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Feasibility of an emotion regulation intervention for young children with autism spectrum disorder: A brief report

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ABSTRACT

Background: Emotion regulation (ER) is key to young children's school readiness and mental health. Many children with autism spectrum disorder exhibit emotionally dysregulated behavior, yet no interventions target this skill in the preschool years. This study examined the feasibility and preliminary efficacy of a parent-mediated intervention to promote emotion regulation skills in preschool-age children with autism spectrum disorder.

Method: Participants included five children (3–6 years old) and their mothers. The intervention, Regulation of Emotional Lability in Autism Spectrum Disorder through Caregiver Supports (RELACS) was delivered in participants' homes over eight weeks.

Results: Preliminary results suggest RELACS is acceptable to parents, can be implemented with fidelity, and shows promise in improving parent support for children's ER skills as well as children's regulatory capacity.

Conclusions: Results support the feasibility of using a parent-mediated approach to supporting ER skills in young children with autism spectrum disorder. Though RELACS shows promise in improving parent support for ER and children's ER capacity, further research is necessary to establish its efficacy.

1. Feasibility of an emotion regulation intervention for young children with autism spectrum disorder: A brief report

Emotion regulation (ER) is a process through which children increase, maintain, or decrease the intensity of their emotions according to situational demands (Thompson & Goodvin, 2007). Typically developing preschool children learn when, where, and what emotional displays are suitable (Denham, 2006), which fosters social competence as they are able to neutralize, suppress, substitute, and exaggerate emotions to achieve social goals (Thompson & Goodvin, 2007; Zeman, Cassano, Perry-Parrish, & Stegall, 2006).

Estimates suggest approximately 70% of children with autism spectrum disorder (ASD) have limited ER skills (n = 98, mean age = 10 years; Totsika, Hastings, Emerson, Lancaster, & Berridge, 2011), including lower capacity for self-regulation, increased negativity and resignation, and lower likelihood to persist during frustrating tasks than typically developing peers. Though similar estimates are not available for preschoolers, observational studies of preschoolers with ASD indicate they tend to use simpler strategies than their counterparts, including repetitive/idiosyncratic behaviors, vocalizing negative emotion, and avoidance (Hirschler-Guttenberg, Golan, Ostfield-Etzion, & Feldman, 2014; Jahromi, Bryce, & Swanson, 2013; Konstantareas & Stewart, 2006). Higher ER

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skills were found to be a significant predictor of decreased externalizing behaviors and increased social skills in a sample of 4- to 7-year old children with ASD (Berkovits, Eisenhower, & Blacher, 2017).

Difficulties with ER may impact academic and mental health functioning of children with autism spectrum disorder. School-age children with ASD who exhibit poor ER also are less socially engaged and evidence lower academic achievement than their peers (Konstantareas & Stewart, 2006; Jahromi et al., 2013). Moreover, poor ER relates to anxiety, depression (Simonoff et al., 2008), and anger (Rieffe et al., 2013; Simonoff et al., 2008) symptoms among children and adolescents with autism spectrum disorder. In preschoolers with and without ASD, self-regulation, a broader construct encompassing ER, is related to school readiness (Pellicano et al., 2017). In their cross-sectional study of 30 matched typically developing preschoolers and preschoolers with ASD, Pellicano and colleagues found that children with ASD scored lower than their typically developing peers on both measures of school readiness and on executive functioning. Moreover, differences in specific executive functioning skills such working memory and inhibitory control were related to differences in school readiness scores for children with and without autism spectrum disorder.

Parents are vital in supporting the development of ER in children. For example, at the preschool age, parent reassurance and appropriate modeling contributes to child ER development (Morris et al., 2011). For parents of children with the social, communicative, and restricted/repetitive behavior difficulties associated with ASD (American Psychiatric Association, 2013), support for ER development requires greater knowledge and flexibility than what is necessary to support ER in typically developing children (Hirschler-Guttenberg et al., 2014). Mothers of children with ASD persist with simplistic strategies (e.g., affectionate gestures, verbal comfort) to support ER in their children compared to the increasingly sophisticated strategies (e.g., verbal support for problem solving) used by mothers of typically developing peers, likely due to difficulties in managing complex core symptoms of the disorder and underdeveloped ER skills in their children (Grolnick, Kurowski, McMenamy, Rivkin, & Bridges, 1998). Moreover, parents of children with ASD often experience higher stress than parents of typically developing children (Baker-Ericzén, Brookman-Frazee, & Stahmer, 2005), and negative emotions expressed by parents (i.e., criticism and hostility) are associated with later externalizing problems in children with ASD (Rispoli, 2019; Bader & Barry, 2014).

