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BRIEF REPORT

The Emotion Regulation Checklist with Young Autistic Children: Data Set for Comparative Use in Intervention Studies

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Abstract

Purpose Comparative data of autism-sensitive standardized measures of emotion regulation and lability, describing percentage change over time for populations of young autistic children, are currently publicly unavailable. We propose publication of such data as a support for future therapeutic intervention studies.

Methods We generate and present data of the Emotion Regulation Checklist (and subscales) for a comparative array of percentage change over time (10 months) for autistic children *not* receiving psychological or behavioral therapies (N = 98, ages 4–8).

Results Comparative data summaries are presented here, and the full data set is presented as *Online Resource 1*.

Conclusion We propose that this autism-sensitive measure, now with autism-specific comparative data to provide a comparison group in studies of therapeutic intervention, is well placed to assess co-occurring affective, regulatory, and behavioral factors of personal development for autistic children.

Keywords Autism · Emotion regulation checklist · Normative data · Therapy · Intervention · Efficacy

There is significant co-occurrence between autism and complex psychiatric disorders (Leyfer et al., 2006) and between autism and affective disorders (Cai et al., 2018; Lainhart & Folstein, 1994) including anxiety (Adams & Emerson, 2021) and depression (Pezzimenti et al., 2019). In a large-scale study of autistic children accessing psychological services, Kommu et al. (2017) found that co-occurring mental health conditions were highly prevalent (41.3% with Axis-I co-morbidity), and more common for children older than 3 years as compared to younger children. Such childhood elevated rates of mental health symptoms often persist into adolescence and adulthood (Lai et al, 2019) without effective early intervention.

It seems that best-practice autism psychological support will need to engage and address the particular communicative and sensory needs of each autistic individual, *while also* providing autism-sensitive therapeutic support for co-occurring challenges to *emotion regulation*. "Emotion Regulation is the ability to modify arousal and emotional reactivity to achieve goals and maintain adaptive behaviors" (Beck et al., 2020, p. 4). Emotion regulation impairment is thought to underlie many symptoms of psychological distress, such as anxiety, depression, as well as externalizing behaviors that express this distress, and yet it is largely unaddressed clinically and in research (Beck et al., 2020; Berkovits et al., 2017; Cai et al., 2018; Cibralic et al., 2019). The working concept, *Emotion Regulation* (Beck et al., 2020), encompasses states of overall lability (where *negative lability* refers to core state *dysregulation*–relating to rapid changes, variation, and extremes in mood states, lack of body-state awareness, and a lack of flexibility (Shields & Cicchetti, 1997)).

It follows that in any experimental design, testing the efficacy of autism-sensitive therapy approaches will need standardized measures of autism-specific factors *and* co-occurring affective and regulatory factors (assessed in an autism-sensitive manner). The former, autism-specific standardized measures (measuring change over time in classical diagnostic criteria) are well established. The latter,

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autism-sensitive standardized measures of emotion regulation and lability over time, are missing from our tool-kit.

In the context of studying therapeutic efficacy, an optimal duration for comparative data (from initial to final data gathering) will take into account any information available on optimal treatment duration (number of therapy sessions) needed for significant therapeutic change. Meta-analyses which take into account treatment-duration are rare, but enough are available for us to tease out a reasonable optimal treatment-duration heuristic. In consideration of significant improvements in social, communication, and emotion domains, optimal treatment-duration is suggested as follows: Play Therapy (child mixed population, including complex needs)-30 + sessions (Leblanc & Ritchie, 2001) and 35–40 sessions (Bratton et al., 2005); Music Therapy (population, "children with serious mental disorders") large effects 16 to 51 sessions (Gold et al., 2009); Creative Movement Therapies (Amonkar et al., 2021) (population, children with autism) including: Music and Movement therapies (32 + sessions), Martial Arts (36–42 sessions), Dance Movement Therapy (24 + sessions, but significance of effect not established in this instance). All noted meta-analyses reported that therapeutic effect was more enduring the more sessions provided (within stipulated ranges). Regarding optimal treatment-duration and therapeutic efficacy, we propose a reasonable working heuristic of 35 + sessions.

