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Authors

Nuske, Heather J
Shih, Wendy I
Sparapani, Nicole
et al.

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Self-regulation predicts companionship in children with autism

Heather J. Nuske[1], Wendy I. Shih[2], Nicole Sparapani[3], Lauren Baczewski[2], Amanda Dimachkie Nunnally[2], Samantha Hochheimer[4], Consuelo Garcia[2], Fernanda Castellon[2], Lynne Levato[4], Erin Fischer[4], Zabryna L. Atkinson-Diaz[1], Jennica Li[3], David S. Mandell[1], Connie Kasari[2] and the Autism Intervention Research—Behavioral 1 team

[1]Penn Center for Mental Health, University of Pennsylvania, Philadelphia, PA, USA; [2]Semel Institute for Neuroscience and Human Behavior, University of California, Los Angeles, CA, USA; [3]University of California Davis MIND Institute, University of California, Davis, CA, USA; [4]Developmental and Behavioral Pediatrics, University of Rochester Medical Center, Rochester, NY, USA

Abstract Self-regulation is associated with many positive outcomes in children with and without autism, including increased mental health and academic achievement, and decreased problem behavior. Less is known regarding whether and how self-regulation and symptoms of mental health challenges (internalizing and externalizing problems) relate to social outcomes, such as friendship quality and loneliness. Parents and teachers of 106 children with autism aged 5–12 reported on children's self-regulation difficulties and externalizing and internalizing symptoms. Four-to-five months later, children reported on the quality of their friendship with their best friend (companionship, conflict, helpfulness, sense of relationship security, closeness), and their feelings of loneliness. Linear regression was used to examine the effects of self-regulation and symptoms of mental health challenges on friendship quality and loneliness. Less self-regulation difficulties predicted stronger companionship and girls had better quality friendships with their best friend than did boys, in terms of companionship, helpfulness, security and closeness, confirming that they have a protective advantage in friendship development. Autism symptoms, IQ, and age were not associated with friendship quality or loneliness. Results highlight the importance of self-regulation and mental health interventions for school-aged children with autism.

KEYWORDS: autism; self-regulation; friendship; loneliness; depression; mental health: internalizing problems; externalizing problems

Introduction

Throughout early to middle childhood, typically developing children become increasingly attuned to their peers and skilled at connecting with them in a coordinated, meaningful way. This supports social learning, provides emotional support and security, and creates templates for later affiliative experiences and intimacy in relationships (Hartup 1984, 1992). During this developmental period, children are better able to identify best friends, as well as reflect and report on the quality of their friendships and feelings of loneliness (Hartup 1992, Ladd 1988, 1999, Sullivan 2013). In typically developing children, high rates of loneliness during elementary school predict more depressive symptoms at the end of elementary school (Qualter *et al*. 2013). Not only are friendships integral to children's social skill development and their mental health (Howes 2009, Woods *et al*. 2009), but mental and emotional health also impacts friendship outcomes (Cardoos and Hinshaw 2011, Leflot *et al*. 2011, Manfro *et al*. 2017, O'Driscoll *et al*. 2015, Patalay and Fitzsimons 2018, Pamela Qualter *et al*. 2010, Silke *et al*. 2016, Wood 2006). Therefore, the relationship between mental health and friendship is bi-directional (e.g. Mundt and Zakletskaia 2014).

Although most children with autism spectrum disorder (ASD) report having friends, many youth with ASD exhibit challenges developing and maintaining friendships (Bauminger-Zviely and Kimhi 2017). Compared with their neurotypical peers, children with ASD report having fewer friends and poorer quality friendships, specifically in terms of companionship,

Correspondence to: Heather J. Nuske, Penn Center for Mental Health, University of Pennsylvania, 3535 Market Street, Philadelphia, PA 19146, USA. Email: heather.nuske@pennmedicine.upenn.edu

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security, and helpfulness (Bauminger and Kasari 2000, Calder *et al*. 2013). Low friendship quality is associated, in turn, with greater loneliness and lower self-worth among children and adolescents on the autism spectrum (Bauminger *et al*. 2004, Whitehouse *et al*. 2009)—putting them at a greater risk for experiencing mental issues later in life. In fact, recent reports illustrate that individuals with ASD experience considerable mental health challenges throughout their lifespan (Benevides *et al*. 2020, Gotham *et al*. 2020, Jackson *et al*. 2018), and this is, in part, due to difficulties with friendship development earlier in life. Not only is there a bi-directional link between childhood social experiences and later mental health status in typically developing children, as mentioned above, these reciprocal associations over development are also true in children with ASD, although much more work has been done predicting mental health outcomes from friendships, rather than the other way around (Chiang and Gau 2016, Cotugno 2009). Hence, it is critical that we cultivate a greater understanding of how to help children with ASD develop and maintain strong, positive friendships within early and middle childhood to improve their social outcomes overall and resilience to later mental health challenges.

Individual characteristics, family factors, and environmental contextual features help to determine whether children with ASD will successfully develop and maintain friendships with their peers (Bauminger *et al*. 2010b, Calder *et al*. 2013). For example, studies examining children with ASD have documented the impact that sex has on friendship development (Dean *et al*. 2014, Sedgewick *et al*. 2016). Both girls and boys with ASD have fewer peer nominations and social relationships than their neurotypical peers, but boys with ASD are more overtly rejected by their peers than are girls with ASD (Dean *et al*. 2014).

Another important but less-studied child characteristic that may have an effect on friendship formation in children with ASD is self-regulation—the ability to control, monitor, and manage emotion, cognition, and behavior for the purposes of pursuing a goal (Blair and Diamond 2008, Kopp 1982, Robson *et al*. 2020). Self-regulation has been conceptualized as an overarching construct that includes control over a variety of processes, such as emotional experiences and expressions (i.e. emotion regulation), cognitive processes (i.e. executive function), and approach/withdrawal behavior (i.e. effortful/behavioral control (e.g. Jahromi 2017). Individuals may exhibit adaptive responses to environmental stimuli, which helps them to successfully accomplish a goal, or they may respond with maladaptive behaviors, which interfere with accomplishing a goal. In typical development, children show evidence of self-regulation as early as five months-of-age (Stifter and Braungart 1995) and become increasingly sophisticated and effective at using emotion regulation strategies with age (e.g. Morris *et al*. 2011). As described in the conceptual framework outlined in Mazefsky *et al*. (2013), children with ASD may experience a limited capacity to regulate their emotions and behaviors due a host of factors associated with the ASD phenotype related to self-regulation (i.e. cognitive inflexibility, differential information processing, perseveration, atypical neural circuitry) and mental health symptoms (i.e. psychiatric conditions such as mood and/or anxiety disorders). Together, these factors make students with ASD more susceptible to episodes of dysregulation than their typically developing peers (Mazefsky *et al*. 2013). Studies have documented that young children with ASD are less likely to use adaptive self-regulatory strategies and tend to express more negative affect than their non-spectrum peers (e.g. Jahromi *et al*. 2012, Konstantareas and Stewart 2006, Nuske *et al*. 2017). Difficulties with self-regulation are common in ASD; a population-based sample identified emotion regulation problems in 74% of children with ASD, compared with 42% in children with intellectual disability and 18% of typically developing children (Totsika *et al*. 2011). In fact, research suggests that difficulty with emotion regulation may be a core feature of ASD (Mazefsky *et al*. 2013, Mazefsky and White 2014, Prizant *et al*. 2006). Difficulties with the cognitive and behavioral aspects of self-regulation in children with ASD have been well-documented in the research literature (e.g. Bachevalier and Loveland 2006, Geurts *et al*. 2004, Gilotty *et al*. 2002, Gomez and Baird 2005, Jahromi 2017, Loveland 2005).

