)	3.65(1.77)	4.02(1.82)	.48(2)
Total of ToM emotions (max 12 points)	8.35(2.5)	7.4(2.73)	7.77(2.83)	1.17(2)
ToM beliefs (max 5 points)	3.45(1.16)	2.75(1.20)	2.96(1.34)	2.98(2)

M: mean; SD: standard deviation; ID: with intellectual disability; EB: with externalizing behavior disorders; TD: typically developing children.

^{*} $p = .035$.

Table 3

Mean scores and standard deviations for self-regulation and socio-emotional problem-solving for each group and between-group comparisons.

	TD children ($n = 33$) M(SD)	Children with EB ($n = 43$) M(SD)	Children with ID ($n = 40$) M(SD)	F(df)
Overall self-regulation (max 168 points)	128.2(20)	123.7(25.3)	127.8(21)	1.01(2)
Self-identification of objective (max 24 points)	21.7(3)	19.7(5.9)	21.7(2.9)	1.19(2)
Self-planning (max 24 points)	19(4.9)	17.1(6.9)	18.8(5.2)	.86(2)
Joint attention (max 24 points)	22(2.1)	17.2(5.5)	21.4(3.7)	4.63(2) ^{**}
Behavior regulation (max 24 points)	21.2(5.5)	21.3(6.5)	21.3(5.8)	.09(2)
Self-attention (max 24 points)	20.1(3.1)	15.4(6.8)	19.9(3.5)	4.58(2) ^{**}
Self-motivation (max 24 points)	14.3(5.2)	14(5.5)	13.8(5.9)	1.53(2)
Self-evaluation (max 24 points)	13.6(6.2)	12.43(7.9)	12.5(6.4)	.28(2)
Socio-emotional problem-solving (max 24 points)	19.2(4.5)	17.93(4.8)	17.68(4.9)	.22(2)

M: mean; SD: standard deviation; ID: with intellectual disability; EB: with externalizing behavior disorders; TD: typically developing children.

^{**} $p < .015$.

Table 4

Mean scores and standard deviations for SCBE scales in each group and between-group comparisons.

	TD children (n = 33) M(SD)	Children with EB (n = 43) M(SD)	Children with ID (n = 40) M(SD)	F(df)
SCBE scales				
(1) Depressive-happy	51.7(7)	48.7(10.5)	47.6(8.6)	1.69(2)
(2) Anxious-secure	51.9(5.6)	43.4(9.1)	45.4(7.5)	10.87(2)***
(3) Isolated-integrated	50.3(8.3)	44.1(13)	46.5(10.2)	2.77(2)
(4) Dependent-autonomous	50.9(5.3)	42.5(6.9)	43.7(7.9)	14.5(2)***
(5) Angry-tolerant	52.9(7.3)	39.3(8.6)	44.3(9.3)	22.23(2)***
(6) Aggressive-controlled	52.6(7.7)	42.9(8.2)	45.7(10.7)	10.47***
(7) Egoistic-prosocial	53.9(8.5)	46.3(10.7)	46.9(11.2)	5.46(2)**
(8) Resistant-cooperative	51(6.7)	42.9(8.5)	46.3(10.3)	7.63(2)***
Social adaptation in SCBE				
Affective adaptation (scales 1, 2, 5)	52.2(5.4)	43.8(7.6)	45.7(6.7)	13.97(2)***
Interactions with peers (scales 1, 2, 5)	52.3(6.4)	44.4(9.2)	46.4(8.9)	7.84(2)***
Interactions with adults (scales 1, 2, 5)	50.9(4.9)	42.7(6.8)	45(6.6)	15.46(2)***
Social competence (positive socio-affective behavior in all scales)	51.9(6.7)	46(8.4)	47.6(6.7)	5.43(2)**
General adaptation (all basic scales)	53.3(7.2)	51.7(35.5)	45.5(8.4)	.95(2)
Social maladjustment in SCBE				
Internalizing problems (presence of affective difficulties in scales 1, 2, 3, 4)	52.4(8.1)	45.4(8.3)	45.2(8)	9.01(2)***
Externalizing problems (presence of behavioral difficulties in scales 5, 6, 7, 8)	53.7(7)	44.9(11.7)	45.9(10.9)	7.22(2)***

M: mean; SD: standard deviation; ID: with intellectual disability; EB: with externalizing behavior disorders; TD: typically developing children.

** $p < .006$.*** $p < .001$.

of joint attention and of attention, which was lower in groups with EB and with ID than in TD children. Moreover, Bonferroni's post hoc tests of multiple comparisons showed that children with EB displayed lower self-regulation of joint attention and of attention than children with ID ($p < .05$).

4.4. Socio-affective profiles, social adjustment and maladjustment

Table 4 presents mean scores and standard deviations for all SCBE scales, for each group.

