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Genuine and non-genuine smiles in individuals meeting criteria for a clinical high-risk syndrome

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Abstract

Aim: Psychosis is characterized by both alterations in emotional functioning and environmental stressors including bullying victimization. Recent evidence suggests that some alterations in emotional functioning (e.g., blunted positive facial expressions) are already present in the psychosis risk period. Yet, some clinically relevant facial emotions have not been investigated such as genuine smiles (thought to reflect genuine positive emotions) and non-genuine smiles (thought to fake positive or mask negative emotions) in individuals meeting criteria for a clinical high-risk (CHR) syndrome. Further, despite a compelling conceptual basis to suggest a link between affective expression and exposure to environmental stress, to date, no investigations have sought to examine this association. Here, we aim to assess differences between a sample of CHR (N = 65) and control (N = 67) individuals in genuine and non-genuine smiles and associations with bullying victimization.

Methods: Smiles (i.e., genuine; non-genuine) were objectively coded on a second-by-second basis using the Facial Action Coding System during a digitally recorded clinical interview segment. Bullying victimization was measured via parent report.

Results: Findings revealed that the CHR group (1) showed blunted genuine (but not non-genuine) smiles compared to controls. Moreover, (2) bullying victimization was related to blunted genuine smiles, but not non-genuine smiles.

Conclusion: These findings expand our understanding of emotional alterations in this group with implications for diagnosis (highlighting blunted genuine smiles as a specific marker) and etiology (underscoring the role of bullying victimization in the etiology of emotional dysfunction).

KEYWORDS
bullying victimization, clinical high-risk, genuine and non-genuine smiles, positive emotions, psychosis spectrum

1 | INTRODUCTION

Alterations in emotional functioning are a hallmark of psychosis (Andreasen, 1982; Kirkpatrick et al., 2006; Kring & Caponigro, 2010; Kring & Elis, 2013). Additionally, studies show that alterations in facial expressions of emotion are present among individuals with a clinical high-risk (CHR) syndrome (Gupta et al., 2019; Gupta et al., 2020; Miller et al., 2003). These individuals are at a heightened risk for transitioning to a psychotic disorder in a short period of time (Cannon et al., 2008; Fusar-Poli et al., 2012; Fusar-Poli et al., 2013) and have high-comorbidity rates with other non-psychotic disorders (e.g., mood disorders) (Fusar-Poli et al., 2014). Furthermore, blunted facial

expressions are often observed in non-psychotic disorders such as those with depression (Davies et al., 2016; Sobin & Sackeim, 1997). Emerging work has suggested that rather than blunting across the board, individuals in this group show *selective blunting* of positive (but not negative) facial expressions (Gupta et al., 2019). While our understanding of emotional functioning prior to the onset of psychosis is growing, an area of research that is more established is the role of bullying victimization in the etiology of psychosis (Corcoran et al., 2003; Vargas, Damme, & Mittal, 2019). To date, the relationship between facial expressions and bullying victimization in this group is unknown. Understanding these relationships can inform the etiology of psychosis, development of intervention and prevention strategies, and emotional processing conceptualizations.

Alterations in emotional functioning are already present in the prodromal period among individuals with a CHR syndrome (Addington et al., 2008; Amminger et al., 2011; Gupta et al., 2021; Kohler et al., 2014; Strauss et al., 2020). Previous work has shown that blunting in select facial expressions, particularly blunted expressions of joy (i.e., smiling), is one notable feature in CHR groups (Gupta et al., 2019; Gupta et al., 2020; Strauss et al., 2020). Smiling serves important functions in daily life and is related to work outcomes, well-being, and mental health (Barger & Grandey, 2006; Harker & Keltner, 2001; Keltner & Gross, 1999; Papa & Bonanno, 2008). Furthermore, they play a key role in the emotion generation process (Levenson, 1999); provide important interoceptive cues (James, 1884; Noah et al., 2018); and they play a key role in social relationships (Gray et al., 2011; Keltner, 2009).

