



Emotion Regulation Strategies in Preschoolers with Autism: Associations with Parent Quality of Life and Family Functioning

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Abstract

Children with autism experience challenges with emotion regulation. It is unclear how children's management of their emotions is associated with their family's quality of life. Forty-three preschoolers with autism and 28 typically developing preschoolers were coded on emotion regulation strategies used during low-level stress tasks. Parents reported on their quality of life and family functioning, and their child's internalizing and externalizing behaviors. More externalizing behaviors across groups and use of two emotion regulation strategies (self-soothing, deep exhalation) in the autism group predicted lower family quality of life. Findings suggest that children's emotional outbursts and reduced use of passive comforting strategies are linked to lower family quality of life.

Keywords Emotion regulation strategies · Parent quality of life · Family functioning · Externalizing behaviors · Comforting strategies

Introduction

One major source of disruption and stress for parents is caring for a child who experiences difficulty regulating their emotions. Many studies have shown that these difficulties directly impact parent stress and, for parents of children with a disability, their child's difficulties with emotion regulation adds additional stress over and above that associated with the disability (Baker et al. 2002; Davis and Carter 2008; Nachshen et al. 2005). Children with autism spectrum disorder (ASD) frequently have emotional regulation difficulties

(Berkovits et al. 2017; Mazefsky et al. 2013; Nuske et al. 2017a; Samson et al. 2014), which are associated with internalizing symptoms, such as anxiety and depression (Berthoz and Hill 2005; Rieffe et al. 2011, 2014), and externalizing behaviours, such as aggression and hyperactivity (Ashburner et al. 2010; Bauminger et al. 2010). Unsurprisingly, such problem behaviors have been found to predict stress in parents of children with ASD (Allik et al. 2006; Bromley et al. 2004; Davis and Carter 2008; Gulsrud et al. 2010; Hastings 2003; Kuhlthau et al. 2010; Lecavalier et al. 2006; McStay et al. 2014; Suzumura 2015; Tomanik et al. 2004), suggesting a possible role of emotion dysregulation in parent quality of life and family functioning.

Family quality of life is a multidimensional construct, involving a variety of physical, social and emotional dimensions (Frey et al. 1989; Predescu and Sipos 2017). Children's competencies, such as communication skills, can affect parent stress and access to family social supports. This may in turn affect outcomes such as parent quality of life, i.e. their personal physical, emotional, social and cognitive functioning, which may be seen as a proximal outcome, and family functioning, i.e., the family's engagement in daily activities and the family relationships, which may be seen as a distal outcome (Armstrong et al. 2005). As indicated in two recent reviews and a meta-analysis, parents of children with ASD were found to experience more stress and mental

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health issues than parents of children with other disabilities (e.g., Down syndrome, cerebral palsy, intellectual disability) or typically developing children (Hayes and Watson 2013; Karst and Van Hecke 2012; McStay et al. 2015). Many parents of children with ASD report having no time for themselves, engage in few social activities and lack friends, as well as the negative impacts on their marriage and on the siblings without ASD (Howell et al. 2015; Sikora et al. 2013). Some parents experience significant problems completing everyday activities (e.g., grocery shopping), and have depleted energy and feelings of isolation due to frequent behavioral issues in their child with ASD, like tantrums (Kuhlthau et al. 2010).

Given the possible association of poor emotion regulation in children with ASD with parental quality of life and family functioning, a fine-grained decomposition of the impact of children's emotion regulation on parent quality of life and family functioning, compared to children with typical development, is warranted. In typical development, emotion regulation strategies progress through a number of key developmental phases from passive to active, marking a shift from a reflex-driven child to one that is purposeful and a reflective driver of behavior (Calkins and Hill 2007). Infants use basic self-soothing strategies (e.g., non-nutritive sucking, body rubbing) and gaze aversion to modify their emotional arousal (Gianino and Tronick 1988; Stifter and Braungart 1995; Zimmer-Gembeck and Skinner 2011). As their cognitive and language capacities develop, so too do their emotion regulation strategies (Cole et al. 1994; Kopp 1982; Mischel and Patterson 1978; Vygotskii 1962). During the preschooler period more active strategies start to emerge (Thompson and Goodman 2010; Zimmer-Gembeck and Skinner 2011). Typical preschoolers use multiple strategies that may be classified as: co-regulated via others/other-directed (e.g., social negotiation, hugs) versus self-directed (e.g., self-talk, self-soothing, deep exhalation); and passive (e.g., gaze aversion, task disengagement) versus active (e.g., leaving one task for another; Buss and Goldsmith 1998; Grolnick et al. 1996; Kopp 1989). There is also a shift between regulating through caregivers to regulating through other adults, such as teachers or even unfamiliar adults (Zimmer-Gembeck and Skinner 2011). Therefore the trajectory of emotion regulation strategy development in typical children is shaped by parallel developments in autonomy and growing awareness of one's agency. Emotion regulation skills are critical throughout the lifespan as they promote school success (Graziano et al. 2007; Gumora and Arsenio 2002; Howse et al. 2003), and are protective against later problem behavior and mental health problems (Eisenberg et al. 2000, 2001; Graziano et al. 2007; Hill et al. 2006; Rubin et al. 1995; Silk et al. 2003). Such skills even predict physical and mental health in adulthood (Mischel et al. 2010).

Children with ASD have been found to present with more maladaptive (Jahromi et al. 2012; Konstantareas and Stewart 2006; Mazefsky et al. 2014b) or delayed (Nuske et al. 2017a) emotion regulation strategies, including less active communicative and more passive soothing-type strategies (Nuske et al. 2017a; Zantinge et al. 2017). Specific child emotion regulation strategies have been linked to internalizing and externalizing symptoms in children with ASD, such as use of self-stimulation (Nuske et al. 2017a), worry/rumination (Rieffe et al. 2014), and shutting down (e.g., emotional numbing and being unable to think or act; Mazefsky et al. 2014b). In typically developing children, use of more passive comforting emotion regulation strategies that help them manage, but do not actively change the situation (e.g., self-soothing, physical comfort seeking, avoidance) have been associated with more negative behavioral and social child outcomes (Eisenberg et al. 1994, 1996; Martini and Busseri 2010; Supplee et al. 2009). Similarly, in children with ASD, lower child quality of life has been linked to more frequent use of passive strategies (Nuske et al. 2017a). Furthermore, parents' own use of emotion regulation strategies with their child has been found to be related to parent wellbeing, with one study finding less use of vocal comforting strategies (e.g., vocal soothing) was related to higher parent stress (Gulsrud et al. 2010). However, no study has yet started to unpack which specific child-initiated strategies might be associated with quality of life in parents and family functioning as a whole, and whether differences between children with ASD and children with typical development in use of such strategies affect these family outcomes.

Current Study

In the current study, we aimed to explore how specific child emotion regulation strategies were related to parent quality of life and family functioning, above and beyond factors that are known to play a role, including an ASD diagnosis, developmental delays and problem behaviors.