In both typical development and individuals with ASD, the ability to self-regulate has been linked to a host of positive outcomes, including better mental health (e.g. less anxiety and depression), decreased problem behavior (e.g. aggression) and higher academic achievement (Ashburner *et al*. 2010, Bauminger *et al*. 2010a, Berthoz and Hill 2005, Duckworth and Carlson 2013, Gross and Muñoz 1995, Mischel *et al*. 2010, Ponitz *et al*. 2009, Rieffe *et al*. 2011, Robson *et al*. 2020, Trentacosta and Izard 2007, Villavicencio and Bernardo 2013). Additionally, in children with ASD, recent evidence suggests self-regulation difficulties are bi-directionally linked to cognitive development (Nuske *et al*. 2020). In typically developing children, self-regulation skills have been linked to positive social outcomes (Berkovits and Baker 2014, Blair *et al*. 2015, Chang *et al*. 2012, Chervonsky and Hunt 2019, Dollar and Stifter 2012, Spinrad *et al*. 2006, Spritz *et al*. 2010). In children with ASD, initial evidence suggests that self-regulation predicts later social skills (Berkovits *et al*. 2017) and less social impairment (Goldsmith and Kelley 2018). However, less is known on how self-regulation and symptoms of mental health challenges affect *social relationship (e.g. friendship)* outcomes. To

Table 1. Participant characteristics.

		Frequency	%	Mean	SD
Gender	Female	18	17.0		
	Male	88	83.0		
Age	Years			8.11	1.50
Grade	1st	20	18.9		
	2nd	30	28.3		
	3rd	23	21.7		
	4th	11	10.4		
	5th	13	12.3		
	Missing/not reported	9	8.5		
IQ	ABIQ			89.73	15.46
SCQ	Autism symptom severity			15.6	7.47
Ethnicity	African American	8	7.5		
	Caucasian	39	36.8		
	Hispanic	17	16.0		
	Asian	24	22.6		
	Other	5	4.7		
	Missing/not reported	13	12.3		
Site	Los Angeles	46	43.4		
	Baltimore	33	31.1		
	Ann Arbor	8	7.5		
	Seattle	19	17.9		
Mother's education	Less than 7th grade	3	2.8		
	Junior High	4	3.8		
	Some High School	3	2.8		
	High School Graduate	10	9.4		
	Special training after high school	6	5.7		
	6 = Some college	15	14.2		
	7 = College Graduate	39	36.8		
	8 = Graduate/professional training	21	19.8		
	Missing/not reported	5	4.7		
Family income	Less than $10,000	5	4.7		
	$10,000–$15,000	9	8.5		
	$15,000–$20,000	3	2.8		
	$20,000–$25,000	6	5.7		
	$25,000–$30,000	2	1.9		
	$30,000–$35,000	3	2.8		
	$35,000–$40,000	1	0.9		
	$40,000–$45,000	3	2.8		
	$45,000–$50,000	4	3.8		
	$50,000–$55,000	9	8.5		
	$60,000–$65,000	1	0.9		
	above $60,000	50	47.2		
	Missing/not reported	10	9.4		
BRIEF (T1)	BRI			64.25	11.07
	Emotional control			60.28	10.75
	Inhibit			61.12	11.10
	Shift			66.64	12.48
BASC (T1)	Externalizing problems composite			156.35	25.82
	Aggression			52.05	9.95
	Hyperactivity			54.98	10.97
	Conduct			49.37	8.60
	Internalizing problems composite			160.82	26.92
	Depression			57.15	11.41
	Anxiety			54.37	12.96
	Somatization			49.65	9.69
FQS (T2)	Companionship			13.31	4.16
	Help			15.11	5.35
	Security			13.87	4.16
	Closeness			18.82	4.16
	Confidence			8.33	3.64
CLS (T2)	Loneliness			38.81	14.50

Note. ABIQ = Stanford Binet Abbreviated IQ; BASC = Behavior Assessment System for Children; BRI = Behavioral Regulation Index (BRIEF sub-scale); BRIEF = Behavior Rating Inventory of Executive Function; FQS = Friendship Quality Scale; LS = Loneliness Scale; SCQ = Social Communication Questionnaire (SCQ; Rutter et al. 2003); T1 = Time 1; T2 = Time 2, 4–5 months after T1.

our knowledge, no research has examined how they affect friendship formation, maintenance or quality, or loneliness in children or adolescents with ASD (though work has begun on this topic in adults; see Mazurek 2014).

The aim of this exploratory study was to examine the impact of self-regulation difficulties and symptoms of mental health challenges (externalizing and internalizing behavior) on friendship quality and loneliness in school-age children with ASD. Based on the aforementioned literature from typical development (e.g. Berkovits and Baker 2014, Blair *et al.* 2015, Chervonsky and Hunt 2019) and adults with ASD (Mazurek 2014), our main working hypotheses were

that: 1) friendship quality would be negatively associated with self-regulation difficulties and symptoms of mental health challenges, and 2) loneliness would increase with self-regulation difficulties and symptoms of mental health challenges.

Methods

Setting

The current study comprised a secondary analysis from a larger randomized controlled trial (*et al.*, 2016). Study participants from the original study included school-aged children with ASD recruited across four sites (Los Angeles, Baltimore, Ann Arbor, or Seattle) over the course of two years. The trial was registered (clinical.trials.gov) and approved by each site's Institutional Review Board. Families gave written consent and children assented. The sample comprised of children who were randomized into the two intervention conditions (ENGAGE vs SKILLS; see Kasari *et al*. 2016 for intervention and randomization details). The children included in this study had a diagnosis of ASD and an IQ of at least 65 (confirmed by the abbreviated Stanford Binet-5; Roid 2003; i.e. children were moderately to high functioning), were between the ages of 5 and 12 years, in elementary school (grades 1–5), and educated in a general education classroom for a minimum of 80% of the school day (due to the focus of the larger study context of an intervention focusing on social skills with typical peers (Kasari *et al*. 2016). More than half of children were of ethnic/racial minorities. See Table 1 for participant characteristics.

Recruitment

The eligibility criteria were explained to school personnel, who identified potential students for the study. A recruitment packet to the parents of the potential students was sent home. Once parents returned the signed consent forms to the school, the research team communicated directly with the parents to commence study participation.

Participants

In total, 106 participants of the 148 from the original study were included in the present study (34 had missing outcome measures, one had missing Autism Diagnostic Observation Schedule (ADOS; Lord *et al*. 1999) data, (we were unable to verify ASD diagnosis), and seven did not meet criteria for ASD on the ADOS. Compared to the included participants, the sub-group with missing outcome measures were more likely to be from the Baltimore or Seattle sites ($\chi^2 = 33.73$, $p < .001$), and had a higher IQ, though their mean was still within the average range ($t = -1.989$, $p = .049$; included *M [SD]* = 89.73 [15.46]; missing outcome measures = 95.97 [17.96]). See Table 1 for participant characteristics.