Yet, not all smiles are the same. Smiles can include *genuine* (i.e., smiles involving the movement of two facial muscles—the zygomatic major muscle (lip corner raise) and the orbicularis oculi muscle (cheek raise to form crow's feet around the eyes) and *non-genuine* smiles (i.e., smiles without movement of the orbicularis oculi muscle) (Ekman & Friesen, 1982), and they differ in terms of anatomy, correlates and consequences (Ekman et al., 1981; Ekman et al., 1990; Ekman & Friesen, 1982; Frank et al., 1993; Keltner & Bonanno, 1997; Papa & Bonanno, 2008). *Genuine smiles* are thought to reflect genuine positive emotions (e.g., enjoyment, amusement) and are difficult to produce voluntarily. Furthermore, many of the existing studies find that when smiles have benefits, these benefits stem specifically from genuine (rather than non-genuine) smiles (Davidson et al., 1990; Ekman et al., 1990; Ekman & Friesen, 1982; Keltner & Bonanno, 1997; Papa & Bonanno, 2008; Soussignan, 2002). *Non-genuine smiles* can be produced voluntarily and are thought to communicate positive emotion that is not really there or mask negative emotions (e.g., embarrassment) (Davidson et al., 1990; Ekman & Friesen, 1982; Keltner & Bonanno, 1997; Papa & Bonanno, 2008; Soussignan, 2002). To date, there is some work documenting reduced genuine smiles in samples of individuals diagnosed with schizophrenia (Krause et al., 1989); however, there are no studies examining these smiles prior to the onset of psychosis.

Research on sources of emotional alterations in individuals with a CHR syndrome is sparse, but one candidate source is environmental stress—which can include bullying victimization (Tognin et al., 2020). There is evidence of relationships between facial expressions and broader environmental stressors such as a history of sexual harassment in individuals diagnosed with schizophrenia (Yildirim et al., 2014). In CHR groups, increasing evidence indicates that individuals endorsing CHR syndromes are more likely to report experiencing bullying victimization when compared to healthy controls (Catone et al., 2015; Valmaggia et al., 2015). To our knowledge, there is one study that has assessed the relationship between emotional processes and bullying victimization in individuals endorsing CHR syndromes (Tognin et al., 2020), with no studies investigating relationships between smiles and bullying victimization. Given that adolescence is a sensitive developmental period with increasing demands that result in increased stress exposure (Fuhrmann et al., 2015; Konrad et al., 2013), and smiles serve adaptive functions, there is a utility in investigating the interplay between smiles and bullying victimization in this risk group.

The present study sought to determine whether individuals with a CHR syndrome exhibit alterations in specific types of smiles, genuine and non-genuine smiles, when compared to healthy controls. Based on prior work (Gupta et al., 2019), we expected the CHR group to display blunting in smiles when compared to controls. Further, the present study sought to examine links between smiles and bullying victimization in the CHR group. Given evidence of links between emotional processes and environmental stress in both schizophrenia and CHR groups (Tognin et al., 2020; Yildirim et al., 2014), we hypothesized that reduced smiles would be related to bullying victimization in this group.

2 | METHOD

2.1 | Participants and procedure

A total of 132 participants (65 individuals with a CHR syndrome and 67 healthy controls), aged 12–21 (M = 18.30, SD = 2.33) were recruited using a variety of methods (e.g., e-mail announcements, newspaper advertisements, flyers, community health referrals through the Adolescent Development and Preventive Treatment (ADAPT) Program. Although the sample was not entirely composed of referred participants, participants were, for the large part, help-seeking and quite symptomatic. Along these lines, self/family referrals have been found to be a recruitment stream in our studies as well as across other sites (Addington et al., 2012; Addington et al., 2015; Yee et al., 2020). Exclusion criteria for all participants included the presence of neurological disorders, head injury, substance dependence, and IQ < 70. Furthermore, individuals that met for a psychotic disorder (e.g., schizophrenia) were excluded. The University of Colorado Boulder Institutional Review Board approved the study.

