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Emotion regulation, emotionality, and expression of emotions: A link between social skills, behavior, and emotion problems in children with ASD and their peers

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ABSTRACT

This study aimed to investigate differences between emotion regulation (ER), emotionality, and expression of emotions in children with Autism Spectrum Disorder (ASD) and their typically developing (TD) peers; and to examine the potential links between these areas of development with social skills in both groups, as well as with behavioral, emotional, and social problems in ASD. Forty-four children (40 males and 4 females, ages 3 to 7 years) with ASD ($n = 22$) and their TD peers ($n = 22$) were included in this study. Mothers reported about their children's ASD symptoms, social, emotional, and behavioral functioning. As predicted, children with ASD were described as showing decreased ER, increased emotionality, and decreased expression of emotions when compared to their TD peers. Moreover, in the ASD group, increased social skills were associated with enhanced ER and increased expression of emotions; and in the TD group, increased social skills were correlated with decreased emotionality. Finally, enhanced ER was linked to decreased peer problems, and increased prosocial behaviors; and decreased emotionality was linked to decreased behavior and emotional problems in the ASD group. Implications for further research are discussed.

1. Introduction

It is well documented that children with Autism Spectrum Disorders (ASD) experience significant social problems (American Psychiatric Association, 2013), demonstrate difficulties in emotional competence (Begeer et al., 2008), and show behavior and emotional problems (Totsika, Hastings, Emerson, Lancaster, & Berridge, 2011). In this study, we examined the associations among aspects of emotional and social competence, and behavior and emotional problems, and we compared the functioning of children with ASD and their typically developing (TD) peers in these domains. Examining associations among these constructs will increase our understanding of social and emotional developmental in children with ASD.

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1.1. Emotion regulation, emotionality, and expression of emotions

Emotional competence is defined as the ability to identify one's own and others' emotional states (e.g., appraisal), to appropriately express emotions, and to regulate those emotions (Saarni, 2000). Here, we focus on three specific aspects of emotional competence: emotional regulation (ER), emotionality, and expression of emotion, which are described in further detail below. Although there is no consensus of a universal definition ER, it is often described as the voluntary management and change of emotional responses (e.g., occurrence, form, duration, and intensity) by engaging in cognitive processes to regulate affective states to achieve a goal (Eisenberg, Fabes, Guthrie, et al., 1996; Gross, & Thompson, 2007). Previous research on ER indicate that young children with ASD seem less able to soothe themselves, show greater variability in their ER abilities, and use fewer successful ER strategies when compared to TD peers (Berkovits et al., 2017; Jahromi, Meek, & Ober-Reynolds, 2012; Konstantareas & Stewart, 2006). These difficulties appear to persist, as adolescents and young adults with ASD also tend to show poor ER skills when compared to their peers (Mazefsky et al., 2014; Samson et al., 2015). Overall, previous research has indicated that youth with ASD tend to experience ER difficulties and these difficulties tend to persist over time.

Another construct of emotional competence related to ER is emotionality, which is described as an inclination to generate an intense negative emotional response to an affective-provoking stimulus (Eisenberg, Fabes, Karbon, et al., 1996). Previous research in emotionality and ASD indicates that young children with ASD are frequently viewed by their caregivers as demonstrating more reactivity/distress and negative affect, and less positive affect than TD children (Hepburn & Stone, 2006; Konstantareas & Papa-georgiou, 2006). In addition, they are described as showing persistent irritability (Sofronoff et al., 2007). In general, these findings indicate that parents of children with ASD tend to describe their children as showing increased negative emotionality when compared to TD peers.

Young children with ASD often demonstrate difficulties expressing a wide range of emotions, which is considered to be part of emotional competence. For example, they often demonstrate less positive affect during joint attention (i.e., shared interaction with another individual; Kasari et al., 1990). Also, when compared to children with Down syndrome, youth with ASD tend to display fewer facial expressions when asked to produce specific facial expressions, and demonstrate more atypical facial expressions (e.g., flat affect; Loveland, Tunali-Kotoski, & Brelsford, 1994). Moreover, children with ASD tend to demonstrate differences distinguishing between subtle emotions (e.g., interesting and pleasing) when compared to same age peers (Shalom et al., 2006). Although it is well documented that children with ASD tend to express fewer or more atypical emotions than their peers, it is not known whether their ability to express emotions, another aspect of emotion competence, is linked to social competence in this population.