This study presents comparative data of emotion regulation over a 10-month period, which allows for research comparison to 35–43 real-world weekly sessions[1] (in alignment with our optimal treatment-duration heuristic). As such, these data will enable future intervention research to measure change in emotion regulation over time with an autism-sensitive measure.

Method

Participants

This paper presents data from the same longitudinal study as Berkovits et al. (2017), a study which employed a battery of standardized autism measures and a range of emotion regulation and behavioral measures when assessing autistic children. After full recruitment and study enrollment, a subset of participants from the larger longitudinal study (N = 156) had data at two time points (Start point and Finish point, 10 months apart) using the Emotion Regulation Checklist (Shields & Cicchetti, 1997). For this paper, we have excluded all subjects who received *psychological or behavioral therapies* during our 10 month participation period (N = 58), leaving *our sample group* (N = 98) to further analyze stability of emotion regulation *without* these types of outpatient or in-home therapies. Missing item responses in our sample group for the ERC was minimal.[2]

Our umbrella term, *psychological or behavioral therapies*, includes any psychological or behavioral therapy applied in a reasonably consistent and structured manner. As such, subjects receiving the following services as reported by parents were excluded from our sample group: Counselling, Applied Behavioral Analysis (ABA), Cognitive Behavioral Therapy (CBT), Parent Child Interaction Therapy (PCIT), Floortime, Relationship Development Intervention (RDI), and Pivotal Response Therapy (PRT). Most of our sample group were receiving *special education (SE) services* and this was not considered a factor for exclusion. Accountable, under this SE label, we include in our sample group participants in receipt of Occupational Therapy, Speech and Language Therapy, social skills group sessions, and ongoing assistance from teaching assistants/aides trained in the basic modality of ABA but not implementing a regular therapy program. We include in our sample group participants in receipt of sporadic psychiatric assessment and advice or who were receiving psychiatric medications, as this is representative of real-world conditions for autistic children.

Participants were recruited through community agencies, preschools, elementary schools, websites, and local autism-specific events. The primary caregivers of all participants provided informed consent for study participation, and IRB approval for all study procedures was obtained.

Inclusion criteria were: (a) diagnosis of an autism spectrum disorder from a full psychological assessment and/or diagnosis of autistic-like behaviors from a school district; *and* (b) child meeting the autism or spectrum cut-off on the Autism Diagnostic Observation Schedule revised research algorithms (which reflect alignment with the DSM-5 and show improved validity over the original algorithms-Gotham et al., 2007, 2008), as well as the Autism Diagnostic Interview-Revised (ADI-R; Lord et al., 1994) (if prior diagnoses only included school district diagnoses)[3]; and (c) IQ ≥ 50 on the Wechsler Preschool and Primary Scales of Intelligence, 3rd Edition (WPPSI-III); and (d) aged 4–8 at Start point.[4]

[1] Real-world therapy will be marked by child absences, holidays, illness etc. In these terms, 10 months is approximately equivalent to 35–43 weekly sessions.

[2] 9 subjects were missing one item out of the 24-item ERC at just one of the two timepoints; these missing items were prorated by obtaining an average of the other algorithm items for that subscale at the same timepoint. 1 subject was missing two items and was therefore excluded from our sample to obtain our N = 98.

[3] Assessed at a prior study visit, up to 6 months prior to Start point.

[4] In line with the age requirement, participants also needed to be entering U.S. grades pre-K to 2.

Table 1 Participant (demographics)

Participant demographic variables	Percentage of sample, or mean (SD)
Age at start point (years)	5.99 (1.09), range: 4–8 years
Gender (male %)	85.7%
Cognitive functioning: estimated FSIQ (WPPSI-III)	90.17 (16.75)
Cognitive functioning: IQ < 70 (all participants IQ > 50)	13.3%
Spoken language level: syntax construction (CASL-2)	84.91 (18.10)
Spoken language level: pragmatic language (CASL-2)	82.76 (17.65)
Currently receiving any special education services	90.7%
ADOS module 1 administered	12.2%
ADOS module 2 administered	34.7%
ADOS module 3 administered	53.1%
Autism characteristics (ADOS revised algorithm)	7.34 (1.85)
Level of autism characteristics (SRS total T-score)	78.12 (11.15)

In the U.S. context of this sample, child race (58.2% White, 14.3% Hispanic or Latinx, 3.1% Asian American, 2.0% Black or African-American, 17.3% multi-racial, 4.1% other, and 1.0% missing) was based on an open-ended, parent-report item later aggregated into categories. The majority of parents (63.2%) reported a gross household income > US $65,000/year

Key demographic information for participants in this presentation (N = 98) are recorded in Table 1.