The Structured Interview for Prodromal Syndromes (SIPS) (Miller et al., 2003) was used to identify a CHR syndrome—a standardized approach in the field (McGlashan et al., 2001). This was defined by endorsing attenuated positive symptoms, having a family history of psychosis, or a decline in global functioning accompanying the

presence of schizotypal personality disorder (Miller et al., 2003). The Structured Clinical Interview for the DSM-IV Axis I Disorders (SCID) was also administered to rule out a psychotic disorder diagnosis (First et al., 1997). Training of interviewers was conducted during a two-month period for both clinical interviews (i.e., SIPS and SCID), and all interviewers were reliable (κ ≥ .80). All participants included in this study consented to be video recorded during clinical interviews, and all interviews were videotaped.

2.2 | Measures

2.2.1 | Smiles

Smiles were objectively measured for in a sample of participants with available and usable video data (N = 84; 42 with a CHR syndrome and 42 controls) using the Facial Action Coding System (FACS); a comprehensive, anatomically based system for objectively measuring visually discernible facial activity (Ekman & Friesen, 1978). FACS uses action units (AUs) to describe facial muscle activity (e.g., AU 6 is the label for cheeks raising) that are labeled by trained coders in static images or in video segments (labels occur on a second-by-second basis in the video) and is considered a well-established approach to facial coding. The first 1-minute of the SIPS interview was FACS coded with another trained rater to establish inter-rater agreement in line with previous studies analyzing facial expressions in CHR samples (Gupta et al., 2020) as well as healthy populations (Ambady & Rosenthal, 1992). Each coder completed FACS training (estimated to take between 50 and 100 hours) and successfully passed the FACS certification test to demonstrate proficiency (Cohn et al., 2007). The content of the interviews contained neutral information (e.g., discussing information about demographics such as asking about age) (Gupta et al., 2019). Additionally, interviews were FACS coded with special attention to AUs that are related to the emotional category of smiles. Specifically, the following AUs were coded: AU1 (inner brow raise), AU2 (outer brow raise), AU4 (brow lower), AU5 (upper lid raise), AU6 (cheek raise), AU12 (lip corner puller), and AU25 (lips part). An additional category 'AU12 mixed with' was coded when AU12 occurred together with an additional AU such as AU7 (lid tightener), AU9 (nose wrinkle), AU10 (upper lip raise), AU14 (dimpler), AU15 (lip corner depressor), AU20 (lip stretch) and AU24 (lip presser) because some of these AUs could act as disqualifiers of a genuine smile. The intensity of each AU (0 = no expression, 1 = slight, 2 = moderate, 3 = strong) was coded.

Genuine and non-genuine smiles

Based on prior work (Johnson et al., 2017), genuine smiles were defined as the movement of both the zygomatic major muscle (i.e., AU 12; lip corner raise) as well as the orbicularis oculi muscle (i.e., AU 6; cheek raise). Genuine smiles were calculated by taking the average intensity of the apexes of the AU 12 s that were expressed during the duration of participants' genuine smiles. Non-genuine smiles were defined as the movement of the zygomatic major muscle (i.e., AU 12; lip corner raise), but did not involve the movement of the orbicularis oculi muscle (i.e., AU 6; cheek raise) around the eyes. In addition, genuine smiles that were accompanied by additional muscle movements (e.g., AUs 4, 7, 9, 10, 14, 15, 20, 24) served as disqualifiers of genuine smiles and were defined as non-genuine smiles. Non-genuine smiles were calculated by taking the average intensity of the apexes of the AU 12 s that were expressed during the duration of participants' non-genuine smiles. This criteria for coding genuine and non-genuine smiles was consistent with Johnson and colleagues (Johnson et al., 2017). To assess intercoder agreement, two coders coded an overlap of eight videos (10%) of participants' videos. Inter-rater agreement was calculated using Cronbach's alpha and was satisfactory (.76).

2.2.2 | Bullying victimization

Bullying victimization data were available for a sample of N = 104 and were measured via parental report. Specifically, parents completed the Autism-Tics, ADHD, and other Comorbidities inventory (A-TAC) which asks, (1) 'Is he/she easily teased?' (1 = yes, 0 = no) and (2) 'Has she/he been bullied by other children in school?' (1 = yes, 0 = no) (Larson et al., 2013) as well as the Social Responsiveness Scale (SRS), which asks whether the child 'gets teased a lot' (1 = yes, 0 = no) (Constantino et al., 2003). Bullying victimization was dichotomized, and scores ranged from 0 (no bullying) to 1 (endorsed at least one of the three items).