Emotion regulation interventions for children with ASD are scarce. A few programs have been developed targeting older children (e.g., Thomson, Riosa, & Weiss, 2015; Scarpa, Wells, Attwood, & Currie, 2013). The Stress and Anger Management Program (STAMP; Scarpa et al., 2013) utilizes cognitive restructuring and affective education to address emotional functioning in school-aged children with autism spectrum disorder. Parents facilitate at-home practice and skill generalization. Though some support for this program has been garnered from previous research (e.g., reduced parent reports of child negativity; Scarpa & Reyes, 2011), techniques are cognitively-focused and beyond the developmental capabilities of preschool-age children.

The Regulation of Emotional Lability in Autism Spectrum Disorder through Caregiver Supports (RELACS) intervention is the first program to target ER skills in preschool-age children. The intervention is grounded in behavioral principles and intervention delivery is parent-mediated to promote generalization and maintenance of skills (Harrop, 2015). Parent-mediated intervention is considered evidence-based in the treatment of behavioral, social, and communication needs of children with ASD (Wong et al., 2015). RELACS was designed to support ER skill development using techniques (e.g., parent-mediated implementation, visual supports, direct instruction) designed to address the complex social and communicative deficits and restrictive/repetitive behavior patterns as well as developmental needs unique to young children with autism spectrum disorder. The present study is the first to investigate the feasibility of RELACS when implemented with young children with ASD and their parents.

2. Method

2.1. Participants and setting

Five children ages three to six years and their mothers were recruited from community mental health and therapy clinics in the central and southeastern regions of a Midwestern state. Children previously were diagnosed with autism spectrum disorder (per DSM-5 criteria; American Psychiatric Association, 2013) or autism (per IDEA criteria; Individuals with Disabilities Education Act, 2004). Diagnoses were verified with administration of the Autism Diagnostic Observation Schedule, Second Edition (ADOS-2; Lord et al., 2012) by the first author. To participate, children were required to exhibit dysregulated behavior (e.g., tantrums, overexcitement) four or more times weekly per parent report and could not have an intellectual disability or significant speech delay [as indicated by Developmental Ability Scale, Second Edition (DAS-II; Elliott, 2007) General Conceptual Ability (GCA, or overall IQ) > 70 and Verbal or Nonverbal Ability domain standard score ≥ 80, and Preschool Language Scales, Fifth Edition (PLS-5; Zimmerman, Steiner, & Pond, 2011) expressive or receptive language standard score ≥ 80]. For the sample, mean GCA = 92, PLS Receptive = 90, and PLS Expressive = 93. See Table 1 for additional demographics.

2.2. Constructs and measures

Unless otherwise noted, measures were completed at pretest, post-test, and 3-month follow-up.

2.2.1. Intervention acceptability

Mothers' perceptions of the intervention were assessed at post-test and 3-month follow-up with the Behavior Intervention Rating Scale (BIRS; Elliott & Treuting, 1991). The BIRS is a 24-item inventory using a 6-point Likert-type scale ("Strongly Disagree" to "Strongly Agree"). Items comprise three domains: Acceptability (α = .97), Effectiveness (α = .92), and Time of Effectiveness (α = .87; Elliott & Treuting, 1991).

Table 1
Participant Demographics.

