Journal of Developmental and Physical Disabilities
https://doi.org/10.1007/s10882-021-09795-9

ORIGINAL ARTICLE

Alexithymia is Associated with Emotion Dysregulation in Young People with Autism Spectrum Disorder

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Accepted: 24 March 2021

Abstract

Evidence suggests young people with autism spectrum disorder (ASD) have lower levels of emotion regulation than typically developing peers and struggle to modulate the frequency and intensity of their emotions. It may be that these emotion regulation difficulties are a result of co-occurring alexithymia rather than being a core symptom of ASD. We explored the associations between alexithymia and emotion regulation in 43 young people with ASD, aged 10 – 18 years, through self and parent report questionnaires. Parents completed questionnaires measuring the young person's emotion regulation skills and ASD symptom severity. The young people completed measures of emotion regulation and alexithymia. Correlational analysis and linear regression were used to investigate the relationships between ASD severity, alexithymia and emotion regulation. As predicted, high levels of alexithymia and high level of emotion dysregulation were reported by the young people. Parents also scored the young people as being high on emotion dysregulation. We found statistically significant correlations between alexithymia and emotion regulation, as reported by young people themselves, with some large effect sizes. Parental report of emotion regulation did not correlate with the measure of alexithymia. The source of discrepancies between parent and adolescent perceptions of emotion regulation and emotion recognition are discussed. These results highlighted the key role emotion regulation difficulties play in the lives of young people with ASD and the association with alexithymia. High levels of alexithymia are likely to impinge on the selection of appropriate emotion regulation strategies. The clinical implications for treatment are discussed.

Keywords Adolescence · Alexithymia · Autism Spectrum Disorder · Emotion regulation · Multiple Informants

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Published online: 07 April 2021

The core features of Autism Spectrum Disorder (ASD) include social communication and social interaction difficulties and restricted interests and behaviours, and since the publication of DSM-5 (American Psychiatric Association, 2013) sensory processing difficulties (Case-Smith et al., 2015). However, there are a number of other features which are receiving increasing attention of researchers and clinicians alike, including poor emotional regulation skills in both children and adults with ASD (Tajik-Parvinchi et al., 2020; Weiss et al., 2014). Primary research on this topic has been growing with a number of seminal studies published in the last decade (Berkovits et al., 2017; Jahromi et al., 2013; Mazefsky et al., 2013).

Emotional self-regulation requires the ability to recognize one's own emotions, access strategies to self-soothe if one is experiencing high levels of emotional arousal (either positive or negative) while maintaining progress in one's current activities (Berkovits et al., 2017; Gross, 1998). Children who experience emotion regulation difficulties struggle to modulate the frequency and intensity of their emotions, and the development of emotion regulation has significant implications for children's psychological and social development (Shaw & Starr, 2019) while also being implicated in parenting stress (Lieneman et al., 2019; Ueda et al., 2020; Zlomke et al., 2019). Young people with ASD often have difficulty with self-soothing and once emotions are triggered, it can be difficult for them to return to baseline, often resulting in emotional "meltdowns" (Mazefsky et al., 2013). Samson et al. (2015) found that in comparison to typically developing young people, those with ASD engage more frequently in maladaptive emotion regulation strategies and also experience negative emotions more frequently. Jahromi et al. (2012) also found that children with ASD, when faced with a challenge, use less adaptive emotion regulation strategies than peers, such as avoidance, expressive suppression and venting.

Bird and Cook (2013) have argued that the emotion regulation difficulties common in ASD are primarily due to co-occurring alexithymia, rather than ASD itself and this has been supported in a number of studies (Hill et al., 2004; Shah et al., 2016). Alexithymia is a subclinical condition in which people experience difficulties in recognizing and describing their own emotions (Sifneos, 1973). People with high levels of alexithymia struggle to distinguish between their emotions and bodily functions (Waller & Scheidt, 2004). For example, a person with alexithymia may find it difficult to tell the difference between their heart racing because they are experiencing intense emotion, such as anger, versus their heart racing due to recent physical exercise. Such individuals also tend to have an externally oriented thinking style (Craparo et al., 2015).