2.3 | Statistical approach

To assess for demographic differences between groups, independent t-tests and chi-square tests were employed for continuous and categorical variables, respectively. In terms of normality tests, an examination of skew and kurtosis suggested our data were not highly skewed and, thus, parametric tests were applied. Given high rates of comorbidity within CHR groups (Fusar-Poli et al., 2014), Pearson correlations were used to assess whether blunted smiles were related to depressive symptoms, which were measured using the Beck Depression Inventory (BDI; Beck et al., 1996). Independent sample t-tests were employed to determine group differences in smiles and bullying victimization. Pearson correlations were used to investigate relationships between smiles and bullying victimization within a subsample of the CHR group with available data (N = 56). Overall, our sample size included a total of 84 participants with available and usable video data for FACS coding and 104 individuals with available bullying parent data. It is important to note that controlling for sex and age did not change the direction or magnitude of the findings. Analyses assessing frequency were also employed in efforts to support the interpretation of intensity findings and ensure individuals were displaying facial expressions. Frequency findings are indicated in footnotes below.

3 | RESULTS

3.1 | Sociodemographic characteristics

As shown in Table 1, the CHR group did not differ from controls in age, t (130) = 1.56, p = .12, or parental education, t (124) = −.28, p = .78, but did differ in biological sex, χ^2 (1) = 5.15, p = .02. Additionally, the CHR group was more likely to report bullying victimization, χ^2 (1) = 5.67, p = .02, compared to controls. Notably, the CHR group showed a range of frequencies of smiles for genuine (0–31) and non-genuine (2–45) smiles. The average frequency was 6.67 (8.05) for genuine smiles and 19.19 (10.86) for non-genuine smiles. For the control group, the average frequency was 19.19 (14.10) for genuine smiles and 17.45 (7.98) for non-genuine smiles. These frequency data suggest there were ample instances of smiles during the video clip. In the CHR group, depressive symptoms were not associated with genuine, r = .15, p = .37, or non-genuine smiles, r = −.02, p = .89.

3.2 | Group differences in genuine and non-genuine smiles

As shown in Figure 1, findings revealed the CHR group showed significantly blunted genuine smiles when compared to controls, t (82) = −3.29, p = .001; d = .72. However, there were no significant differences in non-genuine smiles between groups, t(82) = −.09, p = .93.[1]

3.3 | Associations between smiles and bullying victimization within the CHR group

As shown in Figure 2, those in the CHR group who had blunted genuine smiles were more likely to report bullying victimization, r = −.40, p = .04, but bullying victimization was not associated with non-genuine smiles, r = −.15, p = .45.[2]

TABLE 1 Demographic and symptom details

	CHR	Control	Statistic	p
N = 132[a]				
Age	18.62 (1.81)	17.99 (2.73)	t(130) = 1.56	.12
Biological sex			χ^2 (1) = 5.15	.02
Male	40	28		
Female	25	39		
Total	65	67		
Parent education	31.21 (4.40)	31.46 (5.59)	t(124) = −.28	.78
BDI	19.25 (11.28)	4.00 (4.28)	t(78) = 8.12	<.001
Positive symptoms	11.83 (4.58)	.64 (1.36)	t(130) = 19.15	<.001
Bullying victimization			χ^2 (1) = 5.67	.02
History of BV	25	14		
No history of BV	26	39		
Total	51	53		
N = 84[b]				
Smiles				
Genuine smiles	1.96 (1.53)	2.79 (.56)	t(82) = −3.29	.001
Non-genuine smiles	1.75 (.39)	1.75 (.37)	t(82) = −.09	.93
Age	18.91 (1.91)	18.12 (2.61)	t(82) = 1.58	.12
Biological sex			χ^2 (1) = 5.93	.02
Male	23	12		
Female	19	30		
Total	42	42		
Parent education	31.03 (4.20)	31.49 (5.68)	t(79) = −.42	.68
BDI	19.35 (11.28)	4.00 (4.28)	t(78) = 8.12	<.001
Positive symptoms	11.69 (4.70)	.45 (1.20)	t(82) = 15.01	<.001

