

REACTIVITY OF EMOTIONS IN ADOLESCENTS – CAREGIVERS’ TOOL (REACT): DEVELOPMENT AND VALIDATION OF A NOVEL PARENT-RATED MEASURE FOR ASSESSING EMOTIONAL DYSREGULATION IN YOUTH

Gianluca Sesso, Fulvio Guccione, Lorenzo Conti, Elena Valente, Antonio Narzisi, Stefano Berloffia, Pamela Fantozzi, Valentina Viglione, Gabriele Masi, Annarita Milone

Abstract

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Objective: Emotional Dysregulation (ED) is characterized by the inability to manage emotions effectively, leading to maladaptive behaviors, and often co-occurs with psychiatric conditions carrying significant long-term consequences. Early diagnosis of ED is thus essential for targeted interventions. To address this need, we developed and validated the “Reactivity of Emotions in Adolescents: Caregivers’ Tool” (REACT), a novel parent-rated questionnaire designed to assess ED in adolescents.

Method: The present study involved two samples, one drawn from the general population (n = 89 healthy controls from local schools) and the other composed of clinical patients (n = 76 adolescents with different psychiatric and/or neurodevelopmental conditions). Patients’ diagnoses were confirmed through the clinical interview K-SADS-PL to explore the presence of any psychopathological conditions. Participants from both groups completed the RlPoSt-Y questionnaire, providing a measure of ED, while their parents filled out the ARI, measuring affective reactivity in youth. Confirmatory and exploratory factor analyses were performed to refine the questionnaire’s internal structure.

Results: The final REACT questionnaire consists of 55 items distributed across three subscales, namely Negative Emotionality, Irritability, and Excitability. Psychometric evaluation showed that these subscales demonstrated excellent internal consistency and strong construct validity, with clinical patients scoring higher on all subscales compared to healthy controls. The REACT questionnaire showed also high convergent validity by exhibiting significant positive correlations with established measures of ED.

Conclusions: This novel tool represents a valuable improvement in the assessment of ED in adolescence as it may facilitate tailored interventions to provide emotional well-being and long-term outcomes.

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1. Introduction

Emotion regulation is a dynamic process that develops since infancy throughout childhood and adolescence (Gross, 2002; McRae & Gross, 2020; Sheppes et al., 2011). Different developmental processes, such as the acquisition of executive functions and language, may influence the maturation of emotional regulation strategies (Carlson & Wang, 2007). Emotional regulation allows for the modulation

of emotions, which are by nature time-limited, situation-bound, and characterized by positive or negative valence. It ultimately refers to the ability to regulate not only negative emotions such as fear, anxiety, rage and stress, but also positive emotions, through processes that, although intentionally, does not always occur consciously (Braunstein et al., 2017; Koole et al., 2015; McRae & Gross, 2020).

Emotional Dysregulation (ED) can be thus considered as the inability to regulate one’s own

emotions in response to both internal and external stimuli (Faraone et al., 2019; Mikita & Stringaris, 2013). Although its definition is still a matter of debate among clinicians, it has been recently suggested to be strongly overlapping with early temperamental features (Pisano et al., 2022) and serves as a vulnerability factor for the development of different psychopathological conditions (Haltigan et al., 2018; Holtmann et al., 2011; Stringaris & Goodman, 2009). Children with ED often present with severe irritability, frequent temper outbursts, mood swings, low frustration tolerance, a low threshold for emotional reactions, inappropriately intense emotional expressions, and slow recovery from emotional episodes from an early age (Masi et al., 2021; Sesso et al., 2021). These symptoms commonly affect negatively children's quality of life and social adjustment (Bunford et al., 2018).

ED typically involves a cyclic pattern of rapid mood swings between opposite extremes, potentially impairing an individual's social and performance functioning, along with an excessive sensitivity to emotionally significant stimuli, resulting in disproportionately intense responses to both negative and positive emotions. Especially during youth, individuals with high ED are more prone to react quickly and intensely than their peers to interpersonal cues including judgement and criticism, which indicates a more pronounced or exaggerated susceptibility to rejection, stemming from feelings of inadequacy, inferiority, and low self-esteem (Masi et al., 2021; Sesso et al., 2021).