A one-way ANOVA applied to scores on the SCBE scales showed significant differences between the groups to the disadvantage of children with EB and with ID in comparison with TD children for the six following basic scales: (2) anxious-secure, (4) dependent-autonomous, (5) angry-tolerant, (6) aggressive-controlled, (7) egoistic-prosocial, (8) resistant-cooperative. Moreover, children with EB and with ID, in comparison with TD children, obtained significantly lower scores on three global scales (social competence, internalizing problems, externalizing problems) and their composite scores for affective adaptation, interactions with peers, and interactions with adults. The one-way ANOVA also emphasized a very important variance in general adaptation specifically in the group with EB. Moreover, Bonferroni's post hoc tests of multiple comparisons showed lower scores in the SCBE scales in children with EB and in children with ID, than in TD children. Children with EB presented lower scores in the SCBE scales than children with ID, although the difference was significant only for the scale angry-tolerant ($p < .05$).

4.5. Links between chronological and developmental ages, self-regulation, ToM abilities and socio-emotional problem-solving

Table 5 shows the results of correlational analyses obtained by applying Spearman's coefficient between the chronological age, developmental age and scores for self-regulation, ToM emotions, ToM beliefs and socio-emotional problem-solving, in each group.

In the TD group, positive significant correlations (from $p < .05$ to $p < .001$) were obtained between on the one hand, chronological age, global developmental age, verbal developmental age, overall self-regulation, self-planning, self-attention and joint attention, and on the other hand, scores for ToM emotions and ToM beliefs. In the group with EB, positive significant correlations (from $p < .05$ to $p < .001$) were obtained between on the one hand, developmental age (verbal and non verbal), overall self-regulation, self-planning, joint attention, self-motivation and self-evaluation, and on the other hand, scores for ToM emotions and ToM beliefs; self-identification of objective and self-attention were also positively and significantly linked with ToM emotions. In the group with ID, developmental age (verbal and non verbal) was positively and significantly linked with scores for ToM emotions and ToM beliefs (from $p < .005$ to $p < .001$); overall self-regulation, self-identification of objective, self-planning and self-evaluation were positively and significantly linked with ToM emotions; and self-attention was positively and significantly linked with ToM beliefs (from $p < .05$ to $p < .01$).

Table 5

Correlations between chronological age, global developmental age, verbal developmental age, self-regulation, ToM emotions and beliefs, and socio-emotional problem-solving abilities in each group.

Groups	ToM emotions	ToM beliefs	Socio-emotional problem-solving
TD children (<i>n</i> = 33)			
Chronological age	.54****	.55****	.50***
Global developmental age	.61****	.44**	.53***
Verbal developmental age	.65****	.43*	.54***
Overall self-regulation	.65****	.44**	.46**
Self-identification of objective	.35	.20	.30
Self-planning	.52****	.50***	.50***
Joint attention	.67****	.70****	.20
Behavior regulation	.20	.22	.06
Self-attention	.46**	.45**	.40*
Self-motivation	.30	.28	.18
Self-evaluation	.33	.34	.22
Children with EB (<i>n</i> = 43)			
Chronological age	.29	.25	.21
Global developmental age	.57****	.52****	.45***
Verbal developmental age	.66****	.67****	.46***
Overall self-regulation	.63****	.41*	.42**
Self-identification of objective	.54****	.27	.31*
Self-planning	.78****	.71****	.61****
Joint attention	.74****	.77****	.40**
Behavior regulation	.05	.12	.01
Self-attention	.44***	.16	.16
Self-motivation	.43***	.33*	.12
Self-evaluation	.35*	.41**	.12
Children with ID (<i>n</i> = 40)			
Chronological age	.22	.12	.02
Global developmental age	.58****	.50****	.61****
Verbal developmental age	.55****	.45***	.62****
Overall self-regulation	.43**	.31	.53****
Self-identification of objective	.33*	.08	.30
Self-planning	.38*	.04	.38*
Joint attention	.03	.14	.13
Behavior regulation	.16	.08	.02
Self-attention	.26	.43**	.39*
Self-motivation	.19	.15	.26
Self-evaluation	.32*	.13	.23

ID: with intellectual disability; EB: with externalizing behavior disorders; TD: typically developing children.

* $p < .05$.

** $p < .01$.

*** $p < .005$.

**** $p < .001$.

In addition, performances in socio-emotional problem-solving were correlated positively and significantly with developmental age (verbal and non verbal) and overall self-regulation in each group. In the three groups, self-planning was positively linked with performances in socio-emotional problem-solving. However, different positive correlational patterns were obtained in the three groups between performances in socio-emotional problem-solving and other specific self-regulatory strategies.

Multiple regressions by the stepwise method were applied in order to verify the extent to which chronological age, global developmental age and self-regulation (as independent variables) could predict the variance in ToM emotions and the variance in ToM beliefs (as dependent variables, respectively) displayed by the participants in each group. The results are presented in Table 6.

In the TD group, chronological age explained 32.6% of the variance in ToM emotions and 31.3% of the variance in ToM beliefs. In the group with EB, global developmental age explained 28.8% of the variance in ToM emotions and 20.7% of the variance in ToM beliefs. In the group with ID, global developmental age explained 28.6% of the variance in ToM emotions and 17.8% of the variance in ToM beliefs.