Measures

Friendship quality

Friendship quality was measured using the Friendship Quality Scale (FQS; Bukowski *et al*. 1994), in which children report on the extent to which the statements are true regarding the quality of their friendship with their best friend, ranging from 1 (not at all true) to 5 (really true). The FQS has 23 items across five sub-scales, with the first four measuring positive aspects of friendship quality: 1) companionship (i.e. "Sometimes my friend and I just sit around and talk about things like school, sports, and things we like"), 2) help (i.e. "If other kids were bothering me, my friend would help me"), 3) security (i.e. "If there is something bothering me, I can tell my friend about it even if it is something I cannot tell to other people"), and 4) closeness (i.e. "I think about my friend even when my friend is not around"). The fifth sub-scale measures one negative aspect of friendship quality, conflict (i.e. "I can get into fights with my friend"). Internal consistency reliability of the measure for our sample was moderate to high across sub-scales (Companionship $\alpha = .72$; Help $\alpha = .71$; Security $\alpha = .53$; Closeness $\alpha = .73$; Conflict $\alpha = .57$).

Loneliness

Loneliness was measured using the Asher Children's Loneliness Scale (CLS; Asher *et al*. 1984). The CLS is a 24-item self-report questionnaire that measures feelings of loneliness and social dissatisfaction in children. Sixteen of the 24 survey items assess feelings of loneliness, social dissatisfaction, and/or evaluations of the child's social status in reference to their peers (e.g. 'I have lots of friends'). The remaining eight items are filler questions designed to allow the child to become comfortable with the structure of the measure (e.g. 'I like playing board games a lot'). Items are measured on a 5-point Likert scale (1= always true, 5= not at all true). A total loneliness score is derived by reverse coding negatively phrased items and summing the responses to the loneliness-related items. Responses to the hobby items are not included in the total score. Higher scores indicate greater feelings of loneliness and social dissatisfaction. For the current study, participants with ASD completed the measure. Internal consistency reliability of the measure for our sample was high ($\alpha = .87$).

Self-regulation

Self-regulation was measured with selected sub-scales of the BRIEF, the Behavioral Regulation Index, and its subscales: Emotion Control, Inhibit, and Shift. The BRIEF (Gioia *et al*. 2000) is a standardized, empirically validated caregiver/teacher questionnaire designed to measure executive functioning behaviors for children

Table 2. Linear regression models predicting friendship quality and loneliness from self-regulation difficulties and mental health challenges.

	Outcomes					
	Friendship Quality Scale					*CLS*
	Companionship	Conflict	Help	Security	Closeness	Loneliness
BRIEF						
Behavioral Regulation						
Emotional control	**−.29***	−.15	−.14	−.09	−.06	.11
Inhibit	**−.33***	.11	.03	−.04	−.13	−.01
Shift	**−.38****	.01	−.25#	.22	−.18	.16
BASC						
Externalizing						
Aggression	.04	**.23***	−.02	.08	−.03	.17
Hyperactivity	.06	.10	−.09	.04	.03	.19
Conduct Problems	.11	.10	−.08	−.08	.01	.22#
Internalizing						
Depression	−.09	.16	−.01	.02	−.01	**.25***
Anxiety	.03	−.02	.11	.08	.04	.04
Somatization	−.07	.03	−.04	.04	.02	−.01
Covariates						
Child Characteristics						
Autism severity (SCQ)	−.13	−.12	−.04	−.13	−.13	.05
IQ	−.09	−.12	.08	.01	.07	−.11
Age	−.08	−.11	−.08	−.12	.13	−.02
Gender (0= Female, 1= Male) 83% Male	**−.36*****	−.02	**−.31****	**−.23***	**−.27****	.15
Study Characteristics						
Site (reference = Los Angeles)						
Baltimore	−.16+	**−.23***	−.07	−.17+	−.13	−.20+
Ann Arbor	−.20#	−.09	−.07	−.05	.03	−.04
Seattle	−.05	−.09	**. 25***	.01	.13	−.05
Intervention	< −.01	−.06	−.02	−.15+	−.16+	.01

Note. Standardized beta coefficients shown above. BASC = Behavior Assessment Scale for Children; BRIEF = Behavior Rating Inventory of Executive Function; CLS = Children's Loneliness Scale; Intervention = ENGAGE vs. SKILLS (see Kasari et al. 2016 for more details); Site = Los Angeles, Baltimore, Ann Arbor, or Seattle; SCQ = Social Communication Questionnaire. For all BASC and BRIEF scales, the Conflict scale of the Friendship Quality Scale and the Loneliness scale, higher scores indicate more difficulties. In order to determine which covariate to include on each regression model, covariates as shown above were first tested in reduced models (with only the covariates included). As per Hosmer and Lemeshow (2000), the Friendship Quality Scale sub-scales and Children's Loneliness Scale that were associated with covariates at p <. 2 (gender, site and intervention group), those significant covariates were adjusted for in the final BRIEF and BASC models. Each BRIEF and BASC sub-scale was entered, with the appropriate covariates, in separate regression models. ***$p < .001$, **$p < .01$, *$p < 0.05$, # $p < .1$, +p <. 2 (latter for covariates only as per Hosmer and Lemeshow 2000).

aged between 5 and 18 years. The questionnaire is composed of 86 questions in total, scored on a 3-point Likert scale: 1 = never, 2 = sometimes, 3 = often, and produces T scores per sub-scale ($M = 50$, $SD = 10$). Higher scores indicate more difficulties. For the current study, caregivers completed this questionnaire. Although this measure was originally validated using samples of typically developing children and children with ADHD, the BRIEF has been widely used to measure executive functioning in children with ASD, and has been found to be effective in detecting executive dysfunction in this population (Gilotty *et al*. 2002, Gioia *et al*. 2002, Kenworthy *et al*. 2005, Rosenthal *et al*. 2013). Internal consistency reliability of the measure for our sample was high (Behavioral Regulation Index $\alpha = .93$; Emotion Control sub-scale $\alpha = .87$; Inhibit sub-scale $\alpha = .87$; Shift sub-scale $\alpha = .79$).

Internalizing and externalizing problems

Internalizing and externalizing problems, symptoms of mental health challenges, were measured with selected sub-scales of the Behavior Assessment Scale for Children, Second Edition (BASC-2; Reynolds and Kamphaus 2004). The BASC-2 was used because data were collected prior to the release of BASC-3. The BASC-2 is an individually administered behavior rating scale that helps to identify emotional and behavioral difficulties in children. It assesses for both internalizing (depression, anxiety, and somatization) and externalizing (aggression, hyperactivity and conduct) problems. Items are scored on a 4-point Likert scale: 0 = never, 1 = sometimes, 2 = often, and 3 = almost always. T scores for each sub-scale are produced; higher scores indicate more difficulties. For the current study, teachers completed this measure to assess functioning in the school setting. Internal consistency reliability of the measure for our sample was low to high (Internalizing scale $\alpha = .63$; Depression sub-scale $\alpha = .21$; Anxiety sub-scale $\alpha = .21$; Somatization sub-scale $\alpha = .51$; Externalizing scale $\alpha = .77$; Aggression sub-scale $\alpha = .75$; Hyperactivity sub-scale $\alpha = .03$; Conduct sub-scale $\alpha = .85$).

Autism symptoms

Children were included in the current study if they had an ASD diagnosis confirmed by trained (i.e. research-reliable) clinicians using the Autism Diagnostic Observation Schedule (ADOS; Lord *et al*. 2000), a

semi-standardized play assessment of ASD symptoms. In addition, the Social Communication Questionnaire (SCQ; Rutter *et al*. 2003) was administered to parents. The SCQ is a 40-item questionnaire used to evaluate social communication and social functioning in children four years and older. The SCQ yields a total score, with a recommended cut-off score of 15 or greater indicating possible ASD.