Methods

Participants

Forty-three children with ASD (age range 24–59 months) and 28 age- and gender-matched TD children (age range 24–61 months) were recruited as a part of a larger study on emotion regulation (see Nuske et al. 2017a). Exclusion criteria for the TD group was having a sibling with ASD or clinical levels of ASD symptoms as detected by the Social Communication Questionnaire (Rutter et al. 2003). Inclusion criteria for both groups of children were that they were aged between 2 and 5 years. ASD diagnoses were confirmed

Table 1 Participant characteristics

Variable	ASD group (<i>n</i> = 43) <i>M</i> (<i>SD</i>)/frequency (%)	TD group (<i>n</i> = 28) <i>M</i> (<i>SD</i>)/frequency (%)	Comparison statistics
Age (months)	40.89 (8.96)	41.79 (10.70)	<i>t</i> (71) = 0.39
Gender: males	32 (76%)	22 (73%)	$\chi^2(1,73) = 0.09$
MSEL standard score ^a	77.27 (25.78)	110.21 (16.59)	<i>t</i> (69.98) = 6.60*
ADOS CS ^b	6.95 (2.59)	–	–
SCQ ^c	15.46 (6.11)	5.59 (2.72)	<i>t</i> (58.95) = -9.15*
BASC ^d			
Internalizing	54.09 (14.64)	49.46 (11.40)	<i>t</i> (70) = 1.42
Externalizing	55.77 (8.54)	49.07 (7.93)	<i>t</i> (70) = -3.34*
PedsQL family impact module ^e			
Parent quality of life	52.60 (20.50)	80.98 (14.56)	<i>t</i> (70) = 6.43*
Family functioning score	52.69 (22.18)	80.06 (15.61)	<i>t</i> (70) = 5.75*

^aMullen Scales of Early Learning Early Learning Composite Standard Score

^bAutism Diagnostic Observation Schedule Comparison Score

^cSocial Communication Questionnaire

^dBehavior Assessment System for Children

^ePediatric Quality of life Scale, Family Impact Module

**p* ≤ 0.001 (no other group differences found)

with the Autism Diagnostic Observation Schedule, second edition (ADOS-2; Lord et al. 2012). ADOS-2 calibrated Comparison Scores (CS) are provided (see Table 1) on a 10-point scale with scores anchored to ADOS-2 classifications, based on the raw overall scores, module used, and age of the child. Severity scores are provided by the publisher for Modules 1–3 (Lord et al. 2012). For the present study, CS for the toddler module were based on algorithms provided by Esler et al. (2015; see also Hedley et al. 2016). Additionally, parents of all children completed the Social Communication Questionnaire (Rutter et al. 2003), to screen for ASD symptoms in the TD group (all were under the recommended cut-off for preschoolers; Allen et al. 2007). Developmental ability was assessed using the Mullen Scales of Early Learning (Mullen 1995). See Table 1 for full participant characteristics and group comparison statistics.

Measures

Tasks and Emotion Regulation Strategy Coding

Full task and emotion regulation strategy coding description is available in Nuske et al. (2017a). Eight tasks, designed to mimic everyday life experiences in which children need to regulate low-level stress, were taken from the locomotor and preschool versions of the Laboratory Temperament Assessment Battery (Lab-TAB; Goldsmith et al. 1993; Goldsmith and Rothbart 1999). Each task includes a stressor: a toy/toys or snack that cannot be accessed or is missing (Attractive toy in a transparent box, Box empty, Dinky toys,

Snack delay), a strange person or toy interacting with them (Stranger approach, Unpredictable mechanical toys) or a being presented with a dull video or task (Fidgeting video and Block sorting). Convergent validity of the negative emotion elicitation of Lab-TAB tasks has been found to be moderate to strong when compared to child observer ratings ($r = 0.25–0.76$, Gagne et al. 2011; $r = 0.27–0.41$; Durbin and Wilson 2012).

The emotion regulation codes were based on those provided in the Lab-TAB Locomotor version and on the literature on emotion regulation strategies in toddlers and preschoolers (Buss and Goldsmith 1998; Cole et al. 1994; Grolnick et al. 1996; Kopp 1989). Coders, blind to diagnostic group and study hypotheses, coded the emotion regulation strategies following group training on the codes and achieving inter-rater reliability (IRR) of 80% or higher on three consecutive training videos with the lead coder. The lead coder also double-coded a minimum of 20% of each coder's videos (IRR $M = 80.57\%$, $SD = 5.05\%$, range 70.51–89.10%) to check ongoing reliability maintenance. Emotion regulation strategies were coded on presence or absence per task, for a total of eight tasks (therefore range per child was from 0 to 8 on each strategy). Ambiguous child behaviors were discussed in order to reach a consensus.

Eleven emotion regulation strategies were included in the analyses: (1) communicative, with unfamiliar people, (2) communicative, with familiar people, (3) communicative, directed to the self (i.e., self-talk), (4) comforting, sought from others (e.g., hug from mother), (5) comforting, use of own breath (i.e., deep exhalation), (6) comforting,

soothing behaviors directed to self (i.e., self-soothing, to lower arousal), (7) comforting, stimulatory behaviors directed to self (i.e., self-stimulation, to maintain or increase arousal), (8) task approach, (9) perceptual disengagement (e.g., gaze aversion), (10) avoidance (i.e., task disengagement), and (11) behavioral distraction (i.e., engagement in new activity). See Table 2 for a description and example behaviors for each emotion regulation strategy, and frequency of use per strategy, per group.

Questionnaires

Internalizing and Externalizing Symptoms

The Behavior Assessment System for Children, 2nd edition (BASC; Reynolds and Kamphaus 2004) was completed by the primary caregiver to measure children's internalizing and externalizing symptoms. The internalizing scale is made up of three subscales: depression, anxiety and somatization. The externalizing scale is made up of two subscales: aggression and hyperactivity. The BASC is scored on behavior frequency using a 4-point scale (Never-Always), with higher scores indicating more difficulties. A *T* score ($M = 50$, $SD = 10$) per subscale of 60–69 is considered in the At-Risk range, while 70 or above is considered in the Clinically Significant range.

Parent Quality of Life and Family Functioning

The following scales of the Pediatric Quality of Life Family Impact Module were completed by parents: the Health-Related Parent Quality of Life scale ($\alpha = 0.96$), and the Family Functioning Scale ($\alpha = 0.90$) (Varni et al. 2004). The PedsQL—Family Impact Module is a widely used measure of quality of life in parents of children with clinical symptoms (Varni et al. 2005). A Parent Quality of Life summary score (20 items) is computed as the sum of the items divided by the number of items answered in the Physical (e.g., I feel tired when I wake up in the morning), Emotional (e.g., I feel sad), Social (e.g., I feel isolated from others) and Cognitive Functioning (e.g., It is hard for me to remember what I just heard) scales.

The Family Functioning Summary Score (8 items) is made up of the items answered in the Daily Activities (e.g., Difficulty finding time to finish household tasks) and Family Relationships (e.g., Conflicts between family members) scales. The item stem was modified to be relevant to the given research question, so that instead of “In the past 1 month, as a result of your child's health, how much of a problem have you had with...” we used “In the past 1 month, as a result of your child's emotion regulation ability, how much of a problem have you had with...”, after defining emotion regulation ability as: “ability in managing their emotions or stress”. Each

item is scored on a 5-point scale, ranging from 0 = never a problem to 4 = almost always a problem. Items are reversed scored and linearly transformed to a 0–100 scale as follows: 0 = 100, 1 = 75, 2 = 50, 3 = 25, 4 = 0. Higher scores indicate higher parent quality of life and family functioning.

Procedures

This study was approved by the La Trobe University Human Ethics Committee. Upon arrival for the testing session, parents were shown a picture book detailing each of the tasks the child would be involved with by the first experimenter, whilst their child engaged in 5–10 min of warm-up play with the second experimenter. Informed consent from provided by parents before entering the testing room. Parents were seated and provided with a laptop to complete the study questionnaires during the session. They were instructed respond normally if their child approached them. A parent was present in the room throughout the testing session. Tasks were administered in a fixed sequence to maintain any carryover emotion effects between the tasks.