Dyad	*Child* Gender	Age[a] (Y:M)	Race/Ethnicity	DAS-II GCA[b]	PLS-5 Receptive[c]	PLS-5 Expressive[c]	*Mother* Age[a] (Y)	Race/Ethnicity	Marital Status	Education Level	Family Income[d]
A	M	5:8	White	107	113	106	35	White	Married	Some graduate school	200001 +
B	F	3:3	Black	87	91	83	26	Black	Single	Some graduate school	50001-75000
C	M	3:1	White	92	84	100	39	White	Married	Graduate degree	50001-75000
D	M	3:10	White	84	62	81	27	White	Married	Graduate degree	75001-100000
E	M	6:7	White/Hispanic	91	99	95	35	White	Married	Graduate degree	75001-100000

[a] Initial baseline assessment.
[b] Developmental Ability Scale, Second Edition (DAS-II; Elliott, 2007) General Conceptual Ability (overall IQ); eligibility requirement was GCA $>$ 70 and Verbal or Nonverbal Ability domain standard score $\geq$ 80.
[c] Preschool Language Scales, Fifth Edition (PLS-5; Zimmerman et al., 2011); eligibility requirement was expressive or receptive language standard score $\geq$ 80.
[d] Gross family income (per year) reported in US dollars.

2.2.2. Intervention fidelity

Procedural implementation fidelity was evaluated using the RELACS Intervention Session Fidelity Checklist developed for the study. Research assistants viewed video recordings of intervention sessions and completed "yes/no" responses to rate whether the intervention component was observed during the session. Five to seven components were rated across sessions based on session content. Percent of components implemented was calculated for each session by dividing the total number of components implemented by the total possible components and multiplying by 100. Averages were calculated across sessions and inter-rater reliability was examined.

2.2.3. Child emotion regulation

The Temperament and Atypical Behavior Scale (TABS; Bagnato, Neisworth, Salvia, & Hunt, 1999) is a norm-referenced assessment tool designed to measure self-regulation and dysfunctional emotion in children ages 11–71 months. The TABS was validated on children with disabilities and used to study ER in children with ASD (Glaser & Shaw, 2011). Strong internal consistency (split-half) is reported, r = .81–.95 (Neisworth, Bagnato, Salvia, & Hunt, 1999). Standard scores (M = 100, SD = 15) on the Temperament and Regulatory Index (TRI) were calculated. Scores reflect global ratings of mother-reported child self-regulation, with higher scores indicating poorer regulation.

2.2.4. Maternal criticism and emotional over-involvement

The Family Questionnaire (FQ; Wiedemann, Rayki, Feinstein, & Hahlweg, 2002) is a 20-item measure of parental displays of Criticism (e.g., "I have to insist that he/she behave differently," α = .92) and Emotional Over-Involvement (e.g., "I can't sleep because of him/her," α = .80). Mothers rated each item on a 4-point Likert-type scale ranging from 0 "never/very rarely" to 4 "very often." Average scores were calculated for the Criticism and Emotional Over-Involvement domains.

2.2.5. Maternal emotion style

The Maternal Emotion Style Questionnaire (MESQ; Lagacé-Séguin & Coplan, 2005) is a 14-item measure of maternal emotional style. Items were rated on a 5-point Likert scale (1 = "strongly disagree, 5 = "strongly agree"). Mothers' average responses reflected the degree to which they identified with an Emotion Coaching (awareness of own and child's emotions, use of awareness to support emotion socialization, α = .92) and/or Emotion Dismissing (e.g., low awareness of emotions, feel negative emotions reflect ineffective parenting; α = .90) parenting style.

2.2.6. Maternal stress

The Parenting Stress Index, 4th edition (PSI-4; Abidin, 2012) was used to measure maternal stress. The PSI-4 is comprised of 101 items and measures parental perceptions of stress related to child characteristics (Child domain; α = .96) and the parent's own characteristics (e.g., parenting competence; Parent domain; α = .96). Items are rated on a 5-point Likert scale from 1 "strongly agree" to 5 "strongly disagree."