1.2. Emotion regulation and emotionality related to social competence and behavior and emotional problems

Building on these findings, though extensive work has reported that individuals with ASD often showed poor social competence (APA, 2013), only a handful of studies have examined the association between ER skills (e.g., emotional competence) and social competence. For instance, Berkovits et al. (2017) reported that enhanced ER skills were associated with increased social skills and decreased behavior problems; and that increased emotionality was correlated with decreased social skills and increased behavior problems in preschool children with ASD. Similarly, Jahromi et al. (2013) found a correlation between enhanced ER skills and increased prosocial peer engagement at school in preschool children-aged with high functioning ASD. Lastly, a French study (Nader-Grosbois & Mazzone, 2014) that included 3 to 12 year-olds with ASD reported a link between enhanced ER and better quality of social relationships and increased ability to understand mental states. Although positive links are suggested between increased ER and social competence, in general, previous studies included children with high functioning ASD (Nader-Grosbois, & Mazzone, 2014), did not have a comparison group, only included one area of emotional competence (ER; Berkovits et al., 2017), or their sample was composed of young children (Jahromi et al., 2013).

Overall, it has been argued that foundational ER difficulties may actually explain the comorbidity of behavior and emotional problems in youth with ASD (Mazefsky et al., 2013). However, only a few studies have examined the link between ER, behavior problems, and emotional difficulties in youth with ASD and compared these findings to same-aged TD peers. In one study, externalizing behaviors were negatively associated with ER skills, and internalizing behaviors were positively associated with negative emotionality in children with ASD (Berkovits et al., 2017). In another study, ER skills tended to be more strongly associated with self-report of internalizing problems than with parent report of these problems in adolescents with high functioning ASD (Mazefsky et al., 2014). Also, a study that included school-aged children with high functioning ASD, reported a positive association between dysregulation and general mental health problems and psychosocial dysfunction (Joshi et al., 2018), thus suggesting far-reaching positive results related to ER, though not specifically examined in the current study. Previous research, although limited, suggests that ER may be associated with behavior and emotional problems in individuals with ASD. Similarly, previous studies tended to include older children with high functioning ASD (Mazefsky et al., 2014), did not report specific areas of internalizing or externalizing behaviors related to ER and emotionality (Berkovits et al., 2017). Given that youth with ASD may be at greater risk to experience behavior and emotional difficulties than the general population (Totsika et al., 2011), it is critical to investigate whether there is a connection between those difficulties and social and emotional competence to inform treatment for youth with ASD.

1.3. Current study

To address previous gaps in the literature, we first replicated previous research and examined differences in emotional competence (i.e., ER, expression of emotions, and emotionality) in a well-characterized sample of children with ASD, of different functioning levels,

and their TD peers. Our second aim was to investigate the link between those aspects of emotional competence and different aspects of social competence (i.e., peer problems, prosocial behaviors, and general social skills), as well as behavior and emotional problems in young children with ASD. Consistent with previous literature, it was predicted that TD children would demonstrate enhanced ER, decreased emotionality, and increased expression of emotions when compared to children with ASD; and that enhanced ER, decreased emotionality, and expression of emotions would positively correlate with decreased peer problems, increased prosocial behaviors, and enhanced general social skills in both groups. In contrast, poor ER skills and increased emotionality would be associated with increased behavior and emotional in children with ASD and TD.