Data Analysis

Variables were then analyzed for skewness, kurtosis and outliers using the method outlined in Tabachnick and Fidell (1996), with a critical value set at ± 3.29 . As all variables of interest were normally distributed, parametric analyses were conducted. Univariate (unadjusted) associations with the two dependent variables, parent quality of life and family functioning, determined the variables that were entered into the adjusted regression models; those that had a loading of $p = 0.20$ or less (Hosmer and Lemeshow 2000) were included (see Table 3). Zero-order correlations for both groups amongst all variables are also reported in the supplementary material. Two hierarchical (adjusted) multiple regression models were used, one on parent quality of life and one on family functioning, to understand the association between emotion regulation strategies and the family outcomes, after controlling for developmental ability, an ASD diagnosis and problem behaviors. In each, developmental ability was entered in the first step, followed by group (ASD, TD) in the second step, internalizing and externalizing behaviors in the third step and emotion regulation strategies in the fourth step.

Results

Group Differences

As shown in Table 1, children with ASD had significantly higher levels of externalizing but not internalizing behaviors,

Table 2 Emotion regulation strategy codes: Description, examples and mean (SD) frequency across tasks

#	Code	Short description ^a	Example	ASD: M(SD) ^b	TD: M(SD) ^b	<i>t</i>
Other-directed						
1	Physical comfort seeking (parent)	Comforting. Physical comfort from parent involving bodily touch	Leaning in for a hug, moving into parent's lap	2.48 (1.78)	1.69 (1.65)	-1.90 [#]
2	Social-familiar	Communicative. Verbal or non-verbal behaviours (eye-contact, facial expressions, gestures) directed to parent or sibling	Smiling at or talking to parent	3.18 (1.70)	3.52 (2.31)	0.71
3	Social-unfamiliar	Communicative. Verbal or non-verbal behaviours (eye-contact, facial expressions, gestures) directed to experimenter or 'Stranger'	Smiling at or talking to experimenter	1.98 (1.65)	3.86 (1.57)	4.86 ^{***}
Self-directed (passive)						
4	Self soothing	Comforting. Any bodily motions providing oral and/or tactile input that seemingly calm or lower arousal	Sucking thumb, rubbing arm, stroking table	2.77 (1.98)	2.72 (2.02)	-0.10
5	Self stimulatory	Comforting. Repetitive or jerky bodily movements that seemingly provide stimulation or maintain arousal	Hand flapping, body rocking, tapping table	2.07 (1.61)	2.38 (1.18)	0.90
6	Deep exhalation	Comforting. Deep audible breath out	Breathing out audibly	0.77 (1.75)	0.66 (1.49)	-0.30
7	Self-directed vocalization	Communicative. Verbal behaviours directed to self	Singing, talking, counting	2.16 (2.12)	1.93 (1.89)	-0.47
Approach-avoidance (avoidance listed in order from passive to active)						
8	Approach (task engagement)	Approach or engagement in task by reaching for, walking toward or leaning toward toy or stimulus	Engaging in and moving closer to task	5.16 (2.42)	6.07 (2.84)	1.47
9	Perceptual disengagement	Full disengagement of attention to task without attention shifting to a toy, object or person, or moving away from task (not quick glances away)	Gazing away from task	3.05 (2.58)	2.93 (2.02)	-0.20
10	Task disengagement (avoidance)	Disengagement from task by physically moving away	Walking away from task	4.59 (1.90)	3.00 (1.67)	-3.68 ^{***}
11	Behavioural distraction	Shifting focus of attention away from stress-related stimulus to engagement with another toy/object or another part of same toy/object (not to another person or self-soothing/stimulation)	Playing with a different toy or object	4.48 (1.85)	4.24 (1.77)	-0.54

Reprinted from Nuske et al. (2017a)

^aCodes only apply during presentation of stress-related stimulus

^bAs emotion regulation strategy codes were coded by absence (0) or presence (1) per task and there were eight tasks, the total number per strategy is eight

[#]p < 0.10, *p < 0.05, **p < 0.01, ***p < 0.001 (independent samples t-tests, uncorrected)

Table 3 Univariate loadings of predictors on dependent variables (unadjusted models)

	Parent quality of life		Family functioning	
	β	<i>p</i>	β	<i>p</i>
Developmental ability ^a	0.46	<0.001***	0.42	<0.001***
Group (0=TD,1=ASD)	-0.60	<0.001***	-0.56	<0.001***
Problem behaviors				
Internalizing symptoms ^b	-0.22	0.07	-0.20	0.10
Externalizing symptoms ^c	-0.47	<0.001***	-0.48	<0.001***
Emotion regulation strategies ^d				
Communicative: unfamiliar people	0.33	0.006**	0.23	0.05*
Communicative: familiar people	0.11	0.35	0.11	0.37
Communicative: self-directed	0.04	0.73	0.01	0.94
Comforting: physical soothing from others	-0.28	0.02*	-0.24	0.05*
Comforting: deep exhalation	-0.30	0.10 [#]	-0.28	0.02*
Comforting: physical self-soothing	-0.17	0.16 [#]	-0.14	0.16 [#]
Comforting: self-stimulation	-0.16	0.18 [#]	0.02	0.89
Task approach	0.17	0.17 [#]	0.17	0.17 [#]
Perceptual disengagement	-0.11	0.36	-0.10	0.43
Avoidance	-0.33	0.006**	-0.26	0.03*
Behavioral distraction	-0.14	0.25	-0.05	0.66

Variables with a loading of $p \leq 0.20$ were entered into the adjusted regression models (Hosmer and Lemeshow 2000), see Table 3

^aMullen Scales of Early Learning Early Learning Composite Standard Score

^bBehavior Assessment System for Children (2nd Ed.), Clinical Scale Internalizing Symptoms Composite T Score

^cBehavior Assessment System for Children (2nd Ed.), Clinical Scale Externalizing Symptoms Composite T Score

^dCoded emotion regulation strategies

[#] $p \leq 0.20$, ^{##} $p \leq 0.10$, * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

compared to TD children. Parents of children with ASD had significantly lower quality of life and family functioning scores compared to those of TD children.

Associations with Parent Quality of Life and Family Functioning

Univariate associations with the two dependent variables, parent quality of life and family functioning, which determined hierarchical multiple regression model entry (as above; Hosmer and Lemeshow 2000), are shown in Table 3. Results for the two regression models (for parent quality of life and family functioning) are presented in Table 4. For both models, each step significantly¹ contributed to the total variance explained in the regression model, with lower developmental level, an ASD (vs. TD) diagnosis, higher externalizing behaviors and more frequent use of two emotion regulation strategies (self-soothing and deep

exhalation, both passive comforting strategies) significantly associated with lower parent quality of life and lower family functioning. Results show that above and beyond presence of an ASD diagnosis, developmental level and problem behaviors, emotion regulation strategies contributed similar variance to explaining parent quality of life (14%), compared to that of an ASD diagnosis (16%) and problem behaviors (10%), though under that explained by developmental level alone (22%).

For explaining family functioning, emotion regulation strategies contributed similar variance to problem behaviors (9 and 11%, respectively), but less than an ASD diagnosis or developmental level alone (15 and 17%, respectively). Based on the significant effects of group, models were run separately for each group (see Tables 5, 6 for hierarchical multiple regression models for ASD and TD groups respectively). These show that the pattern of results in the ASD group were partially held in the TD group, where higher externalizing symptoms but no emotion regulation strategies predicted lower parent quality of life and family functioning.

¹ For the family functioning regression model, the last step, emotion regulation strategies, was marginally significant ($p = 0.08$).