2.3. Procedure

Intervention development was guided by theoretical and empirical evidence of the associations between parenting and children's emotional development in young children with and without ASD (e.g., Grolnick et al., 1998; Gulsrud, Jahromi, & Kasari, 2010) as well as research describing parental efforts to support emotion and children's ER skills in young children with ASD (e.g., Konstantareas & Stewart, 2006; Jahromi, Meek, & Ober-Reynolds, 2012; Hirschler-Guttenberg et al., 2014). The intervention was delivered to mothers and children in their homes by the first author, a licensed psychologist, or a doctoral student in school psychology (second author and Board Certified Assistant Behavior Analyst) who was trained and regularly supervised by the first author. Intervention sessions began with a review of the previous session and videotaped parent-child interaction for data collection and analysis (Rispoli et al., 2019). Next, the interventionist provided instruction and demonstration of the session topic with the child. The mother then practiced the target skills with the child while receiving concurrent feedback from the interventionist. The intervention sessions concluded with the interventionist providing suggestions for practicing and generalizing skills, followed by joint interventionist-mother goal setting for practicing skills in everyday routines. A manual was used by interventionists to guide each session. Sessions lasted 60 to 120 min. Topics and descriptions are displayed in Table 2. Mothers completed the TABS, FQ, MESQ, and PSI-4 pre- and post-intervention, and at 3-month follow-up.

2.4. Study design and data analysis

A multiple-probe single-case design was used to implement the intervention across all five dyads. For this preliminary study, the primary focus was on feasibility; thus, the report of acceptability and fidelity data was the priority. Multiple probe data focused on observed parent and child regulatory behaviors will be reported elsewhere (Rispoli et al., 2019). In the current study, acceptability and fidelity data were analyzed descriptively. Pre, post, and 3-month follow-up informant report data were analyzed using the reliable change index (RC; Jacobson & Truax, 1991) to determine clinically significant change in behaviors for each participant as a complement to feasibility data. An absolute value of $\geq$ 1.96 was considered clinically significant (Jacobson & Truax, 1991). The equation used was: $RC = (x_2 - x_1)/S_{diff}$, where x_2 equaled the post-test score, x_1 equaled the pre-test score, and S_{diff} equaled the

Table 2
RELACS Sessions.

Session	Topic	Description
1	Being an interactive play partner	Setting up the home to encourage parent-child interaction, labeling child's actions during play
2	Identifying children's emotions	Labeling emotions during play and everyday activities; using visuals (e.g., magnets with common facial expressions) to label emotions
3	Modeling and using effective emotion regulation	Psychoeducation on the importance of parent emotion regulation; strategies to model emotion regulation using actions and verbal descriptions
4	Specific strategies to support emotion regulation	Defining and demonstrating specific strategies to be used to support ER; introduction of "least to most" prompting technique
5	Use of visual tools to support emotion regulation	Use of the Tucker Turtle social story and cue cards to prompt self-regulation during emotional distress/over-excitement
6	Understanding the "ABCs" of behavior	Defining and identifying the antecedents and consequences of behaviors and how to collect behavioral ABC data
7	Using behavioral data to understand dysregulation and identify strategies	Review of behavioral data collected in week prior; demonstration of how to identify the function of behavior and match strategies to address dysregulation
8	Generalization and maintenance	How to generalize strategies to other situations; plans for maintaining strategy use after intervention

standard error of difference between the scores. S_{diff} is calculated using the standard error of measurement: $S_{diff} = \sqrt{2(Se^2)}$. Effect sizes were calculated from average scores using Cohen's d_z, with values near .20 indicating a small effect, .50 indicating a moderate effect, and .80 indicating a large effect (Cohen, 1988).

3. Results

3.1. Intervention acceptability

Mothers found RELACS to be acceptable at post-test and 3-month follow-up (BIRS Acceptability M = 5.28 and 5.05, respectively). Mothers also rated the intervention generally effective in creating change at both post-test and 3-month follow-up (BIRS Effectiveness M = 4.40 and 4.23, respectively) and producing rapid change (BIRS Time of Effectiveness M = 4.30 and 4.50, respectively). See Table 3.

3.2. Intervention fidelity

Procedural intervention fidelity was high for both interventionists and ranged from 96.88 to 100.00% across all intervention sessions (M = 98.88%). Average intervention fidelity across dyads was 98.88%, ranging from 96.88 to 100% average fidelity per dyad. Twenty percent of sessions for each dyad were randomly selected and rated by an external rater. Inter-rater reliability was 90–100% across dyads.

3.3. Child emotion regulation

Children B, C, and E evidenced significantly reduced dysregulation at post-test, follow-up or both time points as reported by mothers on the TABS TRI (d_{zpost} = .59; $d_{zfo\text{-}up}$ = .14; see Table 4). Dysregulation was nearly significantly lower at post-test for Child D (RC = -1.77).