Data analysis

Variables were analyzed for skewness, kurtosis and outliers. As all variables of interest were normally distributed, parametric analyses were conducted. Linear regression models were conducted to examine the impact of self-regulation (BRIEF sub-scales) and symptoms of mental health challenges (BASC sub-scales), measured at time 1, on friendship quality (FQS sub-scales) and loneliness (CLS), measured at time 2, four to five months later. We examined bivariate associations between dependent variables and potential covariates, including age, gender, IQ, ASD symptoms (SCQ total score), site and intervention group. Significant covariates that were bivariately associated in reduced models (only the covariates included) with the dependent variables (FQS sub-scales and CLS) at $p <$. 2 (gender, site and intervention group) were included in the corresponding BRIEF and BASC regression models, as per Hosmer and Lemeshow (2000). Due to the exploratory nature of this study and to avoid the issue of multicollinearity across BRIEF and BASC sub-scales, regression models were run separately for each predictor variable with the corresponding covariates (i.e. sub-scale scores were not entered into the same model). Zero-order correlations amongst all continuous variables are also reported in the supplementary material.

Results

Friendship quality and self-regulation difficulties/symptoms of mental health challenges

Less frequent self-regulation difficulties (all BRIEF sub-scales) at Time 1 predicted stronger companionship with best friends at Time 2 (Behavioral Regulation: $b = -.35$, $t = -2.79$, $p = .007$, 95% CI [-.59, −.10]; Emotional control: $b = -.29$, $t = -2.19$, $p = .03$, 95% CI [−.52, −.02]; Inhibit: $b = -.33$, $t = -2.48$, $p = .02$, 95% CI [−.60, −.06]; Shift: $b = -.38$, $t = -3.09$, $p = .003$, 95% CI [−.60, −.13]). Self-regulation difficulties also explained a significant proportion of variance in companionship scores (Behavioral Regulation: $R^2 = .18$, $F = 5.73$, $p = .006$; Emotional control: $R^2 = .14$, $F = 4.15$, $p = .02$; Inhibit: $R^2 = .16$, $F = 4.80$, $p = .01$; Shift: $R^2 = .20$, $F = 6.62$, $p = .003$).

More frequent aggression at Time 1 predicted more interpersonal conflict with children's best friends at Time 2 ($b = .23$, $t = 2.12$, $p = .04$, 95% CI [.01, .43]), however aggression did not explain a significant proportion of variance in conflict scores ($R^2 = .05$, $F = 2.26$, $p = .11$). Symptoms of mental health challenges (internalizing or externalizing problem) did not predict any aspects of friendship quality. See Table 2 for all standardized regression coefficients.

Loneliness and self-regulation difficulties/mental health symptoms

As shown in Table 2, more frequent depression symptoms measured with the BASC-2 in the children with ASD at Time 1 predicted greater feelings of loneliness at Time 2 ($b = .25$, $t = 2.13$, $p = .04$, 95% CI [−.02, .47]), however depression did not explain a significant proportion of variance in loneliness scores ($R^2 = .12$, $F = 1.87$, $p = .11$). Self-regulation difficulties did not predict loneliness.

Friendship quality/loneliness and other child characteristics

Girls with ASD had stronger companionship ($b = -.36$, $t = -3.80$, $p < .001$, 95% CI [.55, .17]), security ($b = -.23$, $t = -2.35$, $p = .02$, 95% CI [−.45, −.04]), and closeness ($b = -.27$, $t = -2.85$, $p = .005$, 95% CI [−.48, −.09]) with their best friend, and rated their best friend as more helpful ($b = -.31$, $t = -3.14$, $p = .002$, 95% CI [−.51, −.12]) than did boys with ASD. ASD symptoms, IQ, and age were not associated with any aspects of friendship quality or with loneliness. See Table 2 for all standardized regression coefficients.

Discussion

The aim of the present study was to explore the impact of self-regulation difficulties and symptoms of mental health challenges (externalizing and internalizing behavior) on friendship and loneliness in school-age children with ASD. We found that children with ASD who have less self-regulation difficulties have higher quality companionship, indicating that using adaptive self-regulatory behaviors to successfully regulate emotions, cognitions, and behaviors affords children the psychological availability to connect with their best friends in a meaningful way. This study is the first to demonstrate a link between self-regulation and friendship in children with ASD, extending previous research showing this link in typically developing children (e.g. Berkovits and Baker 2014, Chang *et al*. 2012, Spinrad *et al*. 2006).

Interestingly, self-regulation predicted companionship in the children with ASD, but not the other aspects of their friendships measured (help, security, closeness, and conflict). This finding may reflect children's preferences for sustained interactions, like those on which companionship is built, with others who express positive emotions (Halberstadt *et al*. 2001). By contrast, the need for self-regulation during other types of

interactions with friends, such as those focused on gaining help or a sense of security, may not be as crucial. Further research is needed to elucidate this issue.

Children with ASD with more frequent teacher-reported aggression had greater interpersonal conflict with their best friends. This finding is consistent with previous work with children with ASD showing an association between higher self-control and decreased conflict on play dates (Frankel *et al*. 2010). Children with ASD who experienced more frequent teacher-reported depression symptoms had more loneliness in our study. This finding accords with a large body of work on depression in typical development (for review, see Heinrich and Gullone 2006) and is consistent with previous work in ASD (e.g. Mazurek 2014, Pouw *et al*. 2013). Given the established link between depression and self-regulation difficulties in ASD (e.g. Mazefsky *et al*. 2013, Pouw *et al*. 2013), this finding again underlines the significance of targeting self-regulation and mental health in interventions for school-aged children with ASD, which may indirectly support friendship development and prevent loneliness. However, given the exploratory nature of this study, large number of variables explored, and non-significance of the variance explained, these findings warrant replication before any strong conclusions may be drawn.

The main results of an association of less self-regulation difficulties promoting higher companionship between the best friends reflects a the broader phenomenon of the inherent link between *intra*personal wellbeing promoting *inter*personal wellbeing (Kitayama and Markus 2000), and broader still, between self-regulation and wellbeing (Chervonsky and Hunt 2019, Singh and Sharma 2018, van Genugten *et al*. 2017), given the background of the large body of research on self-regulation and positive outcomes (Duckworth and Carlson 2013, Mischel *et al*. 2010, Ponitz *et al*. 2009, Robson *et al*. 2020).

Some programs that have demonstrated success in targeting self-regulation and mental health in children with ASD include cognitive behavior therapy adapted for ASD (for review, see Keefer *et al*. 2018, Lake *et al*. 2020, Perihan *et al*. 2020), mindfulness-based interventions adapted for ASD (e.g. Hwang *et al*. 2015, Ridderinkhof *et al*. 2018), and self-regulation specific programs (Conner *et al*. 2019, Lee *et al*. 2019, Rispoli *et al*. 2019, Thomson *et al*. 2015). These programs have been tested only in home or in clinics, however (Reyes *et al*. 2019). To increase access, these programs could be delivered at school (Atkins *et al*. 2003). Many universal and targeted school-based programs incorporate cognitive, behavioral and/or mindfulness approaches for typically developing children, as we and others have found, there are few programs adapted for the unique support needs of children with ASD (Cannon *et al*. 2011, Christner *et al*. 2007, Durlak *et al*. 2011, Phan *et al*., under review; Taylor *et al*. 2017).