Many studies support the view that children with ASD have a restricted awareness and knowledge of their own emotions (Bauminger et al., 2004; Dyck et al., 2007; Hill et al., 2004) and this is consistent with co-occurring alexithymia. Fitzgerald and Bellgrove (2006) reviewed the overlap between alexithymia and ASD and highlighted many similarities between these two presentations. These included social and relationship difficulties, problems with introspection, difficulties interpreting non-verbal behaviour and speech and language patterns. Similar to the difficulties in social communication and interaction experienced by people with ASD, alexithymia can also cause difficulties engaging and relating to others (Bird & Cook, 2013).

Without being able to identify and describe their own feelings and emotions, it can be difficult for people with alexithymia to regulate their emotions.

Emotional regulation difficulties in children and adults with ASD have often been treated as a byproduct of the core features of autism (Samson et al., 2014), or due to poor theory of mind and social perception deficits (Samson et al., 2012). Berkovits et al. (2017) highlight that interventions to date have tended to focus on teaching children with ASD positive behaviours, modeling social skills or how to match emotional facial expressions with verbal labels, without necessarily addressing the underlying difficulties with emotion regulation. However, the alexithymia hypothesis suggests that young people with ASD may also have a parallel difficulty with identifying their own emotions and this may contribute to their emotional dysregulation, and to social and interpersonal difficulties.

A limited number of studies have investigated the relationship between alexithymia and emotion regulation in typically developing adult clinical populations. Such studies have found that higher levels of alexithymia are, as predicted, associated with poor emotion regulation skills and lower levels of emotion control (Stasiewicz et al., 2012; Verissimo et al., 1998). Rieffe et al. (2011) investigated the extent to which emotion regulation (awareness and coping) is associated with internalizing symptoms (worry/ruminating, depression and somatic complaints) in a sample of children with ASD and found internalizing symptoms correlated negatively with adaptive coping strategies. In typical development, there is a strong relationship between the occurrence of internalizing symptoms and reduced skills in emotion regulation.

The purpose of this study was to explore the potential role alexithymia may play in emotion dysregulation in young people with ASD. We hypothesized that young people with ASD would have elevated levels of alexithymia; they would have lower levels of emotion regulation and we also predicted that higher levels of alexithymia in young people with ASD would correlate with lower levels emotion regulation and this relationship would be stronger than between ASD severity and emotional dysregulation.

Method

Participants and Procedures

Participants were recruited through a specialist ASD diagnostic and intervention service in Ireland. Parents attending the service had informed and helped shape research foci. In particular, understanding emotion dysregulation had emerged as a common theme in service user and carer consultation work.

Two hundred potential participants met inclusion criteria which included (a) a formal clinical diagnosis of ASD made by the multidisciplinary team using both the Autism Diagnostic Observation Schedule (ADOS, Lord et al., 2000) and either the Autism Diagnosis Interview-Revised (ADI-R) (Lord et al., 1994) or the Diagnostic Interview for Social and Communication Disorders (DISCO, Wing et al., 2002), direct observation of the child and information from other sources such as teachers

and therapists and (b) were aged 10 – 18 years and (c) had an IQ > 70. The level of cognitive functioning and age range were chosen to match the abilities required to complete the self-report measures, given the design of the study.

Families were contacted by post with 43 returning completed questionnaires and demographics forms. For a postal survey, this response rate of 23%, while low, is comparable with other studies using this methodology (Knickmeyer et al., 2008; Sinclair et al., 2012). Participant information is summarized in Table 1. It was not possible to directly compare our sample to the non-responders for representativeness, as demographic information for the latter were not available. However, the gender distribution of males (74%) in the sample is representative of gender distributions in the wider population of children with ASD (Whiteley et al., 2010).

Of the parents who participated, 37 were female (86%) and six were male (14%). Eighteen parents (42%) reported having a third level degree or above while twenty-three parents/guardians (55%) reported having education below third level education. Twenty-nine parents/guardians (68%) in our sample were employed, thirteen were retired/homemakers (30%) and one participant (2%) did not respond. None of our sample were unemployed. Overall, 86% of our sample were reported Irish nationality. Additional information about socioeconomic status such as income or specific occupation were not recorded.