Table 4 Effect of child characteristics, problem behaviors and emotion regulation strategies on parent quality of life and family functioning (adjusted models)

	Parent quality of life			Family functioning			Change		
	Adjusted model			Adjusted model			Adjusted model		
	R ²	p	β	R ²	p	β	R ²	p	β
Step 1	0.22	<0.001***		0.22	<0.001***		0.17	<0.001***	
Developmental ability ^a			0.46			0.42			<0.001***
Step 2	0.38	<0.001***		0.16	<0.001***		0.32	<0.001***	
Developmental ability ^a			0.18			0.15			0.24
Group (0 = TD, 1 = ASD)			-0.50			-0.47			<0.001***
Step 3	0.48	<0.001***		0.10	0.004**		0.44	<0.001***	
Developmental ability ^a			0.28			0.24			0.05*
Group (0 = TD, 1 = ASD)			-0.32			-0.28			0.03*
Problem behaviors			-0.06			-0.02			0.87
Internalizing symptoms ^b			-0.31			-0.36			0.002
Externalizing symptoms ^c									
Step 4	0.62	<0.001***		0.14	0.008**		0.53	<0.001***	
Developmental ability ^a			0.22			0.21			0.10 [#]
Group (0 = TD, 1 = ASD)			-0.30			-0.30			0.03*
Problem behaviors			0.01			0.01			0.92
Internalizing symptoms ^b			-0.37			-0.39			0.001***
Externalizing symptoms ^c									
Emotion regulation strategies ^d									
Communicative: unfamiliar people			0.10			-0.02			0.90
Comforting: physical soothing from others			-0.002			0.01			0.91
Comforting: deep exhalation			-0.26			-0.26			0.006**
Comforting: physical self-soothing			-0.21			-0.19			0.09 [#]
Comforting: self-stimulation			-0.15						
Task approach			-0.05			-0.04			0.68
Avoidance			-0.007			-0.01			0.94

^aMullen Scales of Early Learning Composite Standard Score

^bBehavior Assessment System for Children (2nd Ed.), Clinical Scale Internalizing Symptoms Composite T Score

^cBehavior Assessment System for Children (2nd Ed.), Clinical Scale Externalizing Symptoms Composite T Score

^dCoded emotion regulation strategies

[#]p ≤ 0.10, *p ≤ 0.05, **p ≤ 0.01, ***p ≤ 0.001

Table 5 ASD group: Effect of child characteristics, problem behaviors and emotion regulation strategies on parent quality of life and family functioning

	Parent quality of life				Change		Family functioning				Change	
	Adjusted model						Adjusted model					
	<i>R</i> ²	<i>p</i>	β	<i>p</i>	<i>R</i> ²	<i>p</i>	<i>R</i> ²	<i>p</i>	β	<i>p</i>	<i>R</i> ²	<i>p</i>
Step 1	0.05	0.15			0.05	0.15	0.02	0.36			0.02	0.36
Developmental ability ^a			0.22	0.15					0.14	0.36		
Step 2	0.14	0.12			0.09	0.15	0.14	0.12			0.12	0.08 [#]
Developmental ability ^a			0.31	0.08 [#]					0.20	0.25		
Problem behaviors												
Internalizing symptoms ^b			−0.03	0.89					0.09	0.64		
Externalizing symptoms ^c			−0.29	0.11					−0.39	0.04 [*]		
Step 3	0.45	0.02 [*]			0.31	0.03 [*]	0.39	0.04 [*]			0.25	0.06 [#]
Developmental ability ^a			0.26	0.15					0.18	0.33		
Problem behaviors												
Internalizing symptoms ^b			0.08	0.68					0.21	0.29		
Externalizing symptoms ^c			−0.40	0.03 [*]					−0.48	0.01 [*]		
Emotion regulation strategies ^d												
Communicative: unfamiliar people			0.08	0.65					−0.09	0.63		
Comforting: physical soothing from others			−0.01	0.96					0.06	0.74		
Comforting: deep exhalation			−0.26	0.10					−0.48	0.003 ^{**}		
Comforting: physical self-soothing			−0.38	0.04 [*]					−0.20	0.29		
Comforting: self-stimulation			−0.17	0.30								
Task approach			−0.18	0.32					−0.04	0.85		
Avoidance			−0.02	0.92					0.04	0.84		

^aMullen Scales of Early Learning Early Learning Composite Standard Score

^bBehavior Assessment System for Children (2nd Ed.), Clinical Scale Internalizing Symptoms Composite T Score

^cBehavior Assessment System for Children (2nd Ed.), Clinical Scale Externalizing Symptoms Composite T Score

^dCoded emotion regulation strategies

[#]*p* ≤ 0.10, ^{*}*p* ≤ 0.05, ^{**}*p* ≤ 0.01

Discussion

The aim of the current study was to explore which child ER strategies might be associated with parent quality of life and family functioning, over and above other factors known to impact these, such as an ASD diagnosis, developmental ability and problem behaviors. Our findings confirm that these known factors play a role and also show that some emotion regulation strategies are associated with parent quality of life and family functioning in children with ASD. In the families of children with ASD, two emotion regulation strategies, self-soothing and deep exhalation, were found to be negatively associated with parent quality of life and family functioning. Given that these two strategies are passive comforting strategies, which have been found to be associated with poor behavioral and social outcomes in children (Eisenberg et al. 1994, 1996; Martini and Busseri 2010; Supplee et al. 2009), these data suggest that these strategies may be maladaptive in the family context. Indeed,

some research has identified increased use of this type of emotion regulation strategy in ASD, compared to their typically developing peers (e.g., Samson et al. 2015; Ting and Weiss 2017). Moreover, passivity in children with ASD has been linked to reduced benefit from interventions such as social cognition training (Begeer et al. 2015). Our findings suggest that children who more frequently did not actively seek to change situations for their own good, but instead passively accepted them, have families that struggle more to function and achieve a positive quality of life. It may be that parents feel the burden of responsibility for such children as they struggle to achieve emotional independence. We have previously found that, self-development in this same sample is related to emotion regulation strategy development in children with ASD (Nuske et al. 2017a). Alternatively, it may be families who are struggling to function that find it difficult to support children in developing more adaptive emotion regulation strategies. Emotional regulation development is related to social interaction processes, where in the

Table 6 TD group: Effect of child characteristics, problem behaviors and emotion regulation strategies on parent quality of life and family functioning

	Parent quality of life			Change			Family functioning			Change		
	Adjusted model			Adjusted model			Adjusted model			Adjusted model		
	R ²	p	β	R ²	p	β	R ²	p	β	R ²	p	β
Step 1	0.001	0.85		0.001	0.85		0.02	0.48		0.02	0.48	
Developmental ability ^a			0.04			0.14			0.14			0.48
Step 2	0.42	0.004**		0.42	<0.001***		0.42	0.004**		0.40	0.002**	
Developmental ability ^a			0.10			0.20			0.20			0.22
Problem behaviors												
Internalizing symptoms ^b			-0.28			-0.26			-0.26			0.13
Externalizing symptoms ^c			-0.50			-0.50			-0.50			0.006**
Step 3	0.65	0.02*		0.23	0.21		0.46	0.16		0.04	0.97	
Developmental ability ^a			0.31			0.21			0.21			0.37
Problem behaviors												
Internalizing symptoms ^b			-0.37			-0.27			-0.27			0.21
Externalizing symptoms ^c			-0.51			-0.53			-0.53			0.01*
Emotion regulation strategies ^d												
Communicative: unfamiliar people			0.34			-0.02			-0.02			0.93
Comiforting: physical soothing from others			-0.11			-0.13			-0.13			0.64
Comiforting: deep exhalation			-0.25			0.11			0.11			0.66
Comiforting: physical self-soothing			0.10			0.09			0.09			0.72
Comiforting: self-stimulation			-0.15									
Task approach			0.24			0.22			0.22			0.35
Avoidance			0.32			0.05			0.05			0.87