Note: Individuals meeting criteria for a clinical high-risk syndrome (CHR); parental education is the average of mother and father education combined; parent education and age are in years; biological sex is represented in counts; mean and SD for age, parental education, positive symptoms, bullying victimization and smiles are shown; positive symptoms are average sum scores from the Structured Interview for Psychosis-Risk Syndromes (SIPS); bullying victimization is represented in counts.
[a]N = 132 was the sample size used to conduct analyses of group differences in age, biological sex, parental education, positive symptoms, depressive symptoms and bullying victimization.
[b]N = 84 was the sample size used to conduct analyses of differences in smiles.

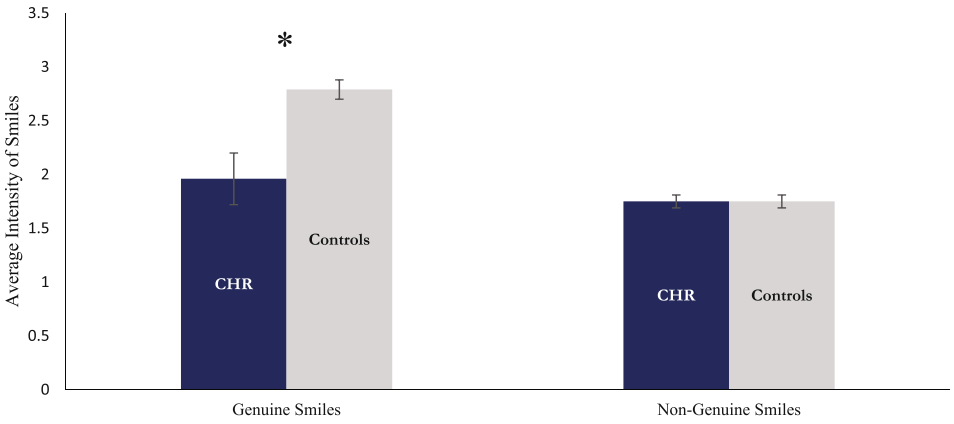

FIGURE 1 Genuine and non-genuine smile intensity in those meeting criteria for a clinical high-risk syndrome and controls. *p < 05. Error bars represent standard errors

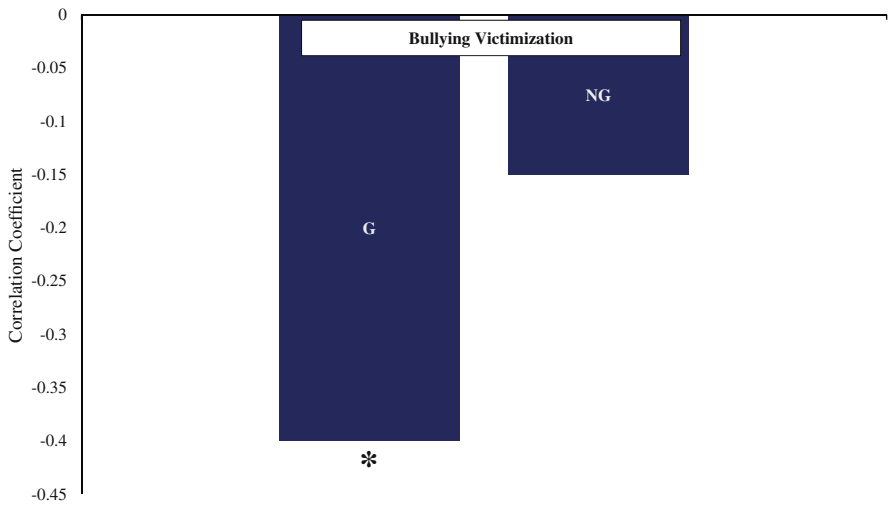

FIGURE 2 Association between bullying victimization and smiles in those considered meeting criteria for a clinical high-risk syndrome. Genuine smiles (G); non-genuine smiles (NG); *$p \leq .05$. N = 51