2. Method

2.1. Participants

2.1.1. Recruitment and characteristics

Forty-four participants were recruited through a flyer sent to a local ASD listserv, an ASD parent-group, local business (e.g., coffee shops), and schools (the flyer included information about study criteria, such as child’s age with or without ASD). Recruitment took place in a small-town in a rural location, and parents who were interested contacted the study coordinator, and they were asked about their children’s diagnosis and a number of screening questions. To participate in the study, children with ASD had to have a previous ASD diagnosis (i.e., Autistic Disorder, Asperger’s Disorder, or Autism Spectrum Disorder, Not Otherwise Specified). Participants were also screened for other conditions, and could not have history of head trauma with loss of consciousness, serious injury, major surgery, or seizures reported. Children in the TD group were excluded if they had another mental health diagnosis (e.g., Attention Deficit/Hyperactivity Disorder (ADHD), history of prematurity (i.e., children born with a gestational age of fewer than 36 weeks), or having first-degree relatives with ASD (e.g., siblings).

A receptive language mental age cut-off of 24-months was used to ensure that children in both groups had comparable language levels. Two children that would have been in the ASD group were excluded because they had a receptive language mental age lower than 24 months.

For the current study, 22 children with ASD (20 males, 2 females; *Age* = 69.36 *SD* = 16.37) and 22 TD peers (20 males, 2 females; *Age* = 58.55, *SD* = 16.50) were included (see [Table 1](#) for full demographic and diagnostic details). The study was open to both parents, but only mothers accompanied their children. Since the children were matched on receptive language mental age, as assessed by the Peabody Picture Vocabulary Test, 4th Edition, (PPVT-4), actual chronological age varied between the two groups. No significant group differences were found in child’s mental age on the PPVT-4; however, children in the TD group tended to be younger than children in the ASD group. ASD severity (as determined by the Autism Diagnostic Observation Schedule (ADOS) and Autism Diagnostic Observation Schedule, 2nd Edition, (ADOS-2)) is also reported in [Table 1](#). All children in the ASD group met criteria for ASD based on the ADOS or ADOS-2 (i.e., children obtained a total score of 7 or above), as administered by a research-reliable clinician. Also, a severity score of ASD-related symptomology was computed and children obtained a severity score of 4 or higher. Regarding the Social Communication Questionnaire (SCQ), 75% of children in the ASD group obtained a 15 or higher total score, which is the suggested ASD cut-off, and none of the children in the TD group had a score of 15 or higher.

2.2. Procedures

After explaining the study’s objectives and procedures to mothers and children, a written consent, which was approved by the university’s Institutional Review Board (IRB), was obtained and verbal assent was also obtained from each child. For this study, mothers completed questionnaires about family’s demographic information, child’s emotional competence, social skills, and ASD symptoms. While mothers completed these forms, children completed the PPVT-4. Children with ASD also completed the ADOS or the ADOS-2. Study visits were generally 1.5 hour long and after completing the study assessments, mothers and children were given a small monetary compensation for their time.

Table 1
Child Demographics.

	Typically Developing Group (n=24)	ASD Group (n=22)		
<i>Child’s Sex</i>				
Boys	20	20		
Girls	2	2		
	<i>M (SD), range</i>	<i>M (SD), range</i>	<i>t</i>	<i>p</i>
<i>Child’s Age</i>				
Chronological Age	58.55 months (16.50), 36-87	69.36 months (16.37), 42-94	3.46	.035
Mental Age (Language Skills-PPVT)	76.41 months (23.30), 27-122	68.17 months (22.36), 31-115	2.68	.264
<i>Autism Symptoms</i>				
ADOS-Severity Scores		7.75 (1.94), 4-10		
SCQ-Total Scores	5.84 (2.58), 2-12	18.15 (7.10), 6-33		

Note. TD=Typically Developing; ASD=Autism Spectrum Disorder; ADOS=Autism Diagnostic Observation Schedule, or Second Edition. PPVT-4=Peabody Picture Vocabulary Test, Fourth Edition; SCQ = Social Communication Questionnaire.