More recent perspectives tend to interpret ED as an early-onset, neurodevelopmental, disorder of emotion regulation, which often presents in comorbidity with most psychiatric disorders, further complicating the management of the underlying condition, and is associated with specific biological correlates (Bellato et al., 2024). ED strongly affects developmental trajectories and outcomes, and persistence of ED later in life can lead to different long-term adverse outcomes in adolescence and adulthood, including relational instability, difficulty in maintaining employment, suicidal and self-injurious behaviors, substance abuse, addictive behaviors, etc. (Brancati et al., 2021; Gatta et al., 2023; Gioia et al., 2021; Halac et al., 2021; Holtmann et al., 2011; Masi et al., 2023; McLaughlin et al., 2011; Paulus et al., 2021; Sesso et al., 2022). This theoretical framework suggests that ED could be a shared risk factor for different conditions and thus a common key feature for the development of later psychopathology (Stringaris & Goodman, 2009).

Therefore, early diagnosis of ED across internalizing and externalizing psychopathological domains is paramount to define targeted therapeutic intervention programs. Validated clinical tools may be useful to assess the presence of ED, including self- and parent-rated questionnaires. Among the most reliable and valid tools to assess ED in adults, the Affective Lability Scale (Harvey et al., 1989) and the Emotion Dysregulation Scale (Kröger et al., 2011) are frequently used measures with adequate internal consistency. While Marwaha and colleagues (Marwaha et al., 2014) systematically retrieved all measurements of affective instability employed in adult clinical populations, a recent systematic review is also available for childhood and adolescence (Freitag et al., 2023). In this latter, the authors identified a subset of five measures of emotion regulation and dysregulation that were most widely used in the literature both in clinical and nonclinical settings: the Emotion Regulation Questionnaire for children and adolescents (ERQ-CA) (Gross & John, 2003; Gullone & Taffe, 2012), specifically focusing on strategies of

self-regulation of emotional contents and expression (Expressive Suppression and Cognitive Reappraisal); the Difficulties in Emotion Regulation Scale (DERS) (Weinberg & Klonsky, 2009), with its structure based on six internal factors aimed to explore components of ED conceptualized according to cognitivist theories; the Cognitive Emotion Regulation Questionnaire (CERQ), with a similar internal structure composed of multiple facets of ED (Garnefski et al., 2005); the Emotion Regulation Checklist (ERC) (Reis et al., 2016) and the Children's Emotion Management Scales (CEMS) (Freitag et al., 2023).

Other parent or self-report measures are available to assess ED in youths. The Child Behavior Checklist (CBCL), one of the most commonly and widely employed instruments for the assessment of developmental psychopathology (Achenbach & Rescorla, 2001), has been repeatedly used as a reliable tool to identify children with ED features. Indeed, its Dysregulation Profile (CBCL – DP) is an indirect index of ED, computed as the sum of T-scores in three out of the eight syndrome scales, namely Anxious/Depressed, Attention Problems, and Aggressive Behaviors. Interestingly, this index, initially conceived as a pediatric Bipolar Spectrum Disorder (BSD) related clinical measure (Faraone et al., 2005), is currently considered a measure of a trans-nosographic dysregulation profile (Holtmann et al., 2011; Mbekou et al., 2014; Volk & Todd, 2007; Youngstrom et al., 2005) predicting the risk for poor psychosocial and overall functioning, substance use and suicidality, subsequent diagnoses of BSD and hospitalizations (Biederman et al., 2009; Holtmann et al., 2011). Similarly, higher scores in children with Oppositional Defiant Disorder and/or Conduct Disorder (ODD/CD) are associated with a greater risk for later Attention-Deficit/Hyperactivity Disorder (ADHD) and mood disorder in adolescence (Masi et al., 2015).