Measures

Alexithymia Questionnaire for Children (AQC) The Alexithymia Questionnaire for Children is a 20 item, self-report measure which was used to assess the young person's level of alexithymia (Rieffe et al., 2006). This scale is an adaptation of the adult Toronto Alexithymia Scale (TAS-20 – Bagby et al., 1994) and measures three components of alexithymia: Difficulty in identifying feelings (alexithymia identification; includes 7 items e.g. 'I am often confused about the way I am feeling inside'), Difficulty describing feelings (alexithymia communication; includes 5 items e.g. 'It is difficult for me to say how I really feel inside, even to my best friend') and Externally-oriented thinking style (alexithymia externally-oriented thinking; includes 8 items e.g. 'I prefer talking to people about everyday things, rather than about how

Table 1 Demographic characteristics of sample

	M (SD)
Child Age	13.1 (2.5)
Child Age of Diagnosis	5.9 (2.5)
	N (%)
Child Sex (male)	32 (74%)
Parent Sex (female)	37 (86%)
Parent Education Level	
Below degree level	23 (54%)
Degree level and above	18 (42%)
Irish Nationality	37 (86%)

they feel'). Responses are recorded on a 3-point Likert scale (0 = *Not true*; 1 = *Sometimes true*; 2 = *Often true*) with higher scores on the Alexithymia Questionnaire for Children Scale indicate higher levels of alexithymia.

General psychometric properties of the scale were reported by Rieffe et al. (2006) who found good internal reliability for two of the alexithymia subscales (alexithymia identification and alexithymia communication; $\alpha = 0.73$ and $\alpha = 0.75$) however, for externally-oriented thinking internal reliability was quite low ($\alpha = 0.29$). Reliability of the measure was calculated for the current study and similar results were found, though all reliability coefficients were interpreted with caution, given the sample size. Alexithymia identification showed high levels of internal consistency ($\alpha = 0.80$) as did alexithymia communication ($\alpha = 0.70$). Alexithymia externally-oriented thinking showed low levels of internal consistency for our sample ($\alpha = 0.20$) and as it did not contribute to the regression model or show predictive value in the psychometric study by Rieffe et al. (2006), this subscale was omitted from further analyses.

Emotion Regulation Index for Children and Adolescents (ERICA) The *Emotional Regulation Index for Children and Adolescents (ERICA)* is a 16 item self-report questionnaire which was used to assess the young person's ability to regulate their emotions (MacDermott et al., 2010) and has been used in a number of recent studies exploring emotion regulation in adolescents (Bunford et al., 2014; Fogleman et al., 2019; Fraser et al., 2018). It is comprised of three subscales which indicate emotion regulation competencies: 1. Emotional Control (7 items e.g. 'When things don't go my way I get upset easily'), 2. Emotional Self-Awareness (5 items e.g. 'When I get upset, I can get over it quickly') and 3. Situational Responsiveness (4 items e.g. 'When other students are friendly to me, I am friendly to them'). Higher scores on the *ERICA* scale indicating higher levels of emotion regulation abilities. According to MacDermott et al. (2010) the ERICA showed good internal reliability ($\alpha = 0.75$). Even higher internal consistency was noted in the current study ($\alpha = 0.84$), indicating that it is a reliable measure for this sample. The ERICA also has good test–retest reliability (0.77) after four-week (MacDermott et al., 2010).

Emotion Regulation Checklist (ERC) The *Emotion Regulation Checklist (ERC)* is a 24 item, parent/guardian self-report measure of the child's emotional regulation (Shields & Cicchetti, 1997) and was included in order to develop a comprehensive view of the young person's emotional regulation abilities. The ERC consists of two subscales: 1. Emotion Regulation (8 items e.g. 'Displays appropriate negative emotions (anger, fear, frustration, distress) in response to hostile, aggressive, or intrusive acts by others') and 2. Lability/Negativity (15 items e.g. 'Is prone to angry outbursts/tantrums easily'). Responses are recorded on a 4-point Likert scale. According to Shields and Cicchetti (1997) both subscales of the ERC have been demonstrated to have high levels of internal reliability (Emotion Regulation $\alpha = 0.83$; Lability/Negativity $\alpha = 0.96$). The internal consistency of the subscales was sufficiently high in our sample (Emotion Regulation $\alpha = 0.73$; Lability/Negativity $\alpha = 0.86$).