2.3. Measures

2.3.1. Autism assessments

2.3.1.1. *Autism diagnostic observation schedule (ADOS)/autism diagnostic observation schedule, second edition (ADOS-2)*. The ADOS (Lord et al., 1999) or ADOS-2 (Lord et al., 2012) was administered to all children in the ASD group to evaluate current social and communicative competence and to confirm an ASD diagnosis by a research-reliable masters' level clinician (Table 1). All children met criteria for an ASD or autism category on the ADOS or ADOS-2 (Both measures were used because the study was initiated shortly before the ADOS-2 was released). During the evaluation, various activities are presented and social presses are made to elicit children's social and communication behaviors. This measure provides scores that distinguish between ASD and non-spectrum categories. The ADOS consists of 4 modules as determined by language level and age. For this sample, Module 2 or 3 were administered, depending upon the child's level of verbal ability (e.g., phrase speech (Module 2) versus complex sentences (Module 3)). Severity scores are reported for both Module 2 and 3 (see Table 1); increased severity scores are indicative of more severe ASD symptoms.

2.3.1.2. *Social communication questionnaire (SCQ)*. Mothers of children with ASD completed the SCQ (Berument et al., 1999). The SCQ includes 40 yes/no questions, and it is designed to measure social-communication deficits and repetitive and restricted interests associated with ASD. SCQ questions are scored 0 or 1 (a higher total score is indicative of increased ASD symptoms) and a score of 15 or more is suggestive of ASD. Two versions of the SCQ were used for this study: The *Current* version was used for children 3-4 years of age and the *Lifetime* version for children older than 4 years. The SCQ showed a sensitivity 0.88 and specificity 0.72 in discriminating between ASD and non-ASD cases and a sensitivity 0.90 and specificity 0.86 between ASD and non-ASD cases (Chandler et al., 2007). For this study, the Cronbach's Alphas were 0.98 and 0.51 for the ASD and TD groups, respectively.

2.3.2. Receptive language skills

2.3.2.1. *Peabody picture vocabulary test, fourth edition (PPVT-4)*. The PPVT-4 (Dunn, & Dunn, 2007) is a brief receptive language test that takes approximately 10-15 minutes to administer. This test is used to assess children's receptive language abilities by presenting a word and asking them to select the correct image from 4 pictures. This test also provides child's mental age, which is reported here. In the present study, children's verbal abilities were assessed to include children whose age equivalent in receptive language was 24 months or older. This assessment was administered by a masters' level graduate student, or by a trained undergraduate Research Assistant who was supervised by a graduate student.

2.3.3. Emotion regulation and emotionality

2.3.3.1. *Emotion regulation checklist (ERC)*. The ERC (Shields & Cicchetti, 1997) was used to assess ER skills and emotionality. The ERC is a parent questionnaire that contains 24 items and is composed of the Emotion Regulation and the Negativity/Lability subscales (item 12 is a fill in item and is not used as a part of the score). The Emotion Regulation subscale contains 8 items that measure the child's ability to regulate emotional states. High scores on the Emotion Regulation subscale reflect increased regulation skills (e.g., "My child is cheerful;" "My child responds positively to neutral or friendly overtures from peers"). Negativity/Lability subscale measures emotionality and contains 15 items and assesses arousal, reactivity, emotional intensity, expression of negative emotions, and mood lability (e.g., "My child exhibits wide mood swings;" "My child is prone to angry outbursts/tantrums easily"). Increased scores on this subscale indicates increased negative emotionality. Shields and Cicchetti (1998) reported good construct validity and a high internal consistency of .83 and good construct validity. The Cronbach's Alphas for ERC- Emotion Regulation subscale were .77 and .66; and for the ERC-Negativity/Lability subscale were .62 and .51 for the ASD and TD group, respectively.

2.3.3.2. *Emotion reaction questionnaire (ERQ)*. The ERQ (Rydellet et al., 2003) was included to assess expression of emotions, including anger, fear, sadness, and positive affect. The ERQ is composed of 19 items and asks caregivers about their children's typical emotional reactions to specific situations (e.g., "My child often becomes sad"). This specifically captures emotional competence. Caregivers indicated the degree to which each statement applies their child in a 5-point Likert scale (e.g., 1 = *does not apply at all*, 3 = *applies somewhat*, 5 = *applies very well*). Rydellet et al. (2003) reported reliability and validity ranging from .62 to .79 in TD children. The Cronbach's Alphas were .84 for the TD group and .72 for the ASD `.