Other tools can be also used to explore similar, related or partially overlapping constructs to ED, such as the Affective Reactivity Index (Stringaris et al., 2012), a dimensional measure of irritability and emotional impulsivity in children mental health settings. Similarly, clinical measurements aimed to assess cyclothymia-related temperamental traits including the Cyclothymic-Hypersensitive Temperament (CHT) questionnaire, whose psychometric properties were recently explored in a large school-based community sample of Italian students (Pisano et al., 2020).

Recently, the Reactivity, Intensity, Polarity, and Stability scale – youth version (RIPoSt-Y) (Masi et al., 2021; Sesso et al., 2021) has been adapted and validated to capture the different features of ED in youth based on self-reports of adolescents aged 11 to 18 years old, overcoming the limitations of a mono-dimensional assessment posed by previous measures (e.g., Dysregulation Profile of the Child Behavior Checklist – 6/18). Indeed, the RIPoSt-Y assesses the presence of ED in adolescents across its main subdomains. Among these, Emotional Reactivity has been defined an excessive susceptibility to emotionally salient stimuli, meaning an exaggerated response to both negative and positive emotions. Individuals with high reactivity to emotional contents typically react more quickly and intensely than their peers. This conceptualization partially overlaps with the construct of Irritability, previously defined as a greater propensity for anger compared to peers (Stringaris et al., 2012). In a broader sense, Emotional Reactivity can be regarded as the tendency to react to emotions regardless of their valence or category, in an excessive, sudden, and intense way, and for a longer duration. Thus, it is part of the broader concept of ED and

poses challenges in terms of prognosis and therapeutic response during adolescence.

Therefore, the need to develop a novel parent-rated measure that allows to explore Emotional Reactivity in youth across different subdomains emerged. We thus developed and validated a new questionnaire, the “Reactivity of Emotions in Adolescents: Caregivers’ Tool” (REACT), addressed to parents to assess ED in its various components. Initially, one hundred items were drafted to capture the temporal and intensity dynamics of emotions, based on *a priori* theoretical assumptions. The items were adapted from various other measures of ED commonly used in youth in both clinical and research settings. Based on these assumptions, the present article aims to validate this novel tool in a mixed population of youth.

2. Methods

2.1. Participants

Two samples were recruited for the present study, ranging from 11 to 18 years. The first sample was recruited from the general population between March 2021 and September 2023 and consisted of anonymous healthy volunteers enrolled from local secondary schools through an online survey on a digital platform. The survey link was distributed to students’ parents by the schools. The inclusion criteria were as follows: age between 11 and 18 years, and the ability and willingness to complete self-assessment questionnaires independently. Initially, sociodemographic data were requested, including date of birth, gender, current school type and year. Eighty-nine subjects completed the survey and were thus included in the non-clinical sample [$n = 89$; age: 14.61 ± 1.85 years; gender: 43 girls (48.31%) and 46 boys (51.69%); current school type: 22 lower secondary school (24.72%), 41 Lyceum (46.07%), 20 technical institute (22.47%) and 6 professional institute (6.74%)].

A second sample of seventy-six referred adolescents was consecutively recruited from October 2019 to April 2022 at the Department of Child and Adolescent Psychiatry and Psychopharmacology of the IRCCS Stella Maris Foundation hospital [$n = 67$; age: 14.15 ± 1.73 years; gender: 35 girls (52.24%) and 32 boys (47.76%)]. The inclusion criteria were as follows: age ranging from 11 to 18 years; presence of ED as clinically confirmed based on psychiatric assessment; normal intellectual functioning confirmed through a full neuropsychological evaluation using the Wechsler Intelligence Scale for Children – Fourth Edition (WISC-IV) (either Intelligence Quotient or General Ability Index ≥ 85). This sample included both inpatient and outpatient meeting the diagnostic criteria of the DSM-5 for any psychopathological or neurodevelopmental disorder. Diagnoses were made according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (American Psychiatric Association, 2013), based on medical history, clinical observations, and a semi-structured interview, the Kiddie Schedule for Affective Disorders and Schizophrenia-Present and Lifetime version (K-SADS-PL) (Kaufman et al., 1997), administered by trained child psychiatrists to both patients and parents. This was a transdiagnostic sample of patients exhibiting complex clinical pictures with multiple comorbidities including BSD (80.60%), ADHD (68.66%), ODD/CD (41.79%), Autism Spectrum Disorder (ASD) (32.84%) and other internalizing and/or externalizing conditions. The final sample, including

both clinical patients and healthy controls, was composed of 156 adolescents aged 11 – 18 years [mean age 14.41 ± 1.81 years; 78 boys (50%)].