Autism Spectrum Rating Scale (6–18 years Parent Ratings) (ASRS) The *Autism Spectrum Rating Scale* (ASRS, Goldstein & Naglieri, 2010) is a parent-report measure which indicates a child's level or severity of ASD. The ASRS is a 71-item measure which is composed of three main subscales: 1. Social/Communication, 2. Unusual Behaviours and 3. Self-Regulation. The ASRS also includes a DSM subscale in line with DSM-5 criteria for diagnosing ASD. As we aimed to identify the relationships between ASD severity and emotion regulation, we used the DSM-5 subscale as the measures of ASD severity instead of the total ASRS score as the total score includes items relating to self-regulation. The ASRS has proven to be a valid and reliable scale for ASD populations with normative data indicating high internal reliability ($\alpha = 0.97$, Goldstein & Naglieri, 2010). In the current study, the internal reliability was also high ($\alpha = 0.95$). The mean and standard deviation for the DSM-5 severity score for our sample was 65.37 (10.98) which is somewhat lower than the mean of 70 for the ASD sample given in the technical manual by Goldstein and Naglieri (2010), however, these are T-scores, so this still reflects a significant elevation of 1.5 standard deviations above typical functioning.

Data Analysis

Statistical analyses were primarily carried out using SPSS Statistics 23 with some additional analysis relying on R version 3.4.3 (Team, 2017). Preliminary analyses were conducted in order to explore and describe the characteristics of the sample, the variables used, and to check that parametric tests were appropriate. Inspection of the distribution of all the questionnaire variables indicated there were no outliers and no violations of normality, linearity, or homoscedasticity, with absolute values of skewness less than 0.5 and kurtosis less than 1.5, except for the dependent variable ERICA. We used a winsorizing procedure to move two outliers to within 2 times the interquartile range of the data distribution on the ERICA total scale (Dixon & Tukey, 1968). The transformed values for the ERICA total score did not deviate significantly from normal (Cramer-von Mises, $W = 0.089$, $p = 0.16$).

Correlation analysis was carried out to explore the relationship between measures of ASD, alexithymia, emotion regulation, to test our initial hypothesis that greater alexithymia would be associated with less emotion regulation. Exploratory t-tests were used to establish if there were any relationships between emotion regulation and demographic factors such as gender of parent, gender of young person, socioeconomic status and parental education, to determine if these factors needed to be controlled for in the regression analysis. None of these demographic variables were found to have a significant relationship with emotion regulation, so were not included in the regression analyses. As only one of the two dependent variables were correlated with the alexithymia variables, the parental measure of emotional dysregulation was also dropped from further analysis. Finally, predictor variables, including ASD severity as measured by the ASRS-DSM-5 subscale and the Alexithymia Identification and Alexithymia Communication scores were then entered into a hierarchical regression analysis to explore if alexithymia added significantly to the

predictive model of the young person's self-report of emotion dysregulation, once the variance from degree of ASD symptomatology had been taken into account.