Emotion Regulation Checklist

The ERC[5] is a 24-item parent-report measure[6] with two subscales (Shields & Cicchetti, 1997). The *emotion regulation* subscale (ERC-ER) assesses children's overall mood, their ability to label and express emotions, and their ability to display appropriate emotions in positive and negative social situations. Higher scores on the ERC-ER represent higher levels of emotion regulation. The *lability/negativity* subscale (ERC-LN) assesses children's lack of flexibility, rapid changes and variation in mood states, dysregulation of negative affect, and a tendency to behave in an overly exuberant manner. Higher scores on the ERC-LN represent higher levels of *dysregulation*. The present study employs the two-factor original structure as presented by Shields and Cicchetti (1997),[7] as *all* subsequent attempts to refine the loading of factors have been shown not to produce significant improvement (Lucas-Molina et al., 2022). An ERC Total-score can also be calculated.[8] Higher scores on the ERC Total-score represent higher levels of emotion regulation.

Measures of reliability for the ERC are high (internal consistency; ERC-LN: $\alpha = 0.96$; ERC-ER: $\alpha = 0.83$), as reported by Shields and Cicchetti (1997). Within the Berkovits et al. (2017) study sample, internal consistencies were also acceptable for the ERC-LN ($\alpha = 0.81$) and ERC-ER ($\alpha = 0.80$) at the initial assessment and for the ERC-LN ($\alpha = 0.85$) and ERC-ER ($\alpha = 0.74$) at the final assessment.

Berkovits et al. (2017) demonstrated significant stability in high levels of emotion regulation *dysfunction* over time in a population of children with diagnoses of ASD (without specific therapeutic intervention): ERC-ER Initial-Final [Paired t-tests = $p > 0.05$; Correlations, $0.78 = p < 0.001$], ERC-LN [Paired t-tests = $p > 0.05$; Correlations, $0.71 = p < 0.001$].

Though the ERC was initially developed for children ages 6–12, it has also been used in children as young as 5 years of age (Graziano et al., 2007). In the Berkovits et al. (2017) study, which had an age range of 4–8 years, no significant age differences in scores were observed for either the ERC-ER ($p = 0.64$) or ERC-LN ($p = 0.35$) as tested via ANOVAs, suggesting that this measure can be used with this slightly younger population.

[5] For free public access to the ERC questionnaire, scoring system, and related articles, you can email: cicchett@umn.edu.

[6] Responses are scored on a 4-point Likert scale: 1 = Never; 2 = Sometimes; 3 = Often; 4 = Almost Always.

[7] ERC-ER subscale is comprised of items 1, 3, 7, 15, 21, and 23 (positively scored) and 16 and 18 (reverse scored). ERC-ER = Sum (1, 3, 7, 15, 21, 23, 16R, and 18R). ERC-LN subscale is comprised of items 2, 6, 8, 10, 13, 14, 17, 19, 20, 22, and 24 (positively scored) and 4, 5, 9, and 11 (reverse scored). ERC-LN = Sum (2,6,8,10,13,14,17,19,20,22,24,4R,5R,9R, and 11R). Note on reverse scoring: (1 = 4) (2 = 3) (3 = 2) (4 = 1). Note: item 12 is not scored for either scale, as it has not loaded on either factor in early validation studies (Shields & Chicchetti, 1997).

[8] To calculate the ERC Total Score, sum all items: 1,2R,3,4,5,6R,7,8R,9,10R,11,13R,14R,15,16R,17R,18R,19R,20R,21,22R,23,24R. (R = reverse score; exclude item 12). Divide this total by 23 for mean Emotion Regulation Total-score.