2.3.4. Social skills

2.3.4.1. *Vineland adaptive behavior scales-2nd edition*. (Vineland-II; Sparrow et al., 2005). The Vineland-II, a parent questionnaire, measures adaptive behaviors in four global areas: Communication, Daily Living Skills, Motor Skills, and Socialization. For this study, we only included the Socialization subscale (99 items) which reflects children's functioning in social situations, including how a child interact and relates to others (e.g., friendships, social appropriateness, and conversation), engages in play and fun activities with others, and responds to or deals with different social situations. The Vineland-II standard scores have a mean of 100 and a standard deviation of 15, and higher scores represent increased social skills. The Cronbach's Alphas were .88 for the TD group and .96 for the ASD group.

2.4. Behavior, emotional, and social problems

2.4.1. Strength and difficulties questionnaire (SDQ)

The SDQ is a brief parent questionnaire designed to screen for behavior, emotional, and social problems in youth, ages 3 to 16 years (Goodman, 2001). The SDQ contains 25 items that screen for emotional symptoms, conduct problems, hyperactivity/inattention, peer problems, and prosocial behaviors (e.g., my child usually does what adults request; my child has many worries or often seems worried; my child shares readily with others). Parents rates their children’s problems on a likert scale: *Not True (0)*, *Somewhat True (1)*, and *Certainly True (2)*. Previous reports indicate the SDQ has acceptable reliability and validity in children without ASD (Goodman, 2001). For this study, the ASD and TD groups had Cronbach’s Alphas of .75 and .47, respectively.

3. Results

3.1. Differences in emotion regulation, emotionality, and expression of emotions between groups

First, we compared ER skills and emotionality between groups using the ERC, then, we also examined differences in expression of emotions as reported on the ERQ, and ended with a comparison of social skills as reported on the Vineland–Socialization Domain (Table 2). Using an independent *t*-test, significant group differences were found between groups on both the ERC–Emotion Regulation and the ERC–Negativity/Lability (emotionality) scales. That is, when compared to their peers, children in the ASD group demonstrated decreased scores on the ERC- Emotion Regulation subscale and increased scores on the ERC- Negativity/Lability subscale. Regarding expression of emotions using the ERQ, group differences were found in the expression of anger, fear, and positive emotions, but not in the expression of sadness. Specifically, children in the ASD group showed lower scores on the expressions of anger, fear, and positive affect subscales than their peers. Lastly, children in the ASD group demonstrated decreased scores on the Vineland–Socialization Domain when compared to their peers

3.2. Associations between emotional and social competence

Pearson correlations were used to examine the link between social competence (i.e., peer problems, prosocial behaviors, and general social skills) and emotional competence (i.e., ER, emotionality, and expression of emotions) in both groups (Table 3). In the ASD group, scores on the ERC–Emotion Regulation subscale were strongly and positively associated with scores on both the Vineland–Socialization Domain and SDQ Prosocial Behaviors subscale, suggesting that enhanced ER is associated with increased social competence. Similarly, scores on the ERC–Emotion Regulation were negatively associated with scores on the SDQ–Peer Problems subscale, indicating that enhanced ER is related to fewer social problems. Moreover, in the ASD group, increased Vineland–Socialization Domain scores were strongly and positively associated with scores on the ERQ– anger, fear, positive affect, and sadness expressions subscales, such that increased social skills were linked to more affect expression. However, no associations were found between scores on the SDQ and ERQ subscales.

In the TD group, Vineland–Socialization Domain scores were negatively associated with ERC– Negative/Lability subscale (emotionality) and positively with scores on the ERQ– expression of fear subscale. That is, enhanced social skills were related to decreased negative emotionality and to increased expression of fear. Also, scores on the ERQ Anger subscale were negatively associated with the scores SDQ Peer Problems and the Prosocial Behaviors subscales. However, scores on the ERC–Emotion Regulation and other ERQ– subscales were not related to the Vineland–Socialization Domain scores.