Results

Participant Characteristics

Participant means across scales are summarized in Table 2. No formal normative data has been published for the AQC, ERICA, or ERC however some normative data has appeared in a number of studies. To compare the results of participants in this study with the published values, we calculated Cohen's d as the difference between two means divided by the pooled standard deviation. Scores on the Alexithymia Questionnaire for Children were significantly higher than the means for secondary school boys (Rieffe et al., 2006) on both the Alexithymia Identification scale and Alexithymia Communication scale (with large effect sizes of Cohen's d = 0.81 and 0.83 respectively) indicating higher levels of alexithymia in young people with ASD. Hurrell et al. (2015) reported mean scores for a typically developing group of children for ERC- Emotion Regulation of 28.63 (2.83) and a mean for ERC-Lability/Negativity of 23.49 (5.03). The scores for our sample are significantly different, with lower emotion regulation (d = -1.3) and higher negativity and lability (d = 0.91). On the ERICA scale, there are a number of recent large-scale studies, the largest of which (n = 1799) the Youth Wellbeing Study by Fraser et al. (2018) reported scores for a typically developing sample of 59.68 (8.16). Our sample showed significantly lower scores on this scale with a medium effect size (d = -0.60). The Autism Spectrum Rating Scale (ASRS) DSM-5 subscale was used as a measure of symptom severity, with most of the sample scoring in the *elevated* and *very elevated* range (mean ASRS DSM-5 subscale T-score = 65.37, SD = 10.98). As was expected, our sample scored much higher than the normative group sampled by Goldstein and Naglieri (2010) with an effect size of d = 1.48.

Table 2 Sample means across scales and effect size deviations from normative means

	N	M	SD	d*
Alexithymia Identification	43	1.81	.52	.81[a]
Alexithymia Communication	43	2.06	.49	.83[a]
ERC Emotion Regulation	43	22.79	5.70	-1.30[b]
ERC Lability/Negativity	43	29.49	7.91	.91[b]
Emotional Control (ERICA)	43	55.02	7.78	-0.60[c]
ASRS DSM-5 Subscale	43	65.37	10.98	1.48[d]

*d = Cohen's Effect size where .2 = small effect; .5 = medium effect; .8 and above = large effect

[a]Rieffe et al. (2006)

[b]Hurrell et al. (2015)

[c]Fraser, et al. (2018)

[d]Goldstein and Naglieri (2010)

Relationship Between Measures of Emotion Regulation, Alexithymia and ASD Symptom Severity

We carried out a correlational analysis between ASD severity, alexithymia, measures of emotion regulation (ERICA and ERC) and age (Table 3.) Firstly, severity of ASD as measured by the ASRS-DSM scale was strongly associated with measures of emotion lability and negativity and negatively associated with emotion regulation (r = 0.62, $p < 0.001$, r = -0.34, $p = 0.026$). Young people judged by their parent to have more severe ASD symptoms were also more likely to be rated as emotionally labile and higher in negativity. The alexithymia subscales identification and communication showed a strong positive correlation with each other (r = 0.70, $p < 0.001$) and a strong negative correlation with the ERICA total score (r = -0.48, $p = 0.001$; r = -0.46, $p = 0.002$, see Fig. 1). The Alexithymia identification scale also correlated negatively with the young person's ERICA – Emotional Control subscale and with ERICA Self-Awareness subscale (r = -0.37, $p = 0.01$, r = -0.46, $p = 0.001$) and the Alexithymia communication subscale correlated with the ERICA Self-Awareness subscale (r = -0.56, $p < 0.001$). This indicates high levels of alexithymia identification was associated with lower emotional control and weaker self-awareness, as reported by young people.

On the other hand, the parental report on the emotion regulation subscale of the ERC did not correlate with the young person's ERICA score; even though both parents and young people reported weaker emotion regulation, they did not agree on ratings of emotion regulation. Furthermore, the scores on the two alexithymia scales did not correlate

Table 3 Correlation coefficients among measures of age, ASD severity, Alexithymia, and adolescent and parent measures of emotion regulation

Variable	Age	ASRS-DSM-5	AlexId	AlexCom	EricaEC	EricaSA	EricaSR	EricaT	ErcLN
ASRS-DSM-5	.12								
AlexIden	-.20	.16							
AlexCom	-.03	.16	.70**						
EricaEC	.07	-.14	-.37*	-.27					
EricaSA	-.05	-.16	-.46**	-.56**	.33*				
EricaSR	-.06	-.22	-.26	-.27	.64**	.30*			
EricaT	-.02	-.23	-.48**	-.46**	.88**	.64**	.77**		
ErcLN	.06	.62**	.19	.27	-.48**	-.33*	-.26	-.46**	
ErcER	-.19	-.34*	-.01	.04	.16	.15	.28	.22	-.06