4.6. Predictive links between chronological and developmental ages, self-regulation, ToM and social (mal)adjustment profiles

Multiple regressions by the stepwise method were applied, for each group separately, in order to verify the extent to which their chronological and developmental ages, self-regulation and ToM emotions and beliefs abilities (as independent variables) could predict the variance in scores on the composite and global SCBE scales (see Table 7), and in scores on the specific targeted SCBE scales (see Table 8).

Table 6
Summary of multiple regression analyses on predictors of ToM emotions and ToM beliefs in each group.

Groups	Predictors	Dependent variables									
		ToM emotions					ToM beliefs				
		B	SE/B	BETA	R ² _{adj.}	F	B	SE/B	BETA	R ² _{adj.}	F
TD children	CA	.193	.048	.589	.326	16.47****	.088	.022	.578	.313	15.56****
Children with EB	DA	.081	.025	.565	.288	10.31***	.034	.013	.495	.207	6.49*
Children with ID	DA	.085	.028	.566	.286	9.43****	.039	.016	.466	.178	5.55*

CA: chronological age; DA: developmental age; ID: with intellectual disability; EB: with externalizing behavior disorders; TD: typically developing children; B: regression coefficient, SE/B: standard deviation of B, BETA: standardized regression coefficient, R²_{adj.}: multiple regression coefficient (percentage of explained variance).

- * $p < .05$.
- *** $p < .005$.
- **** $p < .001$.

As can be seen from Table 7, distinct independent predictors, according to the group, explained scores on composite or global SCBE scales. In the TD group, no significant result was obtained. In the group with EB, general adaptation was highly predicted by ToM emotions (35.9% of variance) and by self-regulation (48.4% of variance); ToM beliefs explained 36.8% of variance in interactions with peers; developmental age explained moderate to high percentages of variances in affective adaptation (20.3%), interactions with peers (21.6%) and interactions with adults (29.4%); and ToM emotions strongly predicted a low level of externalizing problems (45.2%). In the group with ID, ToM emotions explained very high percentages of variances in general adaptation (54.2%), affective adaptation (49.4%), interactions with peers (34.9%) and interactions with adults (42.2%), as well as a low level of internalizing problems (40.6%).

As can be seen from Table 8, distinct independent predictors, according to the group, explained specific targeted SCBE scales. No significant result was obtained in the TD group. In the group with EB, ToM beliefs explained from 13.8% to 36.4% of the variance in the following SCBE scales: isolated-integrated, angry-tolerant, egoistic-prosocial and resistant-cooperative;

Table 7
Summary of multiple regression analyses on predictors of composite and global SCBE scales in each group.

Groups	Predictors	Dependent variables composite and global SCBE scales	B	SE/B	BETA	R ² _{adj.}	F
Children with EB		Adjustment					
		General adaptation					
		ToM emotions	9.906	2.775	.624	.359	12.74***
		Self-regulation	1.088	.419	.610	.484	7.55***
		DA	.225	.089	.491	.203	6.36*
		Interactions with peers					
		DA	.298	.114	.504	.216	6.80*
		ToM beliefs	3.981	1.654	.489	.368	7.11***
		Interactions with adults					
		DA	.228	.073	.573	.294	9.76***
Children with ID		Maladjustment					
		Externalizing problems					
		ToM emotions	3.238	.727	.691	.452	18.31****
		Adjustment					
		General adaptation					
		ToM emotions	2.151	.575	.764	.542	13.99***
		Affective adaptation					
		ToM emotions	1.641	.479	.735	.494	11.73**
	Interactions with peers						
	ToM emotions	2.288	.871	.639	.349	6.89*	
	Interactions with adults						
	ToM emotions	1.741	.579	.689	.422	9.03*	
	Maladjustment						
	Internalizing problems						
	ToM emotions	1.943	.666	.678	.406	8.52*	

DA: developmental age; ID: with intellectual disability; EB: with externalizing behavior disorders; TD: typically developing children; B: regression coefficient; SE/B: standard deviation of B; BETA: standardized regression coefficient; R²_{adj.}: multiple regression coefficient (percentage of explained variance).

- * $p < .05$.
- ** $p < .01$.
- *** $p < .005$.
- **** $p < .001$.

Table 8
Summary of multiple regression analyses on predictors of SCBE scales in each group.

Groups	Predictors	Dependent variables SCBE scales	B	SE/B	BETA	R ² _{adj.}	F
Children with EB		(3) Isolated-integrated					
	DA		.417	.161	.501	.213	6.70*
	ToM beliefs		5.595	2.334	.488	.364	7.01***
		(5) Angry-tolerant					
	ToM beliefs		3.051	1.037	.435	.168	8.65**
		(6) Aggressive-controlled					
	DA		.212	.090	.467	.179	5.59*
	ToM beliefs	(7) Egoistic-prosocial	5.322	1.703	.573	.294	9.76***
Children with ID		(8) Resistant-cooperative					
	ToM beliefs		2.907	1.392	.423	.138	4.36*
		(3) Isolated-integrated					
	ToM emotions		2.626	.922	.669	.393	8.11*
		(5) Angry-tolerant					
	ToM emotions	(7) Egoistic-prosocial	1.694	.625	.651	.366	7.35*
	ToM emotions		2.418	1.041	.592	.285	5.39*

CA: chronological age; DA: developmental age; ID: with intellectual disability; EB: with externalizing behavior disorders; TD: typically developing children; B: regression coefficient; SE/B: standard deviation of B; BETA: standardized regression coefficient; R²_{adj.}: multiple regression coefficient (percentage of explained variance).