All participants and their parents were informed about the purpose of their contribution, and participation in the study was voluntary. The study was conducted in accordance with the Declaration of Helsinki and approved by the Regional Ethics Committee for Clinical Trials of Tuscany (Pediatric Ethics Committee at Meyer Children’ Hospital of Florence; 28/09/2022, protocol code Affect2022). All participants and parents were informed about the assessment tools. Informed consent was obtained from students and both their parents or legal guardians, while school principals were informed about the scope and methods of the survey. Participants were allowed to withdraw their consent at any time during and after completing the questionnaires.

2.2. Clinical measures

The clinical assessment of patients included the administration of the K-SADS-PL clinical interview (Kaufman et al., 1997) to both patients and parents to confirm the diagnosis. Parents of both patients and controls were asked to complete the Affective Reactivity Index (ARI) (Stringaris et al., 2012), a six-item questionnaire investigating the presence of irritability and impulsivity in children (e.g. “gets easily annoyed by others”), with a seventh item assessing clinical severity. This measure showed excellent internal consistency (Stringaris et al., 2012) as well as high convergent validity and test-retest reliability in later studies. Adolescents were instead asked to complete the Reactivity, Intensity, Polarity and Stability – Youth Version (RIPoSt-Y) (Masi et al., 2021; Sesso et al., 2021), a self-rated 31-item questionnaire (e.g. “my cycles of ups and downs tend to recur”) administered to evaluate the presence of ED through a multidimensional assessment that includes three factors [Affective Instability (AI), Emotional Reactivity (ER) and Interpersonal Sensitivity (IS)] with corresponding clinical cut-offs. The instrument showed good test-retest reliability, excellent internal consistency and significant construct, concurrent and convergent validity with other measures of ED (Masi et al., 2021; Sesso et al., 2021).

2.3. The REACT questionnaire

Parents or caregivers of all participants were also asked to complete the Italian original 100-item version of the REACT scale. Responses were given on a 5-point Likert scale, ranging from the following scores: 1 = completely disagree, 2 = partially disagree, 3 = neither agree nor disagree, 4 = partially agree, 5 = completely agree. Items were theoretically adapted from several other measures of ED commonly used in youth both in clinical and research settings, including the ARI, the RIPoSt-Y, the ERQ-CA, the DERS, the ERC and the CERQ which have been described before. Three authors (G.S., F.G. and L.C.) developed the original list of items, under the expert supervision of two seniors (G.M. and A.M.) One-hundred items were originally drafted in order to capture the temporal and intensity dynamics correlates of Emotion Reactivity including the Threshold and Latency of emotion-induced arousal, the Intensity and Persistence of the emotional response and the Frequency of emotional shifts. These five first-order dynamics-related factors based on *a priori* theoretical assumptions (Faraone et al., 2019) were also defined for each of four primary emotions, namely Anger, Fear, Sadness and Joy.

2.4. Factor analysis

Since the development of the scale was based on a strong theoretical assumption, a Confirmatory Factor Analysis (CFA) was first conducted using the *lavaan* package of RStudio® software. One model was specified that included five dynamics-related factors (Threshold, Latency, Intensity, Persistence and Frequency), as previously described. Acceptability of the model fit was evaluated with the Root Mean Square Error of Approximation (RMSEA < 0.06), the Comparative Fit Index (CFI > 0.95), the Tucker-Lewis index (TLI > 0.95), the Standardized Root Mean Square Residual (SRMR ≤ 0.10) and the χ^2 test (p -value > 0.05). Whenever this model did not result to be satisfactorily adequate, a different factor structure of the questionnaire was explored based on a series of Principal Component Analysis.