ASRS-DSM Autism Spectrum Rating Scale – DSM-5, *AlexId* Alexithymia Questionnaire for Children – Identification, *AlexCom* Alexithymia Questionnaire for Children – Communication, *AlexET* Alexithymia Questionnaire for Children – Externally-orientated thinking, *EricaEC* Emotion Regulation Index for Children and Adolescents—Emotional Control, *EricaSA* Emotion Regulation Index for Children and Adolescents – Self-Awareness, *EricaSR* Emotion Regulation Index for Children and Adolescents – Situational Responsiveness, *EricaT* Emotion Regulation Index for Children and Adolescents – Total, *ErcER* Emotion Regulation Checklist—Emotion Regulation, *ErcLN* Emotion Regulation Checklist—Lability/Negativity

*indicates $p < .05$. **indicates $p < .01$

with either of the ERC subscales. However, the Lability and Negativity subscale of the ERC did show a significant negative correlation with a number of the young person's ERICA subscales including Emotional Control, Self-Awareness and ERICA total score (r = -0.48, $p = 0.001$, r = -0.33, $p = 0.03$, r = -0.46 $p = 0.002$). Effectively if the young person self-reported emotional lability and negativity, their parent was more likely to rate them as having emotional control difficulties. Age was not correlated with any of the measures so was excluded from subsequent analysis.

Regression Analyses

A hierarchical multiple regression was conducted, using variables which had been shown to have associations on the preliminary correlations outlined above, to examine the level of variance alexithymia and ASD severity had on emotion regulation. Exploratory analyses did not show any association between possible confounding factors (age, gender and parental educational level) and emotional regulation, thus it was not necessary to enter these into the regression. The data were checked to ensure that they adhered to the various assumptions for regression, including the independence of errors, homoscedasticity, and the lack of co-linearity.

The ERICA Total was utilized as the outcome measure. On Step 1, ASD severity was entered into the model. The model explained just 3% of the variance in emotional regulation and was not statistically significant ($R^2 = 0.05$; Adjusted $R^2 = 0.03$, $p = 0.14$). On Step 2, alexithymia identification and alexithymia communication were entered into the model. A significant linear regression model was found ($F(3,39) = 4.97$, $p < 0.006$ with an Adjusted R^2 of 0.22). The model illustrates that alexithymia identification and alexithymia communication explain a much greater percentage of variance in emotion regulation ($R^2 = 0.28$; Adjusted $R^2 = 0.22$), than ASD severity alone, however neither alexithymia subscale showed contributions that were statistically significant by themselves (both $p > 0.05$; see Table 4) which is likely due to collinearity between the two alexithymia subscales. Therefore, on

Table 4 ASD severity and Alexithymia as predictors of emotion dysregulation

Variable	*B*	*SE*	beta	t	p	Adj. R^2
Model 1						.03
ASRS-DSM	-0.16	0.11	-.23	-1.51	.14	
Model 2						.24
ASRS-DSM	-0.11	0.10	-.14	-1.04	.30	
AlexIden	-4.36	2.85	-.29	-1.53	.13	
AlexCom	-3.64	3.00	-.23	-1.21	.23	
Model 3						.22
ASRS-DSM	-.11	.10	-.16	-1.12	.27	
AlexIden	-6.74	2.08	-.45	-3.24	.002**	
Model 4						.19
ASRS-DSM	-.11	.10	-.16	-1.14	.26	
AlexCom	-6.79	2.21	-.43	-3.07	.004**	

*p < 0.05, **p < 0.01

Step 3, alexithymia communication was dropped from the model. As predicted, the alexithymia identification was now significant (b = -0.45, p = 0.002). For the sake of completeness, in Step 4, alexithymia communication was retained, and alexithymia identification was dropped from the model. Alexithymia communication was now significant (b = -0.43, p = 0.004). The regression weights for both alexithymia variables were significant and negative, indicating that young people with higher alexithymia reported poorer emotion regulation.