* $p < .05$.

** $p < .01$.

*** $p < .005$.

developmental age explained 21.3% of the variance in the isolated-integrated scale and 17.9% of the variance in the aggressive-controlled scale. In the group with ID, ToM emotions explained from 28.5% to 39.3% of the variance in three SCBE scales: isolated-integrated, angry-tolerant and egoistic-prosocial.

5. Discussion

5.1. Specific ToM, socio-emotional problem-solving and self-regulation characteristics, and the links between them

In terms of between-group comparisons of ToM abilities, children in the group with EB were less likely to understand the causes of emotions than the group with ID and TD group matched for developmental age, but not the consequences of emotions and beliefs (where they only displayed a slight delay). The prediction of basic emotions according to situations appeared deficient specifically in children with EB (as observed by Hughes et al., 1998) and should be trained in their psycho-educational intervention program. In both atypical groups, global developmental age partially explains the variance in ToM emotions and beliefs abilities; this has also been reported in previous studies in children with EB (Nader-Grosbois & Fiasse, 2011) and in children with ID (Baurain & Nader-Grosbois, 2013; Charman & Campbell, 2002; Fiasse & Nader-Grosbois, 2012; Thirion-Marissiaux & Nader-Grosbois, 2008a, 2008b; Williams et al., 2005).

No between-group differences were obtained in performances in socio-emotional problem-solving: in comparison with TD children, both atypical groups showed only a slight delay but not a deficit (as also observed in children with ID by Baurain and Nader-Grosbois, 2013). However, in terms of self-regulatory strategies during socio-emotional problem-solving, the between-group comparisons emphasized that the group with EB made less use of self-regulation of joint attention and of attention than the group with ID or the TD group. This weakness in maintaining attention and selective attention has also been observed in children with EB by other authors (Fahie & Symons, 2003; Hughes et al., 1998; Perner et al., 2002; Speltz et al., 1999). Some studies have pointed to the role of attention in the regulation of anger and other negative emotions (Posner & Rothbart, 2007, pp. 19–22), which can protect against externalizing problems (Jungmeen & Deater-Deckard, 2011). Difficulties in joint attention in socio-emotional problem-solving have also been observed in children with EB at a similar developmental period (Nader-Grosbois & Fiasse, 2011).

In addition, there were more numerous positive significant links between several self-regulatory strategies and ToM emotions or ToM beliefs in children with EB than in children with ID. It therefore seems that executive functioning and the development of ToM are linked together more intricately in the group with EB (as observed by other authors: Fahie & Symons, 2003; Hughes et al., 1998, 2001; Lansford et al., 2006; Nader-Grosbois & Fiasse, 2011; Perner et al., 2002; Speltz et al., 1999) than in the group with ID (as observed by Nader-Grosbois and Fiasse, 2011).

Our predictions in (a) were partially confirmed. By comparison with TD children presenting similar developmental age, children with EB presented partial deficits in ToM emotions (understanding causes of emotions) and in two self-regulatory strategies related to joint attention and attention; and children with ID presented delays in ToM, in socio-emotional problem-solving and in self-regulation (but deficits in joint attention and attention). As we predicted in (b), in both atypical groups, developmental age and self-regulation were positively linked with ToM level and socio-emotional problem-solving. (see Figs. 2 and 3).