2.5. Items selection and psychometric assessment

data from both samples were initially used to identify items to retain and assess the validity of the empirically derived subscales from the REACT questionnaire. Items were initially excluded based on response frequency whether insufficient variation was identified (i.e., more than 70% of responses in a single category) or ceiling/floor effect was detected (i.e., more than 90% of responses in the first/last three categories). To avoid items redundancy, inter-item Spearman's rank correlation coefficients were computed and pairs of items exhibiting strong correlations (i.e., coefficients $r > 0.8$) were identified, of which at least one item was excluded. Additionally, items that were unrelated to most of the other items (i.e., correlations with more than 70% [$n = 90$] of the remaining items with coefficients $r < 0.3$) were discarded. Finally, items that were negatively associated with most of the other items (i.e., correlations with more than 50% [$n = 50$] of the remaining items with coefficients $r < 0$) were identified and carefully inspected to assess the need for reverse-coding.

The Kaiser-Meyer-Olkin measure and Bartlett's sphericity test were computed to assess the adequacy of the item sampling and their suitability for the subsequent factor analysis. Subsequently, to determine the number of factors to retain, a series of consecutive Principal Component Analyses (PCA) was performed, and subscale scores were calculated as the sum of individual responses on items loading on the same component for each participant. Internal consistency of the final internal factors was then assessed in the entire sample based on Cronbach's alpha and McDonald's omega coefficients. The construct validity of the REACT questionnaire was assessed by comparing clinical and control groups by means of ANCOVA using age and gender as covariates of the models. Convergent validity was also assessed by computing Pearson's r correlations coefficients with other clinical questionnaires, namely the ARI and the RlPoSt-Y.

3. Results

3.1. Confirmatory factor analysis

A confirmatory factor analysis was first conducted on the initial structure of the REACT questionnaire according to the original five-factor model. The χ^2 test was significant ($\chi^2 = 9761.839$, $p < 0.0001$), indicating that the original model exhibited a crucial reliability

criterion. However, based on other reliability indices of the scale [CFI = 0.785, TLI = 0.776, RMSEA = 0.089 (0.085 – 0.094; $p < 0.0001$), SRMR = 0.062], the five-factor model did not prove to be satisfactorily adequate.

3.2. Development of the scale

No subjects were identified as multivariate outliers with unusual or idiosyncratic response patterns based on Mahalanobis distance and visual inspection of the Q-Q plot. Due to reduced variability and Ceiling/Floor effects, five items (5 – 11 – 61 – 79 – 86) and four items (41 – 42 – 63 – 67) were excluded, respectively. To avoid item redundancy, Spearman's rank correlation coefficients were calculated between items, and pairs of items with strong correlations were identified, of which five were excluded (31 – 51 – 53 – 85 – 90 – 99). Additionally, two items (9 – 62) that were not correlated with most of the other items were discarded. Finally, no item was negatively associated with most of the other items and then code reversed.

Eighty-three items were thus retained for EFA. The Kaiser-Meyer-Olkin value for the Sampling Adequacy Measure was 0.91, and Bartlett's sphericity test resulted in a $p < 0.0001$; thus, the sample was suitable for the subsequent factor analysis. Three consecutive Principal Component Analyses (PCA) were performed with Promax oblique rotation based on the corresponding number of components to be extracted. The first parallel analysis conducted on eighty-three items suggested a three-factor solution, and, therefore, three components were initially extracted. The first PCA was carried out, and 21 items with loadings < 0.6 on any factor were removed (1 – 2 – 4 – 10 – 12 – 14 – 23 – 28 – 38 – 57 – 60 – 65 – 69 – 73 – 78 – 87 – 91 – 93 – 96 – 97 – 98), while sixty-two items were retained.