^aMullen Scales of Early Learning Composite Standard Score

^bBehavior Assessment System for Children (2nd Ed.), Clinical Scale Internalizing Symptoms Composite T Score

^cBehavior Assessment System for Children (2nd Ed.), Clinical Scale Externalizing Symptoms Composite T Score

^dCoded emotion regulation strategies

#p ≤ 0.10, *p ≤ 0.05, **p ≤ 0.01, ***p ≤ 0.001

relationship between caretakers and children, the emotion-related practices (e.g., emotion coaching), facilitates positive development of emotion regulation (Eisenberg et al. 1996, 1998; Gottman et al. 1996; Sappok et al. 2013). Indeed, many parents of children with ASD report that they notice that their own emotions have an effect on their child's emotions and behaviors and vice versa, a phenomenon that has been called "emotional transmission" (Zhou and Yi 2014). Longitudinal research is needed to further understand the direction of the association between passive comforting emotion regulation strategies and family wellbeing.

Though no previous research has examined this, given the adaptive nature of communication strategies in typically developing preschoolers (Cole et al. 2009; Liebermann et al. 2007), one may have expected child-initiated active communication strategies to be associated with parent quality of life or family functioning; however this was not the case in either group. Given that one study found that mother-initiated communication strategies directed towards their child was related to less maternal stress (Gulsrud et al. 2010), parent-initiated child communication strategies may be more relevant to family functioning than child-initiated communication strategies. Parents' use of emotion regulation strategies for their own stress are also relevant, where some studies have found less optimal choice of coping strategies in parents of children with ASD (e.g., emotion-oriented or escape avoidance strategies; Dabrowska and Pisula 2010; Pisula and Kossakowska 2010; Sikora et al. 2013). Again, more research is needed to further understand the relative importance of child versus parent emotion regulation strategies for family quality of life and internalizing/externalizing behaviors in this population.

Some differential patterns of association were noted for parental quality of life compared to family functioning. For the ASD group, more externalizing behaviors were not significantly associated with lower parental quality of life, whereas more externalizing behaviors were associated with lower family functioning. This finding indicates that families' abilities to carry out daily routines are linked with acting out-type behavior, though again the direction of the association cannot be ascertained by these data. With regards to the two emotion regulation strategies that were associated with parental quality of life and family functioning in the ASD group, differential patterns were again noted. Children's more frequent use of physical self-soothing was related to lower parent quality of life (but not family functioning) and children's more frequent use of deep exhalation was related to lower family functioning (but not parent quality of life). Findings suggest that specific passive comforting strategies are linked to different familial challenges in families of children with ASD. Future research, exploring longitudinal relations between strategies and different aspects of family well being is needed to further elucidate this issue.

Results on emotion regulation strategies extend previous findings by showing that not only do poor emotion regulation skills affect other areas of functioning for the child with ASD (e.g. social and academic functioning; Cappadocia et al. 2012; Chamberlain et al. 2007; Jahromi et al. 2013; Nuske et al. 2017b), these difficulties, specifically use of certain less adaptive emotion regulation strategies, are associated with family functioning as a whole. This also extends earlier results showing that parents' (of children with ASD) own less optimal choice of coping strategies (e.g., emotion-oriented or escape-avoidance strategies, Dabrowska and Pisula 2010; Pisula and Kossakowska 2010; Sikora et al. 2013), is related to their own stress levels (Dabrowska and Pisula 2010), with higher use of these strategies leading to more stress, and suggests child-initiated strategies are also relevant for parent wellbeing, or perhaps, vice versa.

Interestingly, externalizing but not internalizing behaviors were associated with parent quality of life and family functioning, which was inconsistent with some previous reports (Gulsrud et al. 2010), but consistent with many others (e.g., Howell et al. 2015; McStay et al. 2014; Pozo et al. 2014). The absence of an impact of internalizing behaviors may be due to the nature of these symptoms in that they do not require extensive parental supervision and have less impact on family's engagement in the community (Sikora et al. 2013).

The early childhood years represent a period of life where tantrums and outbursts are common, even in TD children, more so than the later childhood years. Frontal systems, responsible for key components of the neural circuitry underlying impulse control do not mature until later in development (Sowell et al. 1999). Children aged between 2 and 5 years have a limited capacity with which to control their emotions. As indicated in the current findings, and consistent with other research, externalizing behaviors are already common in young children with ASD. When behaviors persist into older childhood and adolescence, they become increasingly difficult for families to cope with (e.g., a tantruming preschooler vs. a tantruming adolescent). Indeed the vast majority of research in this area has been conducted with older children and adolescent samples, with persistent emotion regulation difficulties common at this age (e.g. Mazefsky et al. 2014a; Samson et al. 2015). The current findings suggests that intervention on emotion regulation strategies should start before the school age.

Regarding other clinical implications of the findings, results suggest that passive comforting strategies have a maladaptive relationship with family wellbeing, in families of children with ASD. Therefore, teaching other strategies which are more active should be encouraged. Although communication strategies (with unfamiliar people) did not impact family wellbeing, after controlling for child developmental level, diagnosis and problem behaviors, univariate

associations were found between higher use of these communication strategies with parent quality of life and family functioning. Also, although task-oriented strategies (e.g., task approach or behavioral distraction) did not have any specific bearing on family wellbeing factors, they were found to be related to greater self-development and child wellbeing (Nuske et al. 2017a); therefore these strategies are recommended in place of passive comforting strategies. More research is needed to verify the best child emotion regulation strategies for the child and family as a whole.

Limitations

As our focus was on emotion regulation strategy use we did not report information on the actual experienced emotion of the children (e.g., coding of child emotional reactivity, physiological markers of stress, etc). However, we did provide parent-report information on internalizing and externalizing symptoms. An important next step for future research is to examine how emotion regulation strategy use impacts and is impacted by the experienced emotion in children with ASD, and how this affects parental quality of life and family functioning.

Conclusion

Overall, results replicate previous findings of an association of an ASD child diagnosis, child developmental delays and externalizing symptoms with parent quality of life and family functioning. Additionally, this is the first study to show that these aspects of family wellbeing are also linked with use of specific emotion regulation strategies in children with ASD, specifically, heightened use of passive comforting emotion regulation strategies.

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Author Contributions HJN conceived of the study and design, with guidance by DH, SB and CD. HJN and DH conducted the research testing and oversaw the behavioral coding of emotion regulation strategies. All authors were involved in the interpretation of the data. HJN and CHT drafted the manuscript, and DH, SB and CD revised it critically. All authors read and approved the final manuscript.

Compliance with Ethical Standards

Conflict of interest Heather Nuske has received research funding from Pierce Armstrong Foundation. The other authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

Informed Consent Informed consent was taken by human participants who were recruited into the study.