3.3. Associations between emotion regulation, emotionality, and behavior and emotional problems in ASD

Pearson correlations were computed to assess the association between ER skills and emotionality on the ERC with behavior and emotion problems on the SDQ in both groups (Table 4). In the ASD group, results demonstrated that ERC–Emotion Regulation scores

Table 2
TD and ASD groups: Mean Differences between ERC, ERQ, and Vineland-II Scores.

	TD Group (n = 24)	ASD Group (n = 22)	t	p
<u>Emotion Regulation Checklist (ERC)</u>	<u>Mean (SD)</u>	<u>Mean (SD)</u>		
ERC – Emotion Regulation	28.50 (2.50)	21.32 (3.76)	7.21	<.001
ERC – Negativity/Lability	28.75 (5.69)	37.59 (5.72)	-5.01	<.001
<u>Emotion Reaction Questionnaire (ERQ)</u>	<u>Mean (SD)</u>	<u>Mean (SD)</u>		
ERQ – Anger	33.05 (2.98)	30.86 (3.04)	2.33	.012
ERQ – Fear	32.50 (3.02)	30.33 (4.28)	1.86	.035
ERQ – Positive	37.50 (4.31)	32.86 (4.46)	3.38	.001
ERQ – Sadness	33.60 (3.87)	32.71 (2.17)	0.90	.184
<u>Vineland Adaptive Behavior Scales-II (Vineland-II)</u>				
Socialization Domain	124.95 (17.371)	80.11 (15.90)	8.57	<.001

Note. TD: Typically Developing; ASD: Autism Spectrum Disorder; RC: Emotion Regulation Checklist; ERQ: Emotion Reaction Questionnaire.

Table 3

TD and ASD Groups: Associations between ER, emotionality, and expression of emotions and social skills.

		1	2	3	4	5	6	7	8	9
11	ERC-Regulation	—	-.16	.09	.14	-.14	.61**	.26	-.01	.17
2	ERC-Negativity/Lability	-.27	—	-.27	.12	.23	-.42	-.44*	.30	-.27
3	ERQ-Fear	.32	-.11	—	.46*	.37	.42*	.57*	.01	-.06
4	ERQ-Sadness	.38*	.14	.64**	—	.28	.57**	.26	-.05	.02
5	ERQ-Anger	.23	.17	.56**	.42*	—	.13	.22	-.41*	-.46**
6	ERQ-Positive	.68**	-.04	.49*	.59**	.35	—	.35	-.22	.23
7	Vineland-II –Socialization	.67**	-.20	.60*	.57*	.49*	.58*	—	.12	.16
8	SDQ – Peer Problems	-.44*	.33	.09	.08	.24	-.05	0.01	—	-.39*
9	SDQ – Prosocial Behaviors	.58*	-.19	-.17	-.07	.15	.24	.46*	-.39*	—

Note. TD: Typical Development; ASD: Autism Spectrum Disorder; ER: Emotion Regulation; ERC: Emotion Regulation Checklist; ERQ: Emotion Reaction Questionnaire; SDQ: Strengths and Difficulties Questionnaire. * indicates ≤ 0.05 ; ** indicates ≤ 0.01 . Correlations for the ASD group are to the left and below the diagonal and correlations for the TD group are to right and above the diagonal.

Table 4

TD and ASD groups: Associations between ER, emotionality, and behavior, emotional problems.

		1	2	3	4	5
1	ERC-Regulation	—	-.16	-.13	-.34	-.32
2	ERC- Negativity/Lability	-.27	—	.35	.62**	.65**
3	SDQ-Emotional	-.21	.41*	—	.47*	.28
4	SDQ-Conduct	-.36*	.50*	.62**	—	.54**
5	SDQ- Hyperactivity/Inattention	.13	.31	.34	.01	—

Note. ERC = Emotion Regulation Checklist. SDQ = Strengths and Difficulties Questionnaire. * indicates ≤ 0.05 ; ** indicates ≤ 0.01 . Correlations for the ASD group are to the left and below the diagonal and correlations for TD group are to right and above the diagonal.

were negatively associated with SDQ – Conduct scores, and the ERC–Negativity/Lability (emotionality) scores were strongly and positively correlated with scores on the SDQ–Emotional and Conduct Problems subscales. In the TD group, ERC–Negativity/Lability scores were positively and strongly associated with SDQ Conduct Problems and Hyperactivity/Inattention subscales only. However, no associations were found between ERC–Emotion Regulation and the SDQ. These findings suggest that enhanced ER and decreased emotionality skills may be strongly associated with fewer behavior and emotional problems, particularly in the ASD group.