The second parallel analysis conducted on sixty-two items suggested a three-factor solution. After the second PCA was performed, five items resulted to show weak correlations with the overall score of each respective subscale (6 – 44 – 45 – 59 – 82) and were eliminated because the corresponding correlation coefficient between the item and scale was $r < 0.6$. The third parallel analysis conducted on fifty-seven items suggested a three-factor solution. After the third and last PCA was conducted, two items exhibited weak loadings < 0.6 on their respective factors (9 – 49) and were eliminated. Fifty-five items out of the original one hundred were ultimately retained in the final structure of the REACT scale, and three factors extracted. Scores of the corresponding subscales were calculated as the sum of individual responses on items loading on the same component for each participant. Values of proportional and cumulative variance of each component identified through the EFA and loadings of the fifty-five items on each component are shown in **table 1**.

3.3. Psychometric properties of the questionnaire

fifty-five items were finally retained and distributed among three subscales identified through the EFA (see **table 2**). The assignment of the corresponding psychometric property measured by each of the three factors in the final structure of the questionnaire was carried out based on a qualitative evaluation of the content of the items within each factor. Particularly, the three components identified were labeled as *Negative Emotionality*, *Irritability* and *Excitability*. Scores for each subscale were obtained by summing the scores on

all the included items.

Internal consistency was assessed in the entire sample, including patients and healthy controls, and the related results are reported in **table 3**. The Cronbach's alpha and McDonald's omega coefficients were excellent ($\alpha > 0.90$, $\omega > 0.90$) for all subscales; the correlations between items and subscales were also generally moderate to strong for the Negative Emotionality and Excitability subscales ($r > 0.60$) and strong for the Irritability subscale ($r > 0.70$).

Construct validity of the REACT questionnaire was assessed by comparing clinical and control groups. Although the two groups did not significantly differ in age and gender distribution, differences in REACT subscale scores were controlled for these demographic variables. ANCOVA and related *post-hoc* analyses conducted for each factor as dependent variables yielded highly significant effects of the group, with clinical patients showing significantly higher scores than healthy controls in all subscales (*Negative Emotionality*: Group: $F = 61.90$; $p < 0.0001^*$; Gender: $F = 0.15$; $p = 0.7000$; Age: $F = 0.79$; $p = 0.3700$; *Excitability*: Group: $F = 27.21$; $p < 0.0001^*$; Gender: $F = 0.15$; $p = 0.6990$; Age: $F = 3.19$; $p = 0.0760$; *Irritability*: Group: $F = 59.69$; $p < 0.0001^*$; Gender: $F = 12.88$; $p = 0.0005^*$; Age: $F = 1.92$; $p = 0.1674$). From the analysis, no significant effects emerged for demographic variables, except for the Irritability subscale, where boys showed significantly higher scores than girls. Comparisons of scores in all REACT subscales between the patients sample and the healthy control sample are also represented in boxplots (see **figure 1**).

The validity of the REACT questionnaire (see **table 4**) was also assessed through Pearson's correlations with other measures of ED. Highly significant positive associations emerged between all REACT subscales and the Affective Instability and Emotional Reactivity subscales of the RlPoSt-Y. There were also