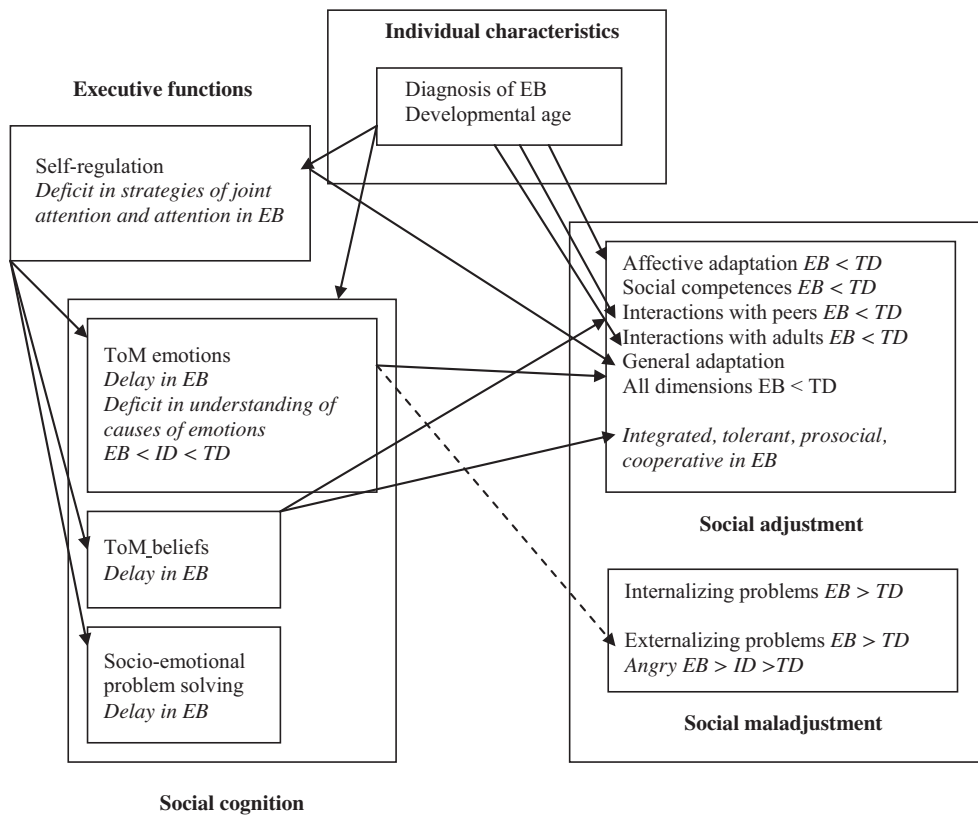


Fig. 2. A posteriori model of social cognition, self-regulation, social adjustment and their links in children with externalizing behavior disorders. EB: children with externalizing behavior disorders; ID: children with intellectual disability; TD: typically developing children; —▶: positive links with abilities in social cognition, self-regulation or social adjustment; - - -▶: positive links with low levels of social maladjustment.

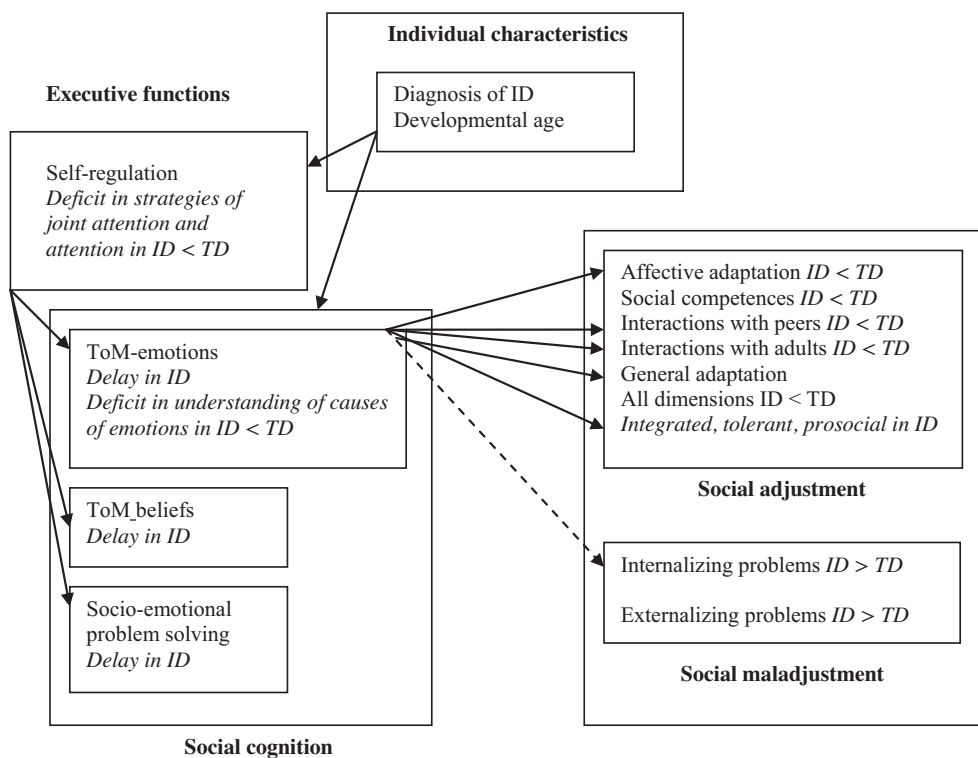


Fig. 3. A posteriori model of social cognition, self-regulation, social adjustment and their links in children with intellectual disability. ID: children with intellectual disability; TD: typically developing children; —▶: positive links with abilities in social cognition, self-regulation or social adjustment; - - -▶: positive links with low levels of social maladjustment.