Discussion

This study explored the relationship between the alexithymia in young people with ASD and their emotion regulation difficulties. The participants reported elevated levels of alexithymia identification and communication in comparison to typically developing young people. This accords with Bird and Cook (2013) finding elevated levels of alexithymia in ASD samples, in this case in young people. There were also indications of significantly higher levels of emotion dysregulation as measured by the ERICA and the ERC. Significant correlations were found between young person's self-report of emotion regulation difficulties and alexithymia subscales identification and communication, with the alexithymia identification scale sharing 22% of the variance with emotional regulation, independent of the severity of ASD. Likewise, the alexithymia communication scale shared 19% of the variance in self-reported emotion regulation. Higher levels of alexithymia are associated with lower levels of self-reported emotion regulation.

However, the parental report of emotional regulation and parent-reported lability/negativity were strongly correlated with ASD severity. We chose the Autism Spectrum Rating Scale in this study as our ASD severity scale but wanted to avoid items that explicitly related to emotion regulation, such as the Attention and

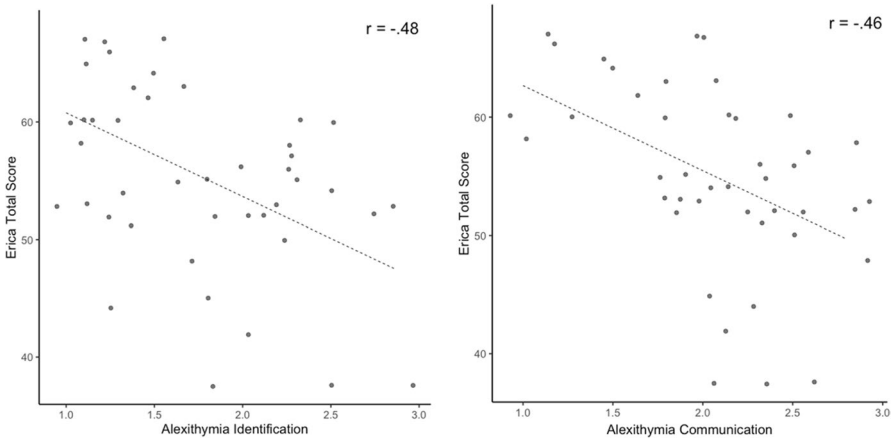

Fig. 1 The relationship between alexithymia scales and emotion regulation

Self-Regulation subscale of the ASRS. However, on further examination, even the DSM-5 scale includes items that related directly to emotion regulation such as ("have a strong reaction to any change in routine" and "become upset if routines are changed'). It is possible this inflated the degree to which the DSM-5 scale correlated with emotion regulation, particularly when the respondents were the same for both measures. However, this does not explain the lack of association between the parent report Emotion Regulation subscale and the two alexithymia subscales.

Overall, we found strong consistency between the young person's report of emotion regulation on the ERICA and the parent's report of emotional lability and negativity on the ERC, but not between parent and young person's responses to the emotion regulation subscales. The scales contain items with strong similarities, so it is surprising that the parents and young people do not agree more strongly in these judgements, though the correlation coefficient for these two variables ($r = 0.22$) would be interpreted as a small to moderate effect size (Cohen, 1988), despite it not reaching statistical significance, so this may reflect a lack of power in the study. Another possibility is that the emotional regulation difficulties in young people with ASD are being misread by their parents. There is strong evidence that children with ASD tend to be less expressive than typically developing children (Brewer et al., 2016; Capps et al., 1993) and as pointed out by Trevisan et al. (2016) may display ambiguous facial expressions that are harder to interpret by those around them. There is evidence that neurotypical individuals may find it more difficult to interpret the facial expressions of people with autism (Edey et al., 2016). Furthermore, adolescents may demonstrate emotional dysregulation in some contexts but not others (for instance differences may emerge between school and home (Kraemer et al., 2003). Parents of adolescents see only one aspect of the young person's behaviour, which is mediated by the home context, differing demands, and the parent–child relationship (Kim et al., 2018). Assessments that include reports from the young person themselves as well as their parents may result in markedly different results, as in this study. The tendency to regard informant discrepancies as uniquely caused by measurement error rather than contextual variations in the young person's behaviour has been criticised (De Los Reyes et al., 2011, 2016). Indeed, many now recognise these variations may represent meaningful differences in both the perspective of the informant and the actual presence or absence of the behaviour in differing contexts (Dirks et al., 2012). In a review of 341 cross-informant studies, De Los Reyes et al. (2015) meta-analysis revealed a correlation of 0.26 for parent–child pairs for internalizing behaviours and 0.32 for externalising behaviours. In this context, the correlation of 0.22 between parents and young people in the current study is less surprising.