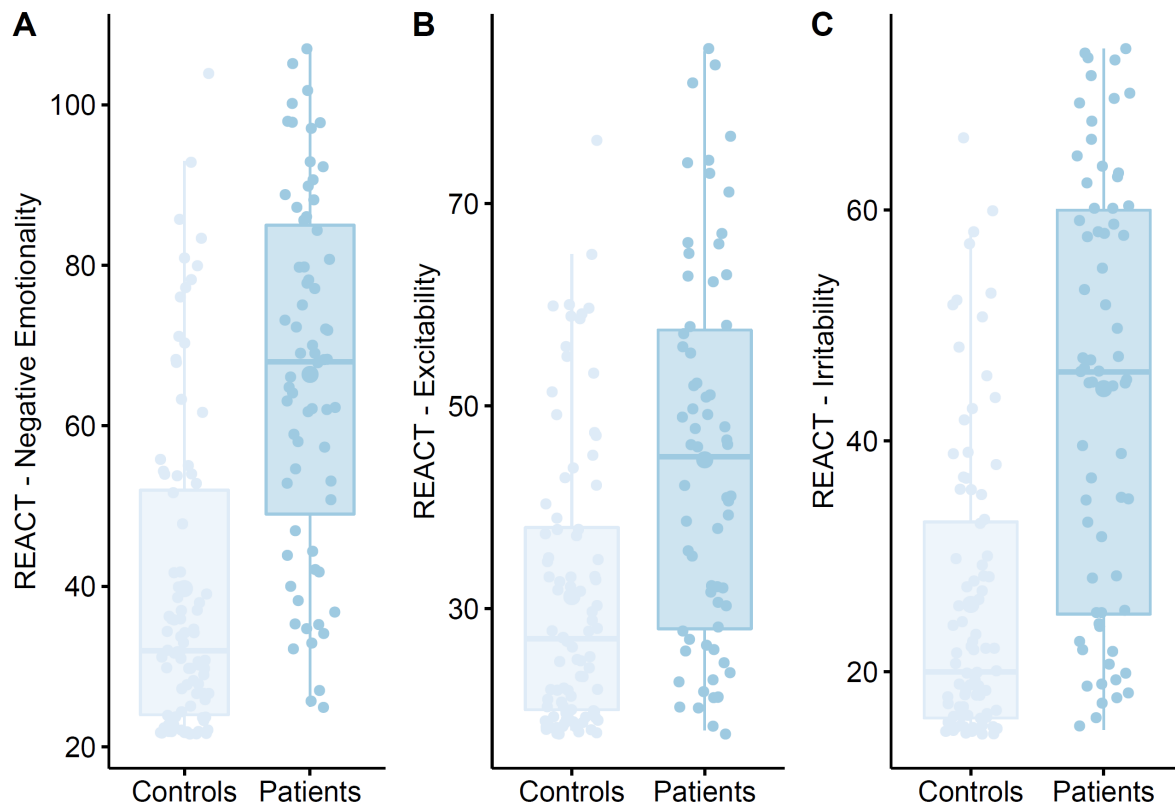
highly significant positive associations between the Irritability subscale of the REACT and the total score and impairment item of the ARI, as well as between the Excitability subscale of the REACT and the impairment item of the ARI.

4. Discussion

The present article explores the development and validation of a novel clinical measure, the "Reactivity of Emotions in Adolescents: Caregivers' Tool" (REACT), designed to assess Emotional Dysregulation (ED) in adolescents through parent reports. Our findings indicate that the REACT is a reliable and valid instrument for measuring ED in adolescents, as evidenced by its robust psychometric properties and significant correlations with established measures of emotion dysregulation. Previous research has emphasized the importance of early diagnosis and intervention to mitigate the adverse long-term consequences associated with ED, such as relational instability, difficulty in maintaining employment, and susceptibility to psychiatric disorders (Paulus et al., 2021). One of the significant contributions of this novel tool is that it is based on parent reports, which provide a valuable perspective on adolescents' emotional regulation capabilities. Parent reports are crucial, especially in clinical settings where self-reports may be limited by the child's developmental stage or insight into their emotional processes. The REACT offers a comprehensive tool for parents to report on their children's emotional dysregulation symptoms, thereby aiding clinicians in early identification and intervention.

Items were originally drafted based on several other measures of ED commonly used in youth both in clinical and research settings and adapted to be rated by parents or caregivers. One-hundred items were initially

Figure 1. Scores in REACT subscales in clinical patients versus healthy controls



in order to capture the temporal and intensity dynamics correlates of Emotion Reactivity: the Threshold and Latency of emotion-induced arousal, the Intensity and Persistence of the emotional response and the Frequency of emotional shifts. Thus, five dynamics-related factors based on *a priori* theoretical assumptions were defined for each of four primary emotions, namely Anger, Fear, Sadness and Joy.