References

- Allen, C. W., Silove, N., Williams, K., & Hutchins, P. (2007). Validity of the social communication questionnaire in assessing risk of autism in preschool children with developmental problems. *Journal of Autism and Developmental Disorders*, *37*(7), 1272–1278.
- Allik, H., Larsson, J.-O., & Smedje, H. (2006). Health-related quality of life in parents of school-age children with Asperger syndrome or high-functioning autism. *Health and Quality of Life Outcomes*, *4*, 1. <https://doi.org/10.1186/1477-7525-4-1>.
- Armstrong, M. I., Birnie-Lefcovitch, S., & Ungar, M. T. (2005). Pathways between social support, family well being, quality of parenting, and child resilience: What we know. *Journal of Child and Family Studies*, *14*(2), 269–281.
- Ashburner, J., Ziviani, J., & 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*(1), 18–27. <https://doi.org/10.1016/j.rasd.2009.07.002>.
- Baker, B. L., Blacher, J., Crnic, K. A., & Edelbrock, C. (2002). Behavior problems and parenting stress in families of three-year-old children with and without developmental delays. *American Journal of Mental Retardation: AJMR*, *107*(6), 433–444. [https://doi.org/10.1352/0895-8017\(2002\)107<0433:BPAPSI>2.0.CO;2](https://doi.org/10.1352/0895-8017(2002)107<0433:BPAPSI>2.0.CO;2).
- Bauminger, N., Solomon, M., & Rogers, S. J. (2010). Externalizing and internalizing behaviors in ASD. *Autism Research*, *3*(3), 101–112.
- Begeer, S., Howlin, P., Hoddenbach, E., Clauser, C., Lindauer, R., Clifford, P., et al. (2015). Effects and moderators of a short theory of mind intervention for children with autism spectrum disorder: A randomized controlled trial. *Autism Research*, *8*(6), 738–748.
- Berkovits, L., Eisenhower, A., & Blacher, J. (2017). Emotion regulation in young children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *47*(1), 68–79. <https://doi.org/10.1007/s10803-016-2922-2>.
- Berthoz, S., & Hill, E. L. (2005). The validity of using self-reports to assess emotion regulation abilities in adults with autism spectrum disorder. *European Psychiatry*, *20*(3), 291–298. <https://doi.org/10.1016/j.eurpsy.2004.06.013>.
- Bromley, J., Hare, D. J., Davison, K., & Emerson, E. (2004). Mothers supporting children with autistic spectrum disorders: Social support, mental health status and satisfaction with services. *Autism: The International Journal of Research and Practice*, *8*(4), 409–423. <https://doi.org/10.1177/1362361304047224>.
- Buss, K. A., & Goldsmith, H. H. (1998). Fear and anger regulation in infancy: Effects on the temporal dynamics of affective expression. *Child Development*, *69*(2), 359–374.