5.2. Social (mal)adjustment profiles

Compared with TD children, children with EB and with ID presented less social competence, more internalizing problems and more externalizing problems, less affective adaptation and fewer abilities in interactions with peers and adults. More specifically, they were more anxious, dependent, angry, aggressive, egoistic and resistant; or in other words, they were less secure, autonomous, tolerant, controlled, prosocial and cooperative. Particularly, the group with EB showed a great variability in general adaptation. Specifically for the angry-tolerant dimension, children with EB were significantly angrier than children with ID. In other words, in comparison with children with ID, children with EB display less tolerance, patience and sensitivity toward others' difficulties, they respond more inadequately to frustration, they are more likely to express indirect and reactive aggression and contrariness, they do not easily control negative emotions and they have more difficulties in accepting the limits imposed by adults. As suggested by other studies, differentiating indirect from direct aggression and reactive from proactive aggression helps to nuance observations about social maladjustments in children with EB (Björkqvist et al., 1992; Renouf, Brendgen, Séguin, et al., 2010; Renouf, Brendgen, Parent, et al., 2010). In children with ID, more internalizing problems were observed than in TD children; this is consistent with the observation of withdrawn and isolated behaviors described by Guralnick (1999) and Merrell and Holland (1997).

Our predictions (c) were confirmed about lower social adjustment in nearly all dimensions of social adjustment profiles in both atypical groups in comparison with TD children. In line with our prediction, we identified a specific deficit in the angry-tolerant dimension in children with EB by contrast with children with ID. In other words, children with EB presented more indirect and reactive aggression than children with ID (see Figs. 2 and 3). Our prediction about more internalizing problems in children with ID than TD children was also confirmed.

Our study showed that the SCBE scales effectively differentiated atypical socio-affective profiles from typical profiles, and showed which dimension significantly differentiated children with EB presenting low intelligence from children with ID. As our results identified several weaknesses in socio-affective dimensions in both atypical groups, it is clear that these weaknesses must be taken into account in order to ensure such children's mental health and limit their social maladjustment. SCBE profiles could help professionals to conceive intervention programs which would in part be identical for these two atypical groups for training social competences, social interactions with peers and adults and affective adaptation, and to work out specific interventions particularly for children with EB, to train them in control of frustration, of negative emotions, of indirect aggression and to support them in developing tolerance and compliance with limits and instructions from adults.

5.3. Links between ToM and social (mal)adjustment profiles

Moreover, both correlational and regression analyses emphasized that there were different kinds of links, according to the atypical group, between on the one hand their abilities in ToM emotions and in ToM beliefs and on the other hand, distinct dimensions in their social adjustment profiles. The regression analyses underlined that ToM emotions abilities were a better predictor of several global, composite and targeted specific dimensions in social (mal)adjustment profiles in children with ID, than in children with EB. More precisely, in children with ID, ToM emotions predicted their general adaptation, affective adaptation, interactions with peers and with adults, and internalizing problems, in particular the specific dimensions of isolated-integrated, angry-tolerant and egoistic-prosocial. This is consistent with positive links obtained in previous studies in children with ID, between the understanding of emotions and social skills (Turk & Cornish, 1998), social behavior displayed in dyadic interactions with an adult and with peers in cooperative, competitive contexts (such as prosocial behavior, empathy and attention toward peers and perseverance) (Baurain & Nader-Grosbois, 2013), and low internalizing problems (Thirion-Marissiaux & Nader-Grosbois, 2008c). Only in children with EB did both self-regulation and ToM emotions abilities predict general adaptation; this is partly consistent with observations made by other authors of a negative impact on their maladjustment of the double weaknesses in executive functioning and in ToM (about emotions, Orobio de Castro et al., 2002; Castro, Merk, Koops, Veerman, & Bosch, 2005; or about beliefs, Capage & Watson, 2001; Fahie & Symons, 2003; Happé & Frith, 1996; Lansford et al., 2006; Renouf, Brendgen, Séguin, et al., 2010). More specifically, in children with EB, ToM emotions predicted externalizing problems; and ToM beliefs predicted interactions with peers and the isolated-integrated, angry-tolerant, egoistic-prosocial and resistant-cooperative dimensions (as observed by Capage and Watson, 2001; Renouf, Brendgen, Parent, et al., 2010).

As we predicted (d), for the two atypical groups, ToM emotions, ToM beliefs and self-regulation respectively were positively linked with their social adjustment abilities, and with low externalizing or internalizing problems, but differently according to the atypical group. More specifically, as we predicted, different significant links according to the atypical group were obtained between ToM emotions or ToM beliefs abilities and the targeted specific dimensions in social adjustment profiles, isolated-integrated, angry-tolerant, aggressive-controlled, egoistic-prosocial and resistant-cooperative (see Figs. 2 and 3).

The results of this study showed that distinct social cognition components have differentiated links with the development of social skills in children presenting EB or ID functioning in the symbolic period, and could explain differences in their social maladjustment and their externalizing or internalizing problems. This also implies that differentiated bidirectional and causal relations could exist between social cognition components and behavior disorders in children presenting distinct developmental psychopathology. These causal relations need to be investigated in future research. However, this study

presents a number of limitations. The prediction obtained in this cross-sectional study needs to be tested in longitudinal and experimental studies. Longitudinal studies should make analyses of developmental trajectories of social cognition components in children with EB and children with ID, linked to the evolution of dimensions of social (mal)adjustment, and should test whether early abilities in ToM relating to distinct mental states, in social problem solving and in social information processing predict later dimensions of social (mal)adjustment. Experimental studies should test the impact of short- or medium-term training in ToM or social information processing on dimensions of social (mal)adjustment, or on externalizing or internalizing problems, with a design including pre-/post-tests and the comparison of experimental and control groups.