Although not within the scope of this study, there is also an emerging body of research demonstrating how peers can support self-regulation in children with ASD, such as acting as peer supports in educational settings or models for teaching self-regulation skills and appropriate behaviors (Jahromi *et al*. 2013, Kayne 2013, Pierce and Schreibman 1995, Weiss 2014). The link between self-regulation and friendship development may be bidirectional and needs further research. For example, some peer-mediated social-skills interventions have shown positive effects on friendship development; Kasari *et al*. (2016) found increased peer engagement and decreased isolation during school recess in children with ASD who took part of an intervention targeting social skills.

Autism symptoms, IQ and age were not associated with any aspects of friendship quality or with loneliness in our study, which contrasts with other research on children with ASD that has identified these links (Bauminger *et al*. 2010b, Bauminger and Kasari 2000, Lieb and Bohnert 2017). Our results call into question the consistency of these findings. We did find, consistent with previous research, that gender was associated with many aspects of friendship quality in our children with ASD. Girls had better quality friendships with their best friend in terms of companionship, helpfulness, security and closeness (Sedgewick *et al*. 2016, 2019). Factors such as earlier language development and the ability to integrate both nonverbal and verbal behaviors may be advantageous to girls with ASD in terms of friendship development (Hiller *et al*. 2014, Wallentin 2009). Girls show more social motivation when seeking friendships, often at levels similar to their peers without ASD (Cook *et al*. 2018, Dean *et al*. 2014, Sedgewick *et al*. 2016) and also present with greater skills in social and emotional reciprocity and empathy (Head *et al*. 2014, Hiller *et al*. 2014, Kreiser and White 2014, Sedgewick *et al*. 2019). In contrast to previous research, girls in the present study did not report significant conflict within their friendships; this is likely attributable to the age group investigated, as the theme related to conflict was most apparent among adolescent females (Head *et al*. 2014, Kreiser and White 2014, Sedgewick *et al*. 2016, 2019).

Limitations

This study is not without limitations. First, the sample included 5-12-year-old children with ASD with IQs > 65, and therefore, cannot address the association of self-regulation with friendship and loneliness outcomes in children with ASD who exhibit significant cognitive or language delays as well as preschool children and adolescents with ASD. Minimally verbal children with ASD have recently been found to have more self-

regulation difficulties than children with ASD without delays (Nuske *et al*. 2020), hence should be a focus of future research. Second, the measurement of friendship quality and loneliness was completed by children with ASD and we cannot verify how realistic or self-reflective they were in their evaluations of their own friendships (Foley Nicpon *et al*. 2010). Therefore, future research should include another means of measurement, for example, by a different reporter via child observations. Third, although friendship quality was the focus of the current study, future research should include friendship network size, which has been found in previous research to be linked to loneliness in adults with ASD (Mazurek 2014). Fourth, some of the BASC subscales (Depression, Anxiety, and Hyperactivity) and FQS sub-scales (Security, Conflict) had low internal consistency reliability. This likely reflects that children with ASD were not included in the development of the measures and have not been validated with children with ASD, and, for the BASC sub-scales, is further evidence of the difference in such mental health symptoms in ASD as compared to non-ASD children, as reported elsewhere (e.g. Kerns *et al*. 2014). Nevertheless, results using these sub-scales warrant further scrutiny. Fifth, given the that this study was embedded in a larger study comparing two social skills interventions for children with ASD, no data from matched non-ASD comparison group was collected, and thus we cannot generalize our pattern of results to non-ASD populations. Future research should aim to include such comparison groups in order to assess the generalizability of these findings. Finally, as data were taken from a convenience sample, there might be some differences between those caregivers who decided to participate in the intervention study and those who felt their child did not need an intervention or for any other reason chose not to participate in the study.

Conclusion

The findings show that self-regulation skills promotes companionship and highlights the critical need of addressing self-regulation difficulties in children with ASD in schools in order to promote their development of meaningful peer relationships.

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ORCID

Heather J. Nuske http://orcid.org/0000-0001-6618-3768
Lauren Baczewski http://orcid.org/0000-0001-8854-2282

References

Ashburner, J., Ziviani, J. and Rodger, S. 2010. Surviving in the mainstream: Capacity of children with autism spectrum disorders to perform academically and regulate their emotions and behavior at school. *Research in Autism Spectrum Disorders*, 4, 18–27.
Asher, S. R., Hymel, S. and Renshaw, P. D. 1984. Loneliness in children. *Child Development*, 55, 1456–1464. JSTOR.
Atkins, M. S., Graczyk, P. A., Frazier, S. L. and Abdul-Adil, J. 2003. Toward a new model for promoting urban children's mental health: Accessible, effective, and sustainable school-based mental health services. *School Psychology Review*, 32, 503–514.
Bachevalier, J. and Loveland, K. A. 2006. The orbitofrontal–amygdala circuit and self-regulation of social–emotional behavior in autism. *Neuroscience & Biobehavioral Reviews*, 30, 97–117.
Bauminger, N. and Kasari, C. 2000. Loneliness and friendship in high-functioning children with autism. *Child Development*, 71, 447–456.
Bauminger, N., Shulman, C. and Agam, G. 2004. The link between perceptions of self and of social relationships in high-functioning children with autism. *Journal of Developmental and Physical Disabilities*, 16, 193–214.:JODD.0000026616.24896.c8
Bauminger, N., Solomon, M. and Rogers, S. J. 2010a. Externalizing and internalizing behaviors in ASD. *Autism Research*, 3, 101–112.
Bauminger, N., Solomon, M., and Rogers, S. J. 2010b. Predicting friendship quality in autism spectrum disorders and typical development. *Journal of Autism and Developmental Disorders*, 40, 751–761.
Bauminger-Zviely, N. and Kimhi, Y. 2017. Friendship in autism spectrum disorder. In J. B. Leaf (Ed.), *Handbook of social skills and autism spectrum disorder: assessment, curricula, and intervention* (pp. 63–79). Cham, Switzerland: Springer International Publishing.
Benevides, T. W., Shore, S. M., Palmer, K., Duncan, P., Plank, A., Andresen, M.-L., Caplan, R., Cook, B., Gassner, D., Hector, B. L., Morgan, L., Nebeker, L., Purkis, Y., Rankowski, B., Wittig, K. and Coughlin, S. S. 2020. Listening to the autistic voice: Mental health priorities to guide research and practice in autism from a stakeholder-driven project. *Autism*, 24, 822–833.
Berkovits, L. D. and Baker, B. L. 2014. Emotion dysregulation and social competence: stability, change and predictive power. *Journal of Intellectual Disability Research*, 58, 765–776.
Berkovits, L., Eisenhower, A. and Blacher, J. 2017. Emotion regulation in young children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 47, 68–79.
Berthoz, S. and Hill, E. L. 2005. The validity of using self-reports to assess emotion regulation abilities in adults with autism spectrum disorder. *European Psychiatry*, 20, 291–298.

Blair, C. and Diamond, A. 2008. Biological processes in prevention and intervention: The promotion of self-regulation as a means of preventing school failure. *Development and Psychopathology*, 20, 899–911.

Blair, B. L., Perry, N. B., O'Brien, M., Calkins, S. D., Keane, S. P. and Shanahan, L. 2015. Identifying developmental cascades among differentiated dimensions of social competence and emotion regulation. *Developmental Psychology*, 51, 1062–1073.

Bukowski, W. M., Hoza, B. and Boivin, M. 1994. Measuring friendship quality during pre- and early adolescence: the development and psychometric properties of the Friendship Qualities Scale. *Journal of Social and Personal Relationships*, 11, 471–484.