- Calkins, S. D., & Hill, A. (2007). Caregiver influences on emerging emotion regulation. *Handbook of Emotion Regulation*, 229–248. Retrieved from <https://books.google.com/books?hl=en&lr=&id=Jh811ZKqFH8C&oi=fnd&pg=PA229&dq=Caregiver+influences+on+emerging+emotion+regulation%27&ots=6gfNneWkcB&sig=LAYIDvCY3k96tqHTkYXtfsbHvc8>.
- Cappadocia, M. C., Weiss, J. A., & Pepler, D. (2012). Bullying Experiences among children and youth with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 42(2), 266–277. <https://doi.org/10.1007/s10803-011-1241-x>.
- Chamberlain, B., Kasari, C., & Rotheram-Fuller, E. (2007). Involvement or isolation? The social networks of children with autism in regular classrooms. *Journal of Autism and Developmental Disorders*, 37(2), 230–242. <https://doi.org/10.1007/s10803-006-0164-4>.
- Cole, P. M., Dennis, T. A., Smith-Simon, K. E., & Cohen, L. H. (2009). Preschoolers' emotion regulation strategy understanding: Relations with emotion socialization and child self-regulation. *Social Development*, 18(2), 324–352.
- Cole, P. M., Michel, M. K., & Teti, L. O. (1994). The development of emotion regulation and dysregulation: A clinical perspective. *Monographs of the Society for Research in Child Development*, 59(2–3), 73–102.
- Dabrowska, A., & Pisula, E. (2010). Parenting stress and coping styles in mothers and fathers of pre-school children with autism and down syndrome. *Journal of Intellectual Disability Research*, 54(3), 266–280. <https://doi.org/10.1111/j.1365-2788.2010.01258.x>.
- Davis, N. O., & Carter, A. S. (2008). Parenting stress in mothers and fathers of toddlers with autism spectrum disorders: Associations with child characteristics. *Journal of Autism and Developmental Disorders*, 38(7), 1278–1291. <https://doi.org/10.1007/s10803-007-0512-z>.
- Durbin, C. E., & Wilson, S. (2012). Convergent validity of and bias in maternal reports of child emotion. *Psychological Assessment*, 24(3), 647.
- Eisenberg, N., Cumberland, A., & Spinrad, T. L. (1998). Parental socialization of emotion. *Psychological Inquiry*, 9(4), 241–273.
- Eisenberg, N., Cumberland, A., Spinrad, T. L., Fabes, R. A., Shepard, S. A., Reiser, M., et al. (2001). The relations of regulation and emotionality to children's externalizing and internalizing problem behavior. *Child Development*, 72(4), 1112–1134.
- Eisenberg, N., Fabes, R. A., Guthrie, I. K., Murphy, B. C., Maszk, P., Holmgren, R., et al. (1996). The relations of regulation and emotionality to problem behavior in elementary school children. *Development and Psychopathology*, 8(1), 141. <https://doi.org/10.1017/S095457940000701X>.
- Eisenberg, N., Fabes, R. A., & Murphy, B. C. (1996). Parents' reactions to children's negative emotions: Relations to children's social competence and comforting behavior. *Child Development*, 67(5), 2227–2247.
- Eisenberg, N., Fabes, R. A., Nyman, M., Bernzweig, J., & Pinuelas, A. (1994). The relations of emotionality and regulation to children's anger-related reactions. *Child Development*, 65(1), 109. <https://doi.org/10.2307/1131369>.
- Eisenberg, N., Guthrie, I. K., Fabes, R. A., Shepard, S., Losoya, S., Murphy, B. C., et al. (2000). Prediction of elementary school children's externalizing problem behaviors from attentional and behavioral regulation and negative emotionality. *Child Development*, 71(5), 1367–1382.
- Esler, A. N., Bal, V. H., Guthrie, W., Wetherby, A., Weismer, S. E., & Lord, C. (2015). The autism diagnostic observation schedule, toddler module: Standardized severity scores. *Journal of Autism and Developmental Disorders*, 45(9), 2704–2720.
- Frey, K. S., Greenberg, M. T., & Fewell, R. R. (1989). Stress and coping among parents of handicapped children: A multidimensional approach. *American Journal on Mental Retardation*. Retrieved from <http://psycnet.apa.org/psycinfo/1990-07508-001>.
- Gagne, J. R., Van Hulle, C. A., Aksan, N., Essex, M. J., & Goldsmith, H. H. (2011). Deriving childhood temperament measures from emotion-eliciting behavioral episodes: Scale construction and initial validation. *Psychological Assessment*, 23(2), 337.
- Gianino, A., & Tronick, E. Z. (1988). The mutual regulation model: The infant's self and interactive regulation and coping and defensive capacities. Retrieved from <http://psycnet.apa.org/psycinfo/1988-97294-003>.
- Goldsmith, H. H., Reilly, J., Lemery, K. S., Longley, S., & Prescott, A. (1993). Preliminary manual for the preschool laboratory temperament assessment battery, version 1.0. Madison: University of Wisconsin-Madison, Department of Psychology.
- Goldsmith, H. H., & Rothbart, M. K. (1999). *Laboratory temperament assessment battery Lab-Tab. Locomotor version 3.1*. Madison: Personality Development Laboratory, Department of Psychology, University of Wisconsin.
- Gottman, J. M., Katz, L. F., & Hooven, C. (1996). Parental meta-emotion philosophy and the emotional life of families: Theoretical models and preliminary data. *Journal of Family Psychology*, 10(3), 243.
- Graziano, P. A., Reavis, R. D., Keane, S. P., & Calkins, S. D. (2007). The role of emotion regulation in children's early academic success. *Journal of School Psychology*, 45(1), 3–19.
- Grolnick, W. S., Bridges, L. J., & Connell, J. P. (1996). Emotion regulation in two-year-olds: Strategies and emotional expression in four contexts. *Child Development*, 67(3), 928–941.
- Gulsrud, A. C., Jahromi, L. B., & Kasari, C. (2010). The co-regulation of emotions between mothers and their children with autism. *Journal of Autism and Developmental Disorders*, 40(2), 227–237. <https://doi.org/10.1007/s10803-009-0861-x>.
- Gumora, G., & Arsenio, W. F. (2002). Emotionality, emotion regulation, and school performance in middle school children. *Journal of School Psychology*, 40(5), 395–413.
- Hastings, R. P. (2003). Child behaviour problems and partner mental health as correlates of stress in mothers and fathers of children with autism. *Journal of Intellectual Disability Research: JIDR*, 47(Pt 4–5), 231–237.
- Hayes, S. A., & Watson, S. L. (2013). The impact of parenting stress: A meta-analysis of studies comparing the experience of parenting stress in parents of children with and without autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 43(3), 629–642. <https://doi.org/10.1007/s10803-012-1604-y>.
- Hedley, D., Nevill, R., Uljarević, M., Butter, E., & Mulick, J. A. (2016). ADOS-2 Toddler and Module 1 standardized severity scores as used by community practitioners. *Research in Autism Spectrum Disorders*, 32, 84–95.
- Hill, A. L., Degnan, K. A., Calkins, S. D., & Keane, S. P. (2006). Profiles of externalizing behavior problems for boys and girls across preschool: The roles of emotion regulation and inattention. *Developmental Psychology*, 42(5), 913.
- Hosmer, D., & Lemeshow, S. (2000). *Applied logistic regression 2nd ed. Chapter 4, Model-building strategies*. New York: John Wiley & Sons Inc.
- Howell, E., Lauderdale-Littin, S., & Blacher, J. (2015). Family impact of children with autism and asperger syndrome: A case for attention and intervention. *Austin Journal of Autism & Related Disabilities*, 1(2), 1008.
- Howse, R. B., Calkins, S. D., Anastopoulos, A. D., Keane, S. P., & Shelton, T. L. (2003). Regulatory contributors to children's kindergarten achievement. *Early Education and Development*, 14(1), 101–120.
- Jahromi, L. B., Bryce, C. I., & 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(2), 235–246.
- Jahromi, L. B., Meek, S. E., & 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, and Allied Disciplines*, 53(12), 1250–1258. <https://doi.org/10.1111/j.1469-7610.2012.02560.x>.
- Karst, J. S., & Van Hecke, A. V. (2012). Parent and family impact of autism spectrum disorders: A review and proposed model for intervention evaluation. *Clinical Child and Family Psychology Review*, 15(3), 247–277.
- Konstantareas, M. M., & Stewart, K. (2006). Affect regulation and temperament in children with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 36(2), 143–154. <https://doi.org/10.1007/s10803-005-0051-4>.
- Kopp, C. B. (1982). Antecedents of self-regulation: A developmental perspective. *Developmental Psychology*, 18(2), 199.
- Kopp, C. B. (1989). Regulation of distress and negative emotions: A developmental view. *Developmental Psychology*, 25(3), 343.
- Kuhlthau, K., Orlich, F., Hall, T. A., Sikora, D., Kovacs, E. A., Delahaye, J., & Clemons, T. E. (2010). Health-related quality of life in children with autism spectrum disorders: Results from the autism treatment network. *Journal of Autism and Developmental Disorders*, 40(6), 721–729. <https://doi.org/10.1007/s10803-009-0921-2>.
- Lecavalier, L., Leone, S., & Wiltz, J. (2006). The impact of behaviour problems on caregiver stress in young people with autism spectrum disorders. *Journal of Intellectual Disability Research*, 50(3), 172–183.
- Liebermann, D., Giesbrecht, G. F., & Müller, U. (2007). Cognitive and emotional aspects of self-regulation in preschoolers. *Cognitive Development*, 22(4), 511–529.
- Lord, C., Rutter, M., DiLavore, P. C., Risi, S., Gotham, K., & Bishop, S. (2012). Autism diagnostic observation schedule: ADOS-2. Los Angeles: Western Psychological Services Torrance.
- Martini, T. S., & Busseri, M. A. (2010). Emotion regulation strategies and goals as predictors of older mothers' and adult daughters' helping-related subjective well-being. *Psychology and Aging*, 25(1), 48–59. <https://doi.org/10.1037/a0018776>.
- Mazefsky, C. A., Borue, X., Day, T. N., & Minshew, N. J. (2014a). Emotion regulation patterns in adolescents with high-functioning autism spectrum disorder: Comparison to typically developing adolescents and association with psychiatric symptoms. *Autism Research*, 7(3), 344–354.
- Mazefsky, C. A., Borue, X., Day, T. N., & Minshew, N. J. (2014b). Emotion regulation patterns in adolescents with high-functioning autism spectrum disorder: Comparison to typically developing adolescents and association with psychiatric symptoms: emotion regulation in adolescents with ASD. *Autism Research*, 7(3), 344–354. <https://doi.org/10.1002/aur.1366>.
- Mazefsky, C. A., Herrington, J., Siegel, M., Scarpa, A., Maddox, B. B., Scahill, L., & White, S. W. (2013). The role of emotion regulation in autism spectrum disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*, 52(7), 679–688. <https://doi.org/10.1016/j.jaac.2013.05.006>.
- McStay, R., Trembath, D., & Dissanayake, C. (2015). Raising a child with autism: A developmental perspective on family adaptation. *Current Developmental Disorders Reports*, 1(2), 65–83.
- McStay, R. L., Trembath, D., & Dissanayake, C. (2014). Stress and family quality of life in parents of children with autism spectrum disorder: Parent gender and the double ABCX model. *Journal of Autism and Developmental Disorders*, 44(12), 3101–3118. <https://doi.org/10.1007/s10803-014-2178-7>.
- Mischel, W., Ayduk, O., Berman, M. G., Casey, B. J., Gotlib, I. H., Jonides, J., et al. (2010). “Willpower” over the life span: decomposing self-regulation. *Social Cognitive and Affective Neuroscience*, 6(2), 252–256.
- Mischel, W., & Patterson, C. J. (1978). Effective plans for self-control in children. In *Minnesota symposia on child psychology* (Vol. 11, pp. 199–230). Retrieved from <https://books.google.com/books?hl=en&lr=&id=eyA14xy4kuIC&oi=fnd&pg=PA199&dq=Effective+plans+for+selfcontrol+in+children.&ots=IkHT-cHhQF&sig=hNhwBnIAFWTDUaHr5kB6waoNFB0>.
- Mullen, E. M. (1995). *Mullen Scales of Early Learning*. Circle Pines, MN: American Guidance Service.
- Nachshen, J. S., Garcin, N., & Minnes, P. (2005). Problem behavior in children with intellectual disabilities: Parenting stress, empowerment and school services. *Mental Health Aspects of Developmental Disabilities*, 8, 105–114.
- Nuske, H. J., Hedley, D., Woollacott, A., Thomson, P., Macari, S., & Dissanayake, C. (2017a). Developmental delays in emotion regulation strategies in preschoolers with autism. *Autism Research*. <https://doi.org/10.1002/aur.1827>.
- Nuske, H. J., Kane, C., Rump, K., Pellecchia, M., Maddox, B., Reisinger Blanch, E., & Mandell, D. (2017b). *The impact of self-regulation skills on academic outcomes in minimally-verbal school-age children with autism*. Poster presented at the international meeting for autism research, May 2017. San Francisco, CA, USA.
- Pisula, E., & Kossakowska, Z. (2010). Sense of coherence and coping with stress among mothers and fathers of children with autism. *Journal of Autism and Developmental Disorders*, 40(12), 1485–1494. <https://doi.org/10.1007/s10803-010-1001-3>.
- Pozo, P., Sarriá, E., & Brioso, A. (2014). Family quality of life and psychological well-being in parents of children with autism spectrum disorders: a double ABCX model: Family quality of life and psychological well-being. *Journal of Intellectual Disability Research*, 58(5), 442–458. <https://doi.org/10.1111/jir.12042>.
- Predescu, E., & Sipos, R. (2017). Family quality of life in autism spectrum disorders (ASD). In M. Fitzgerald & J. Yip (Eds.), *Autism - paradigms, recent research and clinical applications*. InTech. <https://doi.org/10.5772/66201>.
- Reynolds, C. R., & Kamphaus, R. W. (2004). *Behavior Assessment System for Children* (2nd ed.) (BASC™-2). Bloomington, MN: Pearson
- Rieffe, C., De Bruine, M., De Rooij, M., & Stockmann, L. (2014). Approach and avoidant emotion regulation prevent depressive symptoms in children with an autism spectrum disorder. *International Journal of Developmental Neuroscience*, 39, 37–43.
- Rieffe, C., Oosterveld, P., Terwogt, M. M., Mootz, S., Van Leeuwen, E., & Stockmann, L. (2011). Emotion regulation and internalizing symptoms in children with autism spectrum disorders. *Autism: The International Journal of Research and Practice*. <https://doi.org/10.1177/1362361310366571>.
- Rubin, K. H., Coplan, R. J., Fox, N. A., & Calkins, S. D. (1995). Emotionality, emotion regulation, and preschoolers' social adaptation. *Development and Psychopathology*, 7(1), 49–62.
- Rutter, M., Bailey, A., & Lord, C. (2003). *The social communication questionnaire: Manual*. Los Angeles: Western Psychological Services.
- Samson, A. C., Hardan, A. Y., Podell, R. W., Phillips, J. M., & Gross, J. J. (2015). Emotion regulation in children and adolescents with autism spectrum disorder. *Autism Research*, 8(1), 9–18.
- Samson, A. C., Phillips, J. M., Parker, K. J., Shah, S., Gross, J. J., & Hardan, A. Y. (2014). Emotion dysregulation and the core features of autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 44(7), 1766–1772. <https://doi.org/10.1007/s10803-013-2022-5>.
- Samson, A. C., Wells, W. M., Phillips, J. M., Hardan, A. Y., & Gross, J. J. (2015). Emotion regulation in autism spectrum disorder: evidence from parent interviews and children's daily diaries. *Journal of Child Psychology and Psychiatry*, 56(8), 903–913.
- Sappok, T., Budczies, J., Bölte, S., Dziobek, I., Dosen, A., & Diefenbacher, A. (2013). Emotional development in adults with autism