4. Discussion

Results of this study focus on specific aspects of emotional competence (i.e., ER, emotionality, emotional expressions) and compared them in an ASD sample to a TD sample, as well as examining emotional competence and social, behavior, and emotional challenges. Specifically, we first replicated previous research on differences in ER, emotionality, and expression of emotions in young children with ASD and their TD peers. We also examined the associations between the aforementioned variables with social competence (i.e., peer problems, prosocial behaviors, general social skills) in both groups. Finally, the correlation between ER and emotionality with behavior and emotional problems was investigated in both groups. As such, this study provides insight into whether emotional and social competence, and behavior and emotional problems are linked in young children with ASD and TD.

Regarding group differences, it was predicted that children with ASD would show decreased ER, increased emotionality, and decreased expression of emotions when compared to TD children. Findings were consistent with this hypothesis, and they support previous research, in which children with ASD are often described by their parents as being more emotionally negative and irritable (Hepburn & Stone, 2006), being less emotionally expressive (Kasari et al., 1990), and showing a limited repertoire of ER skills (Konstantareas & Stewart, 2006). Notably, children with ASD did not differ in their expression of sadness compared to children with TD, but they did in terms of other emotions (i.e., anger, fear, positive affect). Previous research has also reported that children with ASD may also expressed atypical expressions of emotions (Loveland et al., 1994). As such, it is possible that some children with ASD show atypical emotions or perhaps other emotions (e.g., anger, fear) when they are feeling sad, and they may develop a better ability to show sadness later in life.

Regarding the exploration of social and emotional competence, it was hypothesized that enhanced emotional competence (e.g., ER, emotionality, and expression of emotions) would be associated with enhanced social competence (e.g., social skills, peer problems, prosocial skills). This hypothesis was mostly supported in the ASD group. Specifically, enhanced social competence seems to be strongly linked to increased ER abilities, suggesting that ER skills may play a role in children’s ability to navigate social problems with their peers and to engage in prosocial behaviors (e.g., trying to help a peer when he or she is in distress). These findings are similar to recent reports of the association between social skills and ER skills in children with ASD (e.g., Berkovits et al., 2017; Jahromi et al., 2013; Nader-Grosbois, & Mazzone, 2014). The link between social competence and expression of emotions is less clear, as increased expressions of emotions were related to more general social skills, but not peer problems or prosocial behaviors. Thus, this connection needs to be further explored. Surprisingly, emotionality or expressions of emotions were not related to peer problems or prosocial

behaviors. In general, these results suggest that a connection between ER skills and social competence may persist over time in school-aged children with ASD, and that these constructs may be related in children with ASD with different development levels.

It is important to note that the directionality of these findings are not known. That is, it is unknown whether higher levels of ER skills lead to improved social competence or vice versa. As such, these findings suggest that either children with ASD with enhanced social skills might be more effective at managing and displaying a wide range of emotions and that those who show enhanced ER skills may be more likely to be successful when engaging with their peers. Regardless, children who show increased social and emotional competence may be more accepted by peers and have more opportunities to practice and learn social-emotional skills than other children with ASD who struggle in these domains. Given the connection of social and emotional skills in ASD, treatments designed to address social skills deficits are likely to be more efficacious if they also include an emotion competence component (Scarpa & Reyes, 2013; Weiss et al., 2018).