Table 2 Stability of emotion regulation

	Start point M (SD)	Finish point M (SD)	Paired t-tests (start-finish)	Correlations (start-finish)
Emotion regulation (ERC-ER)	23.82 (4.02)	24.05 (3.88)	p > *.05*	.795 **
Lability/negativity (ERC-LN)	33.74 (6.70)	33.72 (7.17)	p > *.05*	.741 **
Emotion regulation checklist total score (ERC-TOT)	2.83 (0.38)	2.84 (0.41)	p > *.05*	.790 **

**p < .001

Results

Results show a similar level of high stability across the two timepoints as reported in the larger sample in Berkovits et al. (2017). Among children without targeted psychological or behavioral therapies in this sub-sample (N=98), little improvement in emotion regulation is seen as well (Table 2).

In *Online Resorce 1* the ERC-ER data set is presented (N = 98), including individual scores for Start (S), Finish (F), and Percentage Change[9] (ERC-ER-PC) over time (10 months). The ERC-ER-PC showed a Mean[10] of 1.70 (Standard Deviation[11] = 11.07), with a SKEW[12] of 0.67, which is acceptable for a normal or Student's t assumption.[13] Also presented are ERC-ER-PC Percentiles (right-hand tail), enabling the comparison of Single-N study results with the comparative PC data set. The ERC-LN data set is also presented (N = 98), including S, F, and ERC-LN-PC. The ERC-LN-PC showed a Mean of 0.72 (Standard Deviation = 15.02), with a SKEW of 0.41 (acceptable for normal or Student's t assumptions). Also presented are ERC-LN-PC Percentiles (left-hand tail[14]). The ERC Total-score data set is presented (N = 98), including S, F, and ERC Total-score. The ERC Total-score PC showed a Mean of 0.69 (Standard Deviation = 9.30), with a SKEW of 0.39 (acceptable for normal or Student's t assumptions). Also presented are ERC Total-score PC Percentiles (right-hand tail).

Discussion

This paper fills an important gap in our repertoire of measurements of autism-associated mental health symptoms, by providing an autism-specific comparative sample to support intervention studies. Our hope is that future intervention studies can reference this comparative sample[15] to help identify effective ways of improving emotion regulation skills among autistic children. Emotion dysregulation contributes substantially to behavioral challenges and impairment for daily life in this population, yet shows stability over time without specific social-emotional interventions. As such, this is a ripe area for additional therapeutic focus.

Author Contributions All authors contributed to the conception and design of this paper, using previously collected data from the Smooth Sailing Study. Material preparation and analysis were performed by SD and LB. All authors contributed to the draft of the manuscript, and read and approved the final manuscript.

Declarations

Conflict of interest This manuscript was based on the activities of Smooth Sailing, a two-site longitudinal study supported by the Institute of Education Sciences, Grant number R324A110086, J. Blacher, PI, Abbey Eisenhower, co-PI. The Smooth Sailing study was done in collaboration with The Help Group Alliance and Dr. Elizabeth Laugeson. We appreciate the efforts of our doctoral students, staff, and par-

[9] ((F-S)/S)*100.

[10] Excel (Microsoft 10): AVERAGE.

[11] Excel (Microsoft 10): STDEV.P.

[12] Excel (Microsoft 10): SKEW.

[13] Reported *acceptable* ranges vary from (between − 2 to + 2) to (between − 1 to + 1) (George & Mallery, 2010)–so Skew values here fall within acceptable limits of the most extreme reported range.

[14] Remember that for the ERC-LN subscale higher face-value *negative* PC scores = real-world improvements in regulation. As such, use the left-hand tail percentiles here (negative sores) to assess the real-world significance of percentage change in the ERC-LN subscale.

[15] *A note on control groups, ethics, and open-trial effects*: It is, of course, unethical to mislead control group participants (i.e., to inform them that they are participating in therapy, when they are not). It is also functionally impossible to generate conditions in which members of the experimental group are not in some way aware that they are "in therapy". As such, all therapy efficacy studies (which compare non-therapy groups to therapy groups over time) are vulnerable to *open-trial effects,* where labelling might affect outcome. The authors suggest it is reasonable to contextualize this vulnerability with the following assertion: to *know you are in therapy* is an integral psychological factor of the process of being in therapy, whereas *not being in therapy* is likewise a psychological factor of not being. I.e., apparent open-trial effects can be seen as fundamental to process. As we are suggesting there is inevitability and integrity to this *ethics/function vs open-trial-effect* compromise, then the level of vulnerability to open-trial effects remains identical whether the control group is generated within individual study design, or generated from well-matched, randomized external data sources (such as presented here).

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