- and intellectual disabilities: A retrospective, clinical analysis. *PLoS ONE*, 8(9), e74036.
- Sikora, D., Moran, E., Orlich, F., Hall, T. A., Kovacs, E. A., Delahaye, J., et al. (2013). The relationship between family functioning and behavior problems in children with autism spectrum disorders. *Research in Autism Spectrum Disorders*, 7(2), 307–315. <https://doi.org/10.1016/j.rasd.2012.09.006>.
- Silk, J. S., Steinberg, L., & Morris, A. S. (2003). Adolescents' emotion regulation in daily life: Links to depressive symptoms and problem behavior. *Child Development*, 74(6), 1869–1880.
- Sowell, E. R., Thompson, P. M., Holmes, C. J., Jernigan, T. L., & Toga, A. W. (1999). In vivo evidence for post-adolescent brain maturation in frontal and striatal regions. *Nature Neuroscience*, 2(10), 859–861.
- Stifter, C. A., & Braungart, J. M. (1995). The regulation of negative reactivity in infancy: Function and development. *Developmental Psychology*, 31(3), 448.
- Supplee, L. H., Skuban, E. M., Shaw, D. S., & Prout, J. (2009). Emotion regulation strategies and later externalizing behavior among European American and African American children. *Development and Psychopathology*, 21(2), 393. <https://doi.org/10.1017/S0954579409000224>.
- Suzumura, S. (2015). Quality of life in mothers of preschoolers with high-functioning pervasive developmental disorders: QOL in mothers of HFPDD preschoolers. *Pediatrics International*, 57(1), 149–154. <https://doi.org/10.1111/ped.12560>.
- Tabachnick, B. G., & Fidell, L. S. (1996). *Using multiple statistics*. New York, NY: Harper Collins Publishers.
- Thompson, R. A., & Goodman, M. (2010). Development of emotion regulation. In A. M. Kring & D. M. Sloan Emotion regulation and psychopathology: A transdiagnostic approach to etiology and treatment (pp. 38–58). New York, NY: Guilford Press.
- Ting, V., & Weiss, J. A. (2017). Emotion regulation and parent co-regulation in children with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 47(3), 680–689. <https://doi.org/10.1007/s10803-016-3009-9>.
- Tomanik, S., Harris, G. E., & Hawkins, J. (2004). The relationship between behaviours exhibited by children with autism and maternal stress. *Journal of Intellectual and Developmental Disability*, 29(1), 16–26. <https://doi.org/10.1080/13668250410001662892>.
- Varni, J. W., Burwinkle, T. M., & Seid, M. (2005). The PedsQL™ as a pediatric patient-reported outcome: Reliability and validity of the PedsQL™ Measurement Model in 25,000 children. *Expert Review of Pharmacoeconomics & Outcomes Research*, 5(6), 705–719.
- Varni, J. W., Sherman, S. A., Burwinkle, T. M., Dickinson, P. E., & Dixon, P. (2004). The PedsQL™ family impact module: preliminary reliability and validity. *Health and Quality of Life Outcomes*, 2(1), 55.
- Vygotskii, L. S. (1962). *Thought and language*. Retrieved from <https://books.google.com/books?hl=en&lr=&id=B9HCIBOP6d4C&oi=fnd&pg=PR4&dq=Thought+and+language+cambridge&ots=TrMdVccbNm&sig=nP3-pJfrMfrSGAnLJ9511mVMCZk>.
- Zantinge, G., van Rijn, S., Stockmann, L., & Swaab, H. (2017). physiological arousal and emotion regulation strategies in young children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*. <https://doi.org/10.1007/s10803-017-3181-6>.
- Zhou, T., & Yi, C. (2014). Parenting styles and parents' perspectives on how their own emotions affect the functioning of children with autism spectrum disorders. *Family Process*, 53(1), 67–79.
- Zimmer-Gembeck, M. J., & Skinner, E. A. (2011). Review: The development of coping across childhood and adolescence: An integrative review and critique of research. *International Journal of Behavioral Development*, 35(1), 1–17.