Calder, L., Hill, V. and Pellicano, E. 2013. Sometimes I want to play by myself': understanding what friendship means to children with autism in mainstream primary schools. *Autism*, 17, 296–316.

Cannon, L., Kenworthy, L., Alexander, K. C., Werner, M. A. and Anthony, L. 2011. *Unstuck and on target! An executive function curriculum to improve flexibility for children with autism spectrum disorders*, Research Edition. Baltimore, MD: Paul H. Brookes Pub.

Cardoos, S. L. and Hinshaw, S. P. 2011. Friendship as protection from peer victimization for girls with and without ADHD. *Journal of Abnormal Child Psychology*, 39, 1035–1045.

Chang, H., Shelleby, E. C., Cheong, J. and Shaw, D. S. 2012. Cumulative risk, negative emotionality, and emotion regulation as predictors of social competence in transition to school: a mediated moderation model. *Social Development*, 21, 780–800.

Chervonsky, E. and Hunt, C. 2019. Emotion regulation, mental health, and social wellbeing in a young adolescent sample: a concurrent and longitudinal investigation. *Emotion*, 19, 270.

Chiang, H.-L. and Gau, S. S. F. 2016. Comorbid psychiatric conditions as mediators to predict later social adjustment in youths with autism spectrum disorder. *Journal of Child Psychology and Psychiatry*, 57, 103–111.

Christner, R., Forrest, E., Morley, J. and Weinstein, E. 2007. Taking cognitive-behavior therapy to school: a school-based mental health approach. *Journal of Contemporary Psychotherapy*, 37, 175–183.

Conner, C. M., White, S. W., Beck, K. B., Golt, J., Smith, I. C. and Mazefsky, C. A. 2019. Improving emotion regulation ability in autism: the Emotional Awareness and Skills Enhancement (EASE) program. *Autism: The International Journal of Research and Practice*, 23, 1273–1287.

Cook, A., Ogden, J. and Winstone, N. 2018. Friendship motivations, challenges and the role of masking for girls with autism in contrasting school settings. *European Journal of Special Needs Education*, 33, 302–315.

Cotugno, A. J. 2009. Social competence and social skills training and intervention for children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 39, 1268–1277.

Dean, M., Kasari, C., Shih, W., Frankel, F., Whitney, R., Landa, R., Lord, C., Orlich, F., King, B. and Harwood, R. 2014. The peer relationships of girls with ASD at school: comparison to boys and girls with and without ASD. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 55, 1218–1225.

Dollar, J. M. and Stifter, C. A. 2012. Temperamental surgency and emotion regulation as predictors of childhood social competence. *Journal of Experimental Child Psychology*, 112, 178–194.

Duckworth, A. L. and Carlson, S. M. 2013. Self-regulation and school success. In: B. W. Sokol, F. M. E. Grouzet, & U. Müller (Eds.), *Self-regulation and autonomy: social and developmental dimensions of human conduct* (vol. 40, pp. 208–230). New York: Cambridge University Press.

Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D. and Schellinger, K. B. 2011. The impact of enhancing students' social and emotional learning: a meta-analysis of school-based universal interventions. *Child Development*, 82, 405–432.

Foley Nicpon, M., Doobay, A. F. and Assouline, S. G. 2010. Parent, teacher, and self perceptions of psychosocial functioning in intellectually gifted children and adolescents with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 40, 1028–1038.

Frankel, F., Myatt, R., Sugar, C., Whitham, C., Gorospe, C. M. and Laugeson, E. 2010. A randomized controlled study of parent-assisted children's friendship training with children having autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 40, 827–842.

Geurts, H. M., Verté, S., Oosterlaan, J., Roeyers, H. and Sergeant, J. A. 2004. How specific are executive functioning deficits in attention deficit hyperactivity disorder and autism? *Journal of Child Psychology and Psychiatry*, 45, 836–854.

Gilotty, L., Kenworthy, L., Sirian, L., Black, D. O. and Wagner, A. E. 2002. Adaptive skills and executive function in autism spectrum disorders. *Child Neuropsychology: A Journal on Normal and Abnormal Development in Childhood and Adolescence*, 8, 241–248.

Gioia, G. A., Isquith, P. K., Guy, S. C. and Kenworthy, L. 2000. Test review behavior rating inventory of executive function. *Child Neuropsychology*, 6, 235–238.

Gioia, G. A., Isquith, P. K., Retzlaff, P. D. and Espy, K. A. 2002. Confirmatory factor analysis of the behavior rating inventory of executive function (BRIEF) in a clinical sample. *Child Neuropsychology: A Journal on Normal and Abnormal Development in Childhood and Adolescence*, 8, 249–257.

Goldsmith, S. F. and Kelley, E. 2018. Associations between emotion regulation and social impairment in children and adolescents with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 48, 2164–2173.

Gomez, C. R. and Baird, S. 2005. Identifying early indicators for autism in self-regulation difficulties. *Focus on Autism and Other Developmental Disabilities*, 20, 106–116.

Gotham, K., Cassidy, S. and Weiss, J. 2020. Mental health across the lifespan. *Autism*, 24, 805–808.

Gross, J. J. and Muñoz, R. F. 1995. Emotion regulation and mental health. *Clinical Psychology: Science and Practice*, 2, 151–164.

Halberstadt, A. G., Denham, S. A. and Dunsmore, J. C. 2001. Affective social competence. *Social Development*, 10, 79–119.

Hartup, W. W. 1984. The peer context in middle childhood. In W. A. Collins (Ed.), *Development during Middle Childhood: The Years from Six to Twelve*, 240–282. Washington, DC: National Academy Press.

Hartup, W. W. 1992. Peer relations in early and middle childhood. In V.B. Van Hasselt and M. Helson (Eds.), *Handbook of social development* (pp. 257–281). Boston, MA: Springer.

Head, A. M., McGillivray, J. A. and Stokes, M. A. 2014. Gender differences in emotionality and sociability in children with autism spectrum disorders. *Molecular Autism*, 5, 19–19.

Heinrich, L. M. and Gullone, E. 2006. The clinical significance of loneliness: a literature review. *Clinical Psychology Review*, 26, 695–718.

Hiller, R. M., Young, R. L. and Weber, N. 2014. Sex differences in autism spectrum disorder based on DSM-5 criteria: Evidence from clinician and teacher reporting. *Journal of Abnormal Child Psychology*, 42, 1381–1393.

Hosmer, D. W. and Lemeshow, S. 2000. *Applied logistic regression*, 2nd ed. Chap. 4, *Model-building strategies*. New York: John Wiley & Sons Inc.

Howes, C. 2009. Friendship in early childhood. In W. M. Bukowski, B. Laursen, & K. Rubin (Eds.), *Handbook of peer interactions, relationships, and groups* (pp. 180–194). New York, NY: The Guilford Press.

Hwang, Y.-S., Kearney, P., Klieve, H., Lang, W. and Roberts, J. 2015. Cultivating mind: Mindfulness interventions for children with autism spectrum disorder and problem behaviours, and their mothers. *Journal of Child and Family Studies*, 24, 3093–3106.

Jackson, S. L. J., Hart, L., Brown, J. T. and Volkmar, F. R. 2018. Brief report: self-reported academic, social, and mental health experiences of post-secondary students with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 48, 643–650.