3.4. Mother emotion-related behaviors

All mothers but Mother A reported significant improvement in stress related to their children's behaviors (PSI Child Domain, d_{zpost} = .65; $d_{zfo\text{-}up}$ = .37; see Table 4), and three mothers (B, C, and E) reported significantly more emotion coaching behaviors at post-test, follow-up or both assessments (d_{zpost} = .51; $d_{zfo\text{-}up}$ = .28). All results including significant improvements reported for maternal criticism, emotion dismissing and parent stress are displayed in Table 4.

Table 3
BIRS Domain Scores across Participants.

Mother	Acceptability M (SD)	Effectiveness M (SD)	Time to Effectiveness M (SD)
A	5.87 (0.35)	4.71 (0.76)	5.00 (0.00)
B	4.93 (0.96)	4.29 (1.25)	4.00 (0.00)
C	5.47 (0.52)	4.57 (1.51)	4.00 (0.00)
D	5.00 (0.00)	4.43 (0.53)	4.50 (0.71)
E	5.13 (0.52)	4.00 (0.60)	4.00 (0.00)

Note. BIRS items rated on a 6-point scale (1 = "strongly disagree", 6 = "strongly agree").

Table 4
Parent and Child Emotion-Related Behavior Change and Effect Sizes.

Dyad	FQ Criticism	FQ Emotional Over-involvement	MESQ Emotion Dismissing	MESQ Emotion Coaching	PSI Child Domain	PSI Parent Domain	TABS Temperament and Regulation Index
A							
Pre	26	35	4.43	4.86	178	209	32
Post	30	37	4.14	4.43	190	225	33
Fo-Up	27	35	3.85	4.00	191	221	33
RC[a]	2.07†	0.99	−0.95	−2.52†	2.03†	2.33†	0.44
RC[b]	0.52	0.00	−1.90	−5.04†	2.20†	1.74	0.44
B							
Pre	18	33	4.29	4.14	129	135	37
Post	13	21	3.57	4.29	84	76	5
Fo-Up	11	18	3.29	4.71	78	78	10
RC[a]	**−2.59***	**−5.91***	**−2.38***	**0.84**	**−7.63***	**−8.58***	**−14.22***
RC[b]	**−3.62***	**−7.40***	**−3.33***	**3.36***	**−8.64***	**−8.28***	**−12.00***
C							
Pre	21	28	1.86	3.43	168	134	24
Post	20	25	2.71	4.14	159	150	24
Fo-Up	17	23	2.43	4.00	142	148	13
RC[a]	−0.52	−1.48	2.86†	**4.20***	−1.52	2.32†	0.00
RC[b]	**−2.07***	**−2.46***	1.90	**3.36***	**−4.41***	2.03†	**−4.89***
D							
Pre	21	24	3.57	4.57	124	112	15
Post	17	23	3.71	4.71	111	110	11
Fo-Up	22	23	3.71	4.14	119	109	–
RC[a]	**−2.07***	−0.49	0.48	0.84	**−2.20***	−0.29	−1.77
RC[b]	0.52	−0.49	0.48	−2.52†	−0.85	−0.44	–
E							
Pre	27	27	4.29	3.43	166	202	28
Post	24	35	3.57	4.00	155	194	23
Fo-Up	27	33	4.29	4.14	152	189	25
RC[a]	−1.55	3.94†	**−2.38***	**3.36***	−1.86	−1.16	**−2.22***
RC[b]	0.00	2.96†	0.00	**4.20***	**−2.37***	−1.90	−1.33
M (SD)							
Pre	22.60 (3.78)	29.40 (4.51)	3.69 (1.10)	4.09 (0.30)	65.60 (8.99)	158.40 (44.04)	27.20 (8.35)
Post	20.80 (6.53)	28.20 (7.29)	3.54 (0.52)	4.31 (0.27)	61.00 (14.98)	58.00 (19.18)	19.20 (11.14)
Fo-Up	20.80 (6.87)	26.40 (7.27)	3.51 (0.70)	4.20 (0.30)	60.20 (14.70)	58.40 (16.82)	20.25 (10.69)
M_{diff} (SD_{diff})							
Pre-Post	1.80 (3.56)	4.40 (5.59)	0.14 (0.66)	0.22 (0.45)	13.20 (20.43)	7.40 (30.77)	8.00 (13.66)
Post-Fo-Up	0.00 (3.74)	1.80 (1.10)	0.03 (0.43)	0.11 (0.41)	3.40 (9.24)	2.00 (2.74)	1.00 (6.98)
d_z[c]							
Pre-Post	0.51	0.79	0.22	0.51	0.65	0.24	0.59
Post-Fo-Up	0.00	1.64	0.07	0.28	0.37	0.73	0.14