In the TD group, general social skills were negatively associated to emotionality and positively correlated to fear related emotions; and anger related emotions were negatively linked to prosocial behaviors. The results are consistent with previous findings with TD children, which have reported an inverse association between emotionality and social competence (Eisenberg, Fabes, Karbon et al., 1996; Lengua, 2003). However, increased peer problems were associated with decreased anger related emotions in this group. These results were surprising, given that previous research has reported positive associations between social and emotional competence in TD children (e.g., Eisenberg, Fabes, Guthrie et al., 1996; Rubin, Coplan, Fox, & Calkins, 1995). Overall, TD children demonstrated fewer associations between social-emotional variables than children with ASD. It is possible that our findings are different from previous research because scores on the TD sample might have been restricted in range. Also, given that TD children obtained poor coefficient alpha score on the ERC and STD, and they showed more variability in their responses, these scales are less consistent in the TD group than the ASD group, based on parent-report. Thus, these results need to be replicated and current conclusions should be interpreted with caution.

Finally, it was predicted that there is an association between ER and emotionality with behavior and emotional problems in children with ASD and TD. This hypothesis was partially supported. Specifically, emotionality was positively and strongly associated with behavior problems in both groups; however, ER skills were related to behavior problems in the ASD group only. These findings partially support previous research that reported a link between emotional competence and internalizing and externalizing problems (Berkovits et al., 2017; Eisenberg, Fabes, Guthrie, et al., 1996; Joshi et al., 2018). These results suggest that there may be an underlying mechanism that put children with ASD at risk to experience increased emotionality and behavior and emotional problems. Future research needs to examine biological or genetic signatures of such mechanisms and mediation or moderation analyses could further elucidate the specific mechanisms responsible for this finding. These results could also mean that children with ASD with increased negative emotionality might be also viewed by their parents as demonstrating increased affective difficulties and oppositionality, but they do not necessarily meet criteria for other disorders. Moreover, these findings indicate that associations between mental health problems and ER and emotionally needs to be further examined in youth with ASD (Pouw et al., 2013; Rieffe et al., 2011). These findings can guide the development of effective mental health treatments in ASD (Reyes et al., 2019; Weiss et al., 2018).

5. Limitations and future research

This study had several limitations that should be noted. First, the small sample size may have limited the variability and power of current findings. However, results from this study were similar to previous research in ER and ASD, and in spite of having a small sample size, our findings add to the emerging research in ER. Another limitation regarding the small sample size is the small within-group samples, which leads to some analyses being underpowered and results might not be significant if corrections were applied. Thus, results should be interpreted with caution. Second, the ERC and SDQ demonstrated poor psychometric properties in the TD group, and this group demonstrated above average social skills relative to the general population. Therefore, the comparison between the TD and ASD group regarding social skills might not be truly representative of the general population. Future research would benefit from targeting a comparison group who demonstrate social skills more commensurate with the general population or those who also show social and emotional difficulties, such as children with other developmental delays or other childhood disorders (Downs & Smith, 2004). Finally, regarding measures, only maternal report was used to assess children's difficulties, which inherently are inflated due to the shared method variance, and the measures used have not been validated with children with ASD (Weiss et al., 2014). Thus, the conclusions that can be drawn are limited, these findings should be replicated with studies of multiple methods/indices of regulation (Henderson et al., 2006). Although beyond the scope of this paper, it would be also useful to assess social-emotion development longitudinally, and include ASD specific measures to examine ER correlates, progress, and consequences over time.

6. Conclusions

These results support previous research regarding differences in aspects of emotional competence between children with and without ASD. Consistent with previous research, children with ASD demonstrate decreased ER skills, increased emotionality, and decreased expression of emotions in comparison to TD peers, all components of emotional competence. Further, these findings are novel in that they suggest a strong relationship between social competence and ER skills and robust association between emotionality and behavior and emotional problems in ASD. Notably, it is possible that difficulties in social, behavior, and emotional functioning in ASD represent an underlying biological mechanism that needs to be further examined (e.g., Rieffe et al., 2011). In general, these results reveal that the connection between these variables may be present at early age in children with ASD. Thus, findings from the current study also add to burgeoning literature reporting on the importance of ER and emotionality in ASD.

In sum, treatments designed to address social, behavior, and emotional problems could improve children's outcomes if they include learning, practicing, and using ER skills and could start even before school age. Given that ER difficulties may be present across the lifespan, developing interventions that include emotional components from an early age could ultimately improve the quality of social life for individuals with ASD.

Credit statement

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