Jahromi, L. B. 2017. Self-regulation in young children with autism spectrum disorder: An interdisciplinary perspective on emotion regulation, executive function, and effortful control. *International review of research in developmental disabilities*, 53, 45–89.

Jahromi, L. B., Bryce, C. I. and Swanson, J. 2013. The importance of self-regulation for the school and peer engagement of children with high-functioning autism. *Research in Autism Spectrum Disorders*, 7, 235–246.

Jahromi, L. B., Meek, S. E. and Ober-Reynolds, S. 2012. Emotion regulation in the context of frustration in children with high functioning autism and their typical peers. *Journal of Child Psychology and Psychiatry*, 53, 1250–1258.

Kasari, C., Dean, M., Kretzmann, M., Shih, W., Orlich, F., Whitney, R., Landa, R., Lord, C. and King, B. 2016. Children with autism spectrum disorder and social skills groups at school: A randomized trial comparing intervention approach and peer composition. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 57, 171–179.

Kayne, J. 2013. *Effects of peer mediated pivotal response training on social skills for children with autism*. Master's theses. California State University.

Keefer, A., White, S. W., Vasa, R. A. and Reaven, J. 2018. Psychosocial interventions for internalizing disorders in youth and adults with ASD. *International Review of Psychiatry*, 30, 62–77.
Kenworthy, L. E., Black, D. O., Wallace, G. L., Ahluvalia, T., Wagner, A. E. and Sirian, L. M. 2005. Disorganization: The forgotten executive dysfunction in high-functioning autism (HFA) spectrum disorders. *Developmental Neuropsychology*, 28, 809–827.
Kerns, C. M., Kendall, P. C., Berry, L., Souders, M. C., Franklin, M. E., Schultz, R. T., Miller, J. and Herrington, J. 2014. Traditional and atypical presentations of anxiety in youth with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 44, 2851–2861.
Kitayama, S. and Markus, H. R. 2000. The pursuit of happiness and the realization of sympathy: Cultural patterns of self, social relations, and well-being. *Culture and Subjective Well-Being*, 1, 113–161.
Konstantareas, M. M. and Stewart, K. 2006. Affect regulation and temperament in children with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 36, 143–154.
Kopp, C. B. 1982. Antecedents of self-regulation: a developmental perspective. *Developmental Psychology*, 18, 199–214.
Kreiser, N. L. and White, S. W. 2014. ASD in females: are we overstating the gender difference in diagnosis? *Clinical Child and Family Psychology Review*, 17, 67–84.
Ladd, G. W. 1988. Friendship patterns and peer status during early and middle childhood. *Journal of Developmental and Behavioral Pediatrics*, 9, 229–238.
Ladd, G. W. 1999. Peer relationships and social competence during early and middle childhood. *Annual Review of Psychology*, 50, 333–359.
Lake, J. K., Tablon Modica, P., Chan, V., and Weiss, J. A. 2020. Considering efficacy and effectiveness trials of cognitive behavioral therapy among youth with autism: A systematic review. *Autism*, 24, 1590–1606.
Lee, G. T., Xu, S., Feng, H., Lee, G. K., Jin, S., Li, D. and Zhu, S. 2019. An emotional skills intervention for elementary children with autism in China: a pilot study. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, 37, 113–132.
Leflot, G., van Lier, P. A., Verschueren, K., Onghena, P. and Colpin, H. 2011. Transactional associations among teacher support, peer social preference, and child externalizing behavior: A four-wave longitudinal study. *Journal of Clinical Child & Adolescent Psychology*, 40, 87–99.
Lieb, R. W. and Bohnert, A. M. 2017. Relations between executive functions, social impairment, and friendship quality on adjustment among high functioning youth with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 47, 2861–2872.
Lord, C., Risi, S., Lambrecht, L., Cook, E. H., Leventhal, B. L., DiLavore, P. C., Pickles, A. and Rutter, M. 2000. The autism diagnostic observation schedule—generic: a standard measure of social and communication deficits associated with the spectrum of autism. *Journal of Autism and Developmental Disorders*, 30, 205–223.
Lord, C., Rutter, M., DiLavore, P. C. and Risi, S. 1999. *Autism diagnostic observation schedule-WPS (ADOS-WPS)*. Los Angeles, CA*:* Western Psychological Services.
Loveland, K. A. 2005. Social-emotional impairment and self-regulation in autism spectrum disorders. In J. Nadal & D. W. Muir (Eds.), *Emotional development.* (pp. 365–382). UK: Oxford University Press.
Manfro, A. G., Pan, P. M., Gadelha, A., Fleck, M., do Rosário, M. C., Cogo-Moreira, H., Affonseca-Bressan, R., Mari, J., Miguel, E. C., Rohde, L. A. and Salum, G. A. 2017. Psychopathology and friendship in children and adolescents: disentangling the role of co-occurring symptom domains with serial mediation models. *European Child & Adolescent Psychiatry*, 26, 1377–1386.
Mazefsky, C. A., Herrington, J., Siegel, M., Scarpa, A., Maddox, B. B., Scahill, L., and White, S. W. 2013. The role of emotion regulation in autism spectrum disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*, 52, 679–688.
Mazefsky, C. A., and White, S. W. 2014. Emotion regulation: Concepts & practice in autism spectrum disorder. *Child and Adolescent Psychiatric Clinics of North America*, 23, 15–24.
Mazurek, M. O. 2014. Loneliness, friendship, and well-being in adults with autism spectrum disorders. *Autism*, 18, 223–232.
Mischel, W., Ayduk, O., Berman, M. G., Casey, B. J., Gotlib, I. H., Jonides, J., Kross, E., Teslovich, T., Wilson, N. L., Zayas, V. and Shoda, Y. 2010. Willpower'over the life span: Decomposing self-regulation. *Social Cognitive and Affective Neuroscience*, 6, 252–256..
Morris, A. S., Silk, J. S., Morris, M. D., Steinberg, L., Aucoin, K. J. and Keyes, A. W. 2011. The influence of mother–child emotion regulation strategies on children's expression of anger and sadness. *Developmental Psychology*, 47, 213–225.
Mundt, M. P. and Zakletskaia, L. I. 2014. That's what friends are for: Adolescent peer social status, health-related quality of life and healthcare costs. *Applied Health Economics and Health Policy*, 12, 191–201.
Nuske, H. J., Hedley, D., Woollacott, A., Thomson, P., Macari, S. and Dissanayake, C. 2017. Developmental delays in emotion regulation strategies in preschoolers with autism. *Autism Research*, 10, 1808–1822.
Nuske, H. J., Pellecchia, M., Kane, C., Seidman, M., Maddox, B. B., Freeman, L. M., Rump, K., Reisinger, E. M., Xie, M. and Mandell, D. S. 2020. Self-regulation is bi-directionally associated with cognitive development in children with autism. *Journal of Applied Developmental Psychology*, 68, 101139.
O'Driscoll, C., Heary, C., Hennessy, E. and McKeague, L. 2015. Adolescents' beliefs about the fairness of exclusion of peers with mental health problems. *Journal of Adolescence*, 42, 59–67.
Patalay, P. and Fitzsimons, E. 2018. Development and predictors of mental ill-health and wellbeing from childhood to adolescence. *Social Psychiatry and Psychiatric Epidemiology*, 53, 1311–1323.
Perihan, C., Burke, M., Bowman-Perrott, L., Bicer, A., Gallup, J., Thompson, J. and Sallese, M. 2020. Effects of cognitive behavioral therapy for reducing anxiety in children with high functioning ASD: A systematic review and meta-analysis. *Journal of Autism and Developmental Disorders*, 50, 1958–1972.
Phan, M., Caramanico, J., Atkinson-Diaz, Z., Greeson, J., MacKenzie, E., Mandell, D. S. and Nuske, H. J. Under review. *A systematic review on school-based mindfulness-based interventions*.
Pierce, K. and Schreibman, L. 1995. Increasing complex social behaviors in children with autism: Effects of peer-implemented pivotal response training. *Journal of Applied Behavior Analysis*, 28, 285–295.
Ponitz, C. C., McClelland, M. M., Matthews, J. S. and Morrison, F. J. 2009. A structured observation of behavioral self-regulation and its contribution to kindergarten outcomes. *Developmental Psychology*, 45, 605–619.
Pouw, L. B. C., Rieffe, C., Stockmann, L. and Gadow, K. D. 2013. The link between emotion regulation, social functioning, and depression in boys with ASD. *Research in Autism Spectrum Disorders*, 7, 549–556.
Prizant, B. M., Wetherby, A. M., Rubin, E., Laurent, A. C. and Rydell, P. J. 2006. *The SCERTS model: A comprehensive educational approach for children with autism spectrum disorders*. Vol. 1. Baltimore, MD: Paul H Brookes Publishing.
Qualter, P., Brown, S. L., Munn, P. and Rotenberg, K. J. 2010. Childhood loneliness as a predictor of adolescent depressive symptoms: an 8-year longitudinal study. *European Child & Adolescent Psychiatry*, 19, 493–501.
Qualter, P., Brown, S. L., Rotenberg, K. J., Vanhalst, J., Harris, R. A., Goossens, L., Bangee, M. and Munn, P. 2013. Trajectories of loneliness during childhood and adolescence: predictors and health outcomes. *Journal of Adolescence*, 36, 1283–1293.
Reyes, N. M., Pickard, K., and and Reaven, J. 2019. Emotion regulation: A treatment target for autism spectrum disorder. *Bulletin of the Menninger Clinic*, 83, 205–234.
Reynolds, C. R. and Kamphaus, R. W. 2004. *BASC-2: Behavior assessment system for children*. 2nd ed. Circle Pines, MN: AGS Publishing.
Ridderinkhof, A., de Bruin, E. I., Blom, R. and Bögels, S. M. 2018. Mindfulness-based program for children with autism spectrum disorder and their parents: Direct and long-term improvements. *Mindfulness*, 9, 773–791.
Rieffe, C., Oosterveld, P., Terwogt, M. M., Mootz, S., Van Leeuwen, E. and Stockmann, L. 2011. Emotion regulation and internalizing symptoms in children with autism spectrum disorders. *Autism*, 15, 655–670.
Rispoli, K., Malcolm, A., Nathanson, E. and Mathes, N. 2019. Feasibility of an emotion regulation intervention for young children with autism spectrum disorder: a brief report. *Research in Autism Spectrum Disorders*, 67, 101420.
Robson, D. A., Allen, M. S. and Howard, S. J. 2020. Self-regulation in childhood as a predictor of future outcomes: a meta-analytic review. *Psychological Bulletin*, 146, 324–354.