A Confirmatory Factor Analysis (CFA) first attempted to validate the original structure of the REACT questionnaire, which was based on *a priori* theoretical assumptions. However, the CFA indicated that the original model was not adequately fit, leading us to explore a different factor structure through a series of Principal Component Analyses. Through a systematic process of item selection and psychometric assessment, we refined the internal structure of the questionnaire, ultimately retaining 55 items across three factors: *Negative Emotionality*, *Irritability*, and *Excitability*. Interestingly, previous literature showed that irritability, excitability, and negative affectivity, as different facets of ED, can be reliably separated in youth using Exploratory Factor Analysis, with irritability and excitability predicting the later development of mood and externalizing disorders, emotion lability and global functioning (A C Vogel et al., 2021; Alecia C Vogel et al., 2019). Such findings underscore the importance of separating positive and negative, affect dysregulation as early predictors of later psychopathology.

The *Negative Emotionality* subscale, through its 22 items, explores the propensity to experience strong negative feelings, such as sadness, dissatisfaction, worry, and anxiety. This conceptualization strongly overlaps with that of neuroticism, depressive and anxious temperament (Masi et al., 2003). This subscale demonstrated an excellent internal consistency, and a significantly high construct validity. Particularly, our analyses revealed higher scores in the patient group relative to healthy controls, as well as significant positive correlations with all subscales of the RlPoSt-Y.

The *Excitability* subscale, with its 18 items, is aimed to assess symptoms of hyperarousal, that is the tendency to experience sudden and strong feelings of both polarity, such as euphoria, joy, enthusiasm and exuberance, as well as fear and anxiety. Individuals with high scores on this subscale are, indeed, expected to react more rapidly and more intensely than peers to sudden internal and external stimuli. Interestingly, previous studies showed that dysregulation in positive affect can be examined from temperamental, developmental, and clinical perspectives, and that excitability may be associated with increased risk of externalizing symptoms and clinical impairment in youth (Alecia C Vogel et al., 2023). Such subscale showed an excellent internal consistency and a significantly high construct validity. Particularly, we found significantly higher scores in the patient group than controls. Moreover, significant positive correlations were also found with the ARI severity item and the Affective Instability and Emotional Reactivity subscales of the RlPoSt-Y.

Finally, the *Irritability* subscale, consisting of 15 items, reflects the presence of a greater propensity for anger compared to peers, or rather the tendency to violently react to frustration in an excessive, sudden, and intense way, and for a longer duration. This subscale exhibited an excellent internal consistency, along with a significantly high construct validity. Significantly higher scores were reported by the patient group than controls. Significant positive associations emerged with the ARI total score and severity items, as expected, and the Affective Instability and Emotional Reactivity

subscales of the RlPoSt-Y.

Overall, our study successfully proved the reliability and validity of the novel REACT questionnaire, a promising tool for assessing ED in adolescents across its various components. The development of the REACT questionnaire is a valuable contribution to the field of adolescent mental health assessment. Its potential to identify and differentiate specific components of ED could be instrumental in tailoring interventions to the unique needs of individual adolescents, ultimately improving their emotional well-being and long-term outcomes. Our study sets a strong foundation for future research and clinical applications in the assessment and treatment of ED in youth.

Despite the promising findings, this study has some limitations that warrant further consideration. Firstly, the relatively sample size, while adequate for initial validation of the instrument, potentially limits the generalizability of the results. Future research should aim to include larger populations, although the transdiagnostic nature of our sample ensured the external validity of the scale. The cross-sectional design of this study does not allow for the assessment of the predictive validity of the questionnaire or its sensitivity to changes in ED over time. Longitudinal studies will be welcome to evaluate how well the REACT predicts future clinical outcomes and to determine its utility in monitoring changes in ED in response to interventions. Additionally, the reliance on parent reports, while valuable, may introduce bias due to subjective perceptions and varying parental insight into their children's emotional states. Incorporating multi-informant approaches, including self-reports from adolescents and reports from teachers or clinicians, could provide a more comprehensive assessment of emotional dysregulation. Finally, cultural factors were not considered in this study, and the applicability of the REACT across different cultural contexts remains to be explored. Future research should investigate the cross-cultural validity of the REACT to ensure its effectiveness in diverse settings.

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