6. Conclusions and prospects

In the research and intervention work concerned with preventing social maladjustment, it seems indispensable to achieve a more accurate assessment and understanding of specific features of the development of ToM and of social information processing and of self-regulation in young children 'at risk' of developing EB or with ID, and to examine the impact of training in these areas (as shown by Denham et al., 2012, in their SEL program).

In future, it would be relevant, in experimental studies and in longitudinal studies of children with distinct developmental psychopathology, to test how a short-term training program and a medium-term intervention with regard to ToM (emotions and beliefs) and social information processing could have positive and differentiated impacts, not only on the development of ToM, but also on the improvement of social skills or socio-emotional adjustment and the reduction of behavior disorders. For TD children, studies have reported some efficacy in the improvement of their performance in ToM belief tasks after training about false beliefs in different conditions (such as conversations about false beliefs, explanations of correct response, differentiated immediate feedback on performance in tasks, discussion of false belief scenarios) (Amsterlaw & Wellman, 2006; Appleton & Reddy, 1996; Clements, Rustin, & McCallum, 2000; Kloo & Perner, 2003; Melot & Angeard, 2003). Several studies have explored the effect of ToM training on the reduction of behavior disorders or on the improvement of social skills in children with autism spectrum disorders (Gevers, Clifford, Mager, & Boer, 2006; Feng, Lo, & Tsai, 2008; Hadwin, Baron-Cohen, Howlin, & Hill, 1996; Howlin, Baron-Cohen, & Hadwin, 2011; McGregor, Whiten, & Blackburn, 1998; Ozonoff & Miller, 1995; Parsons & Mitchell, 1999; Silver & Oakes, 2001). However, few studies have examined the effect of ToM training in children with ID (training in the computer version of the Sally and Ann task, Swettenham, 1996). Recently, some studies have involved training preschoolers "at risk" or with EB in the understanding of emotions (in the 'Head start' program, Izard, Trentacosta, King, & Mostow, 2004; Izard et al., 2008), sometimes in combination with training in emotion regulation, understanding intentions in others (Orobio de Castro et al., 2002, 2005), or ToM beliefs and executive control abilities (Castro, Bosch, Veernam, & Koops, 2003; Orobio de Castro et al., 2005).

In order to better evaluate the impact of such training, valid assessments are needed of ToM and social information processing in preschoolers (and in atypically developing children) who have limited attention and verbal skills, particularly in expression. A number of methods have been devised recently, including adapted ToM emotions and beliefs tasks (Hutchins & Prelock, 2008; Nader-Grosbois & Thirion-Marissiaux, 2011); computer version, Nader-Grosbois, Mazzone, & Houssa, 2012); other-reported assessment of ToM (Theory of Mind Inventory, TOMI, Hutchins et al., 2008); the Social Problem Solving Task (Barisnikov, Van Der Linden, & Hippolyte, 2004); a new assessment methodology for social information processing (SIPI-P, Ziv & Sorongon, 2011); and a video-based assessment, STEP-P, Schultz et al., 2010). In addition, future studies could examine how the development of ToM is influenced by the manner in which the parents "socialize emotions and beliefs", refer to mental states in their conversations and display reactions toward emotions felt by their children who are "at risk" or present developmental disorders, and by parental emotional openness or competences (with reference in particular to the models developed by Eisenberg et al., 1998; or by Morris et al., 2007). Recently, a parenting intervention program focusing on the improvement of emotion socialization practices showed some positive impact in terms of better emotional knowledge and fewer behavior problems in TD preschoolers ("Tuning in to kids parenting program", Havighurst, Wilson, Harley, Prior, & Kehoe, 2010).

Appendix A. ToM "beliefs" tasks

- (1) *The deception skills test* (Oswald & Ollendick, 1989). Firstly, the child took pleasure in looking for a hidden object in the experimenter's hands and secondly the child hid the object him/herself in his/her hands. The experimenter noted if the child had hidden the object by holding his/her hands behind his/her back, if he/she showed both fists closed and if the object was really hidden. The game was repeated 3 times. The test was successful (1 point) if the three criteria were fulfilled for at least 2 out of 3 trials.
- (2) *The change of representation task* (Flavell, Everett, Croft, & Flavell, 1981). This was based on two concrete objects. In task 1, a cat drawn on one side of a piece of cardboard and a dog drawn on the other side were presented to the child. In task 2, a turtle drawn on a sheet was placed between the experimenter and the child. For each level, two questions were asked to the child: "What do you see?" and "What do I see?" [the experimenter was sitting opposite the child]. The child score 0.5 points if he/she answered two questions correctly in one task and 1 point for the correct answers in two tasks.
- (3) *The appearance-reality task* (Flavell, 1986). Three substitute objects were presented: (a) a flashlight in the shape of a mobile phone, (b) an eraser in the shape of a peanut in its shell and (c) a telescope looking like a glue stick. The child was