Roid, G. H. 2003. *Stanford-Binet intelligence scales*. Riverside Publishing Itasca, IL.

Rosenthal, M., Wallace, G. L., Lawson, R., Wills, M. C., Dixon, E., Yerys, B. E., and and Kenworthy, L. 2013. Impairments in real-world executive function increase from childhood to adolescence in autism spectrum disorders. *Neuropsychology*, 27, 13–18.

Rutter, M., Bailey, A. and Lord, C. 2003. *The social communication questionnaire: Manual*. Los Angeles, CA: Western Psychological Services.

Sedgewick, F., Hill, V., and and Pellicano, E. 2019. It's different for girls': Gender differences in the friendships and conflict of autistic and neurotypical adolescents. *Autism*, 23, 1119–1132.

Sedgewick, F., Hill, V., Yates, R., Pickering, L., and and Pellicano, E. 2016. Gender differences in the social motivation and friendship experiences of autistic and non-autistic adolescents. *Journal of Autism and Developmental Disorders*, 46, 1297–1306.

Silke, C., Swords, L. and Heary, C. 2016. The development of an empirical model of mental health stigma in adolescents. *Psychiatry Research*, 242, 262–270.

Singh, S. and Sharma, N. R. 2018. Self-regulation as a correlate of psychological well-being. *Indian Journal of Health and Wellbeing*, 9, 441–444.

Spinrad, T. L., Eisenberg, N., Cumberland, A., Fabes, R. A., Valiente, C., Shepard, S. A., Reiser, M., Losoya, S. H. and Guthrie, I. K. 2006. Relation of emotion-related regulation to children's social competence: a longitudinal study. *Emotion*, 6, 498–510.

Spritz, B. L., Sandberg, E. H., Maher, E. and Zajdel, R. T. 2010. Models of emotion skills and social competence in the Head Start classroom. *Early Education & Development*, 21, 495–516.

Stifter, C. A. and Braungart, J. M. 1995. The regulation of negative reactivity in infancy: function and development. *Developmental Psychology*, 31, 448–455.

Sullivan, H. S. 2013. *The interpersonal theory of psychiatry*. New York, NY: Routledge.

Taylor, R. D., Oberle, E., Durlak, J. A. and Weissberg, R. P. 2017. Promoting positive youth development through school-based social and emotional learning interventions: a meta-analysis of follow-up effects. *Child Development*, 88, 1156–1171.

Thomson, K., Burnham Riosa, P., and and Weiss, J. A. 2015. Brief report of preliminary outcomes of an emotion regulation intervention for children with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 45, 3487–3495.

Totsika, V., Hastings, R. P., Emerson, E., Lancaster, G. A. and Berridge, D. M. 2011. A population-based investigation of behavioural and emotional problems and maternal mental health: associations with autism spectrum disorder and intellectual disability. *Journal of Child Psychology and Psychiatry*, 52, 91–99.

Trentacosta, C. J. and Izard, C. E. 2007. Kindergarten children's emotion competence as a predictor of their academic competence in first grade. *Emotion*, 7, 77–88.

van Genugten, L., Dusseldorp, E., Massey, E. K. and van Empelen, P. 2017. Effective self-regulation change techniques to promote mental wellbeing among adolescents: a meta-analysis. *Health Psychology Review*, 11, 53–71.

Villavicencio, F. T. and Bernardo, A. B. 2013. Positive academic emotions moderate the relationship between self-regulation and academic achievement. *British Journal of Educational Psychology*, 83, 329–340.

Wallentin, M. 2009. Putative sex differences in verbal abilities and language cortex: a critical review. *Brain and Language*, 108, 175–183.

Weiss, J. A. 2014. Transdiagnostic case conceptualization of emotional problems in youth with ASD: an emotion regulation approach. *Clinical Psychology: Science and Practice*, 21, 331–350.

Whitehouse, A. J. O., Durkin, K., Jaquet, E. and Ziatas, K. 2009. Friendship, loneliness and depression in adolescents with Asperger's syndrome. *Journal of Adolescence*, 32, 309–322.

Wood, J. 2006. Effect of anxiety reduction on children's school performance and social adjustment. *Developmental Psychology*, 42, 345–349.

Woods, S., Done, J. and Kalsi, H. 2009. Peer victimisation and internalising difficulties: The moderating role of friendship quality. *Journal of Adolescence*, 32, 293–308.