Note. Boldface type with * = significant change in expected direction. Italicized with † = significant change in unexpected direction. Significant change indicated by RC = $|1.96|$. – = Not available due to item-level missing data.

[a] Pre- to post-test change.

[b] Post-test to 3-month follow-up change.

[c] Cohen's d_z used as measure of within-group effect size, with values approximate to ≥.20 indicating a weak effect, ≥ .50 indicating a moderate effect, and ≥ .80 indicating a large effect (Cohen, 1988).

4. Discussion

Emotion regulation is central to school readiness for young children (Ursache, Blair, & Raver, 2012) and guards against long-term mental health problems (e.g., Fuji et al., 2013; Simonoff et al., 2008). Given the well-established difficulties children with ASD experience regulating emotion (Totsika et al., 2011) and recent findings about how young children with ASD struggle to modulate their emotional responses (e.g., increased negativity, less persistence; Jahromi et al., 2013; Hirschler-Guttenberg et al., 2014), the current study addresses the need for intervention to address these skills by providing evidence of feasibility for a parent-mediated ER intervention. The RELACS intervention targeted parents' facilitation of ER skills in children with ASD ages 3–5 years across 8 weekly sessions implemented in family homes.

The RELACS intervention was feasible when implemented with mothers in family homes. Specifically, implementation fidelity was high across both interventionists, despite differing backgrounds and levels of training (i.e., PhD versus BCaBA). Interventionists engaged the mothers in didactic instruction, demonstration and in-vivo practice with the child present using everyday routines and preferred activities in the child's natural environment. Each session lasted 60–120 min and was held at a time that was convenient for the family (e.g., after the child returned home from school). With the aid of interventionists, mothers were able to identify weekly goals for use of RELACS strategies with children beyond practicing strategies in the intervention session.

Participating mothers rated RELACS as acceptable and generally efficacious. Specifically, mothers regarded RELACS as an appropriate method for learning to support ER skills in their children and believed other parents would feel similarly. Mothers generally rated themselves more favorably on at least one emotion-related behavior after participating in the intervention. Most mothers reported significant increases in their orientation toward an emotion coaching style after the intervention, suggesting greater awareness of their own and their children's emotions, and ability to use emotions in a teachable way to support socialization. All but one mother also reported experiencing less stress due to their children's behaviors. Reductions in maternal stress related to children's behavior are notable given higher levels of stress in parents of preschool children with ASD compared to parents of typically developing preschoolers (e.g., Jeans, Santos, Laxman, McBride, & Dyer, 2013). Effect sizes were moderate for these outcomes at post-test and small at follow-up. Of note, effect sizes must be interpreted with caution given the small sample size. They provide some information on the clinical relevance of observed changes but should not be used to inform future studies (i.e., power).

On the BIRS acceptability measure, mothers generally agreed that the intervention improved their parenting skills and ability to promote their children's modulation of emotion. It should be noted that while all ratings on the BIRS were high (ranging between 4 and 6 on the 6-point scale), average ratings were higher for Acceptability than Effectiveness and Time to Effectiveness across all 5 dyads. Parents perceived the intervention as a reasonable and fair way to learn how to support ER skills in their children but felt less strongly about the intervention's effectiveness in creating marked and lasting changes in their children's ER skills. Nevertheless, for three of five children, parents reported clinically significant improvements in regulation from baseline ratings at post-intervention, 3-month follow-up, or both. Similar interventions targeting ER in older children with ASD have reported minimal to modest change in ER skills following intervention (Scarpa & Reyes, 2011; Thomson et al., 2015).