asked two questions about each substitute object: “If you look at this object and you don’t touch it, what does it look like?” and “What is it, in reality?” The answers could be given by verbalization or by pointing at one of two pictures (for (a): a picture of a flashlight and a picture of a mobile phone). Some children mimed their answers (with a conventional gesture – e.g. for speaking on the telephone – in reference to the functional aspect of the object). The child scored 0.5 points if he/she answered two questions correctly about 1 substitute object and 1 point for the two correct answers about 2 or 3 substitute objects. Analysis of the answers distinguishes between the phenomenist error (“It looks like a mobile phone and it’s a mobile phone”, the realist error (“It looks like a flashlight and it’s a flashlight”) and an incorrect answer to both questions (“It looks like a flashlight and it’s a mobile phone”).

- (4) *The unexpected content task* (Perner, Leekam, & Wimmer, 1987). This task assessed the child’s ability to predict a false belief given the situation. The child was shown a Smarties box and the experimenter asked: “What is it inside the box?” (The expected response is: Smarties, sweets, chocolates). The child then opened the box and found that there were pencils inside the Smarties box. The pencils were returned to the box and the child was asked: “What did you think was in the box before the box was opened?” (question about false self-belief) and “What will your mother/teacher think is in the box if your mother/teacher has not seen inside the box?” (question about another person’s false belief). The child scored 0.5 points if he/she answered 1 question correctly and 1 point for the correct answers to both.
- (5) *The change of location task* (Wimmer & Perner, 1983). Besides the interest for memorization of the story presented in this false belief task, the play scene with dolls shows which symbolic developmental period the child is in. The task assessed the child’s ability to predict the doll’s behavior given her false belief: the story concerns a doll who believes that a desirable object (chocolate) is in one location when, as the child knows, it is actually in another location. The experimenter placed a doll’s house on the table and presented the story of “Max and the transfer of chocolate” to the child using three dolls, representing three members of the child’s family (his/her mother, his/her older brother or sister or his/her older first cousin) and the child him/herself (this child doll was held by the participant during the story). The story presented the mother doll and child doll at home and explained their actions. The child doll put chocolate in the green cupboard in the living-room. While the child doll was outside the home, the mother doll took the chocolate, cooked a chocolate cake and put a piece of chocolate in the white cupboard in the kitchen. Afterwards, child doll went back inside, was hungry and wanted to eat some chocolate. The final ToM belief question was: “Where will X [child doll] look first for the chocolate?” Two control questions were asked: “Where was the chocolate at first?” (control memory question) and “Where is the chocolate now?” (control reality question). The child scored 1 point if he/she answered the ToM question correctly.

Appendix B. Socio-emotional problem-solving tasks

Preliminary task: identification and recognition of emotions.

Four pictures like ‘smileys’ in four distinct colors, illustrating four emotions (joy, angry, sadness, fear) were presented to the child. The examiner pointed to each picture and asked: “Could you tell me how he is feeling?” If necessary, the examiner gave corrective feedback to the child. When the child responded correctly, the examiner said: “That’s right, the child is happy/angry/sad/afraid”. When the child gave an incorrect response, the examiner, said: “That’s not right, the child is happy/angry/sad/afraid”.

The first four tasks: predicting emotions and well adjusted behavior according to situations.

Four critical situations, illustrated by pictures, were presented one by one on the table. The examiner described the situation in a sentence. The child had to choose the picture illustrating the emotion he or she might feel in each situation (from the four pictures like ‘smileys’ corresponding to the four emotions, happy/angry/sad/afraid). The child was invited to point to the chosen picture and to put it near the picture of the situation. Then the child was asked to choose one of two suggestions about behavior (illustrated by two pictures), specified briefly by the examiner (with an alternating order of presentation). The child had to justify her or his response. The four situations and the four suggestions about two possible behaviors (well adjusted and maladjusted) were as follows:

- (1) “You are alone in a wood and in the dark. How do you feel?”

“What do you do? (1a) either you switch on your pocket torch, or (1b) you go into the forest, laughing”

- (2) “You make a mess in the house. How does your mother feel?”

“What does your mother do? (2a) either she congratulates you, or (2b) she asks you to help tidy up”

- (3) “Your friend has broken his/her leg and is in great pain. How does he or she feel?”

“What do you do? (3a) either you console him or her and you draw a beautiful drawing with a great heart, or (3b) you make fun of him or her, laughing”

- (4) “You have a bucket and a shovel to play in the sand. How do you feel?”

“What do you do? (4a) either you cry because you want to go home, or (4b) you build a sand castle”

The second four tasks: matching situation, emotion and well adjusted behavior.

Four other critical situations were illustrated by four pictures, placed vertically on the table. The examiner explained each situation briefly. The examiner then placed on the right side four pictures like ‘smileys’ illustrating four emotions (in any order). The examiner asked the child to match the four situations and the four emotions, saying: “Could you put the pictures of these

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