These results extend the work of Samson et al. (2015) and Berkovits et al. (2017) whose studies highlighted the key role difficulties in emotion regulation can play in the lives of children with ASD and the work of Bird et al. (2010) who identified the role of alexithymia in social cognition. Bird and Cook (2013), with a lean definition of empathy—emotional contagion, have argued that alexithymia undermines a person's ability to use empathic feelings as useful social information. However, our results suggest that alexithymia may also play a role downstream in making emotion regulation more challenging for young people with ASD. Behavioural

difficulties have long featured as a focus of research in ASD, but less work has been done to examine the role of emotional regulation (Berkovits et al., 2017). If young people with ASD have heightened levels of alexithymia, this is likely to inhibit one of the first stages in the complex process of emotion regulation—identifying one's own emotions—to then be able to select emotion regulation strategies, such as self-soothing, distraction, reappraisal and so forth (Gaigg et al., 2018). Evidence from this study provides partial support for the findings of Bird and Cook's (2013) paper, suggesting emotional difficulties experienced by young people with ASD may be better explained by alexithymia, than by ASD severity. We do not yet know why this finding did not extend to the parent's report of the young person's emotion regulation, though this may reflect the fact that alexithymia is an internal psychological process which makes it difficult for the parent to observe. From a clinical perspective, these finding suggest screening for and addressing underlying alexithymia as a precursor to helping young people with ASD manage their emotional difficulties, may be a useful adjunct to teaching emotion regulation strategies.

There are several limitations to this study. Firstly, there is a risk of response bias as our response rate was relatively low (23%) as is the case in many postal surveys, however the sample was representative in terms of gender balance. Secondly, inherent difficulties exist in investigating inner states such as alexithymia without relying on self-report measures, as has been noted by a number of researchers (Gaigg et al., 2018; Vorst and Bermond, 2001), and some young people with ASD may have limited insight into their emotional states, making accurate reporting challenging. However, alexithymia measurement with self-report has a long history, even in ASD research (see Kinnaird et al., 2019 for a review) and evidence suggests that adolescents and young people with ASD without intellectual disabilities are able to response to self-report questionnaires (Demurie et al., 2011; Hillier et al., 2011; Milosavljevic et al., 2016). Thirdly, our study was limited to young people with ASD without intellectual disabilities. It is not clear how generalizable these results may be to young people with ASD and intellectual disabilities, though some work on alexithymia and challenging behaviour in adults with intellectual disabilities has been published (Davies et al., 2015).

The finding of this study suggest that alexithymia is associated with poorer emotion regulation strategies among young people with ASD, though the association from a parental perspective is more equivocal. Further work to assess why these differences exist between respondents and to assess how alexithymia leads to emotion regulation difficulties would be illuminating.

Acknowledgements This project formed part of Emer Gormley's MA in Applied Psychology (Mental Health). An earlier draft was displayed as a poster presentation at The PSI Early Graduate Group Conference (Sept 2018).

Author Contributions All authors contributed to the study conception and design. Material preparation and data collection were performed by Emer Gormley. Analysis was performed by Emer Gormley, Christian Ryan and Chris McCusker. The manuscript was written Emer Gormley, Christian Ryan and Chris McCusker. All authors read and approved the final manuscript.

Funding This research was carried out without financial support.

Availability of Data and Material Participants were not asked for permission to share their data explicitly in the consent form. However, a synthetic version of the data could be generated using R packages such as synthpop (Nowok et al., 2016) if this would be helpful.

Declarations

Ethics Approval The study was approved by the university ethics committee and the ethics committee of the community disability service. All procedures performed were in accordance with the 1964 Helsinki declaration and its later amendments.

Informed Consent All participants provided full written informed consent before participation in the study.

Conflict of Interest The author declares there is no conflict of interest.

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