There was variability in the preliminary outcome data, which suggests some mothers and children responded less favorably to the intervention than others. For instance, Mother A reported no positive changes on outcome measures for herself or her child and increases in certain unfavorable outcomes (e.g., increased parental criticism, stress). These relatively poorer outcomes may be related to limited or no use of RELACS strategies between sessions or worsening of the child's challenging behaviors, which were discussed with the interventionist in the later weeks of implementation. While this mother did report use of RELACS strategies during weekly sessions, she also expressed concern that it was difficult to apply the strategies. This mother reported the highest acceptability and perceived effectiveness ratings on the BIRS among all of the dyads but may have benefited from coaching or phone consultation to support her use of RELACS strategies and respond effectively to the increase in behavioral difficulties exhibited by her child. On the other hand, clinically significant changes were reported on every outcome measure for Dyad B, either at post-test, follow-up or both timepoints. Though Mother B received the same version of RELACS implemented with Mother A, she often commented on her use of the strategies outside of RELACS sessions. There were also notable improvements in regulatory behavior reported for Child C. Mother C reflected on her application of the strategies across several family activities (e.g., a recent vacation) during the follow-up session, which suggested high levels of use of RELACS strategies beyond the intervention sessions. Mother E reported sharing RELACS intervention strategies with Child E's school team; this collaboration and consistency across environments may have contributed to the reported reductions in his dysregulation. A relevant limitation of this study is the lack of systematic measurement of parental strategy use outside of the weekly intervention sessions. Despite developing specific goals for RELACS strategy use during everyday routines and activities with interventionists, it is possible inconsistencies in use of RELACS strategies contributed to variations in the results. Future research is needed to examine multiple dimensions of fidelity such as quality of parents' strategy use (Knoche, Sheridan, Edwards, & Osborn, 2010) to contextualize outcomes.

4.1. Limitations and future directions

This was a small preliminary study, which limits the ability to generalize findings beyond the sample. Moreover, most mothers were well educated and from upper middle to high socioeconomic backgrounds; resource availability may have increased their ability to engage in and benefit from the intervention. At three-month follow-up, effects decreased for most child and parent behaviors. Lack of data on mothers' use of RELACS strategies outside of sessions during intervention and following the conclusion of the intervention beyond the single follow-up assessment is a limitation and should be addressed in future research. Future research should also consider the added benefit of coaching to bolster parental strategy use.

It is also worth noting that difficulties were encountered in identifying reliable and valid tools for measuring parent and child emotion-related behaviors. Among our parent-focused emotion measures (MESQ, FIQ), extant data with parents of children with ASD were not available. We also observed high levels of variability in certain measures between dyads (e.g., PSI, TABS). Nevertheless, the measures used were well-aligned with the parent and child behaviors targeted in the intervention. Very few measures are available to assess ER in young children with ASD (Weiss, Thomson, & Chan, 2014). Though formal data were not collected, parents' high rates of completion for all measures (i.e., all measures completed at all time points except Child B's TABS at 3-month follow-up) suggests the parents found the measurement protocol acceptable.

4.2. Implications

The importance of bolstering parents' ability to support ER for preschool-age children with ASD is underscored in recent findings that suggest parents' direct efforts, more so than factors such as maternal temperament, may have greater impact in supporting the modulation of emotion in this group (Hirschler-Guttenberg, Feldman, Ostfeld-Estzion, Laor, & Golan, 2015) as well as evidence that training in emotion coaching can diminish child risk for poor ER associated with family adversity (e.g., low SES, stress; Ellis, Alisic, Reiss, Dishion, & Fisher, 2014). The RELACS intervention offers a unique approach to targeting ER in children with ASD younger than

five. Findings from the current study suggest RELACS is a feasible and acceptable intervention when implemented by trained interventionists with parents and children in their homes. Parental acceptability is key to developing interventions for long-term use and scalability (Smith et al., 2007). More research is needed to test the effects of RELACS on parent and child emotion-related behaviors and determine if improvements suggested by the current results hold in larger samples.

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Ethical approval

All procedures performed involving human participants were in accordance with the ethical standards of the institution's Institutional Review Board and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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