4 | DISCUSSION

Blunting in positive emotions broadly (Kring & Elis, 2013) and at the level of facial expressions specifically (Krause et al., 1989) are hallmark features of psychosis. Drawing from affective science, the present study was the first to use an objective, anatomically based coding system, FACS (Ekman & Friesen, 1978), to examine genuine and non-genuine smiles in individuals with a CHR syndrome. Findings revealed that the CHR group showed blunted genuine smiles, but no alterations in non-genuine smiles, when compared to healthy controls. Furthermore, the present study found that those in the CHR group who were more likely to report bullying victimization showed blunted genuine smiles.

Findings suggesting blunted facial expressions of joy (i.e., smiles) are in line with previous studies (Gupta et al., 2020). Facial expressions of emotions can serve as windows into our emotional lives, signal emotional states to others, and help in the creation and maintenance of social bonds (Gray et al., 2011; Keltner, 2009; Keltner & Kring, 1998). A novel aspect of this work was the use of the FACS-based approach in assessing facial expressions. This method revealed unparalleled specificity showing blunting in genuine, but not non-genuine smiles in the CHR group. These data are in line with very early work in schizophrenia suggesting blunting only in genuine smiles is observed (and not non-genuine) (Krause et al., 1989). Given the central importance of genuine (but not non-genuine) smiles for long-term well-being and social functioning (Harker & Keltner, 2001) for individuals and caregivers (Lwi et al., 2019), this finding raises the question of whether blunted genuine smiles in the CHR group may not only serve as an early psychopathological marker but might also predict deterioration of well-being and social relationships prospectively.

These findings indicating the CHR group reported more bullying victimization compared to controls is in line with previous studies as well (Mayo et al., 2017; Vargas, Damme, & Mittal, 2019). Furthermore, results suggesting bullying victimization are related to reduced genuine smiles in the CHR group offer important clues. There exists an enormous body of work documenting the negative long-term effects of environmental stress (i.e., trauma, bullying victimization) on emotional functioning (Burns et al., 2010; Carvalho Fernando et al., 2014; Cicchetti & Rogosch, 2009; Pechtel & Pizzagalli, 2011). Furthermore,

because genuine smiles are thought to reflect 'felt' emotion (Ekman & Friesen, 1982) and are also preferred in social situations (Shore & Heerey, 2011), it is possible that associations between genuine smiles and bullying victimization reflect reduced feelings of positive emotion which can influence social relationships. While our study used correlational analyses and cannot infer causation, these data suggest smiles and bullying, and possibly environmental stress more generally, are interconnected. Further research is necessary to understand the directional relationship (e.g., does bullying victimization lead to reductions in facial expressions, and/or do reduced facial expressions lead to bullying victimization?).

While the present study had several strengths (e.g., first to examine specific smile type, used a FACS-based approach), there are also limitations to discuss that offer opportunities for future directions. For example, smiles were measured during the first minute of a clinical interview. Additional research could determine generalizability across other clinical interview segments. Related, the use of video clips may produce context-specific facial expressivity (e.g., facial expressions may be less intense because of the content discussed during this interview). Future work should consider assessing facial expressivity in different contexts such as when using an evocative film clip task, in naturalistic contexts, during dyadic conversations, as well as when completing various cognitive tasks. Additionally, future work may benefit from further assessing both the frequency and intensity of smiles. Moreover, the present study did not find a relationship between smiles and depressive symptoms in the CHR group. While this relationship suggests the blunted smiles in the CHR group may not be better explained by affective symptoms, it will be valuable for future studies to continue to understand relationships with comorbidity using different measures of depression and larger sample sizes. Also, bullying victimization was dichotomized across different measures to encompass a metric to assess bullying and teasing. There are additional measures that can be used to assess bullying and other environmental stressors (Rigby & Slee, 1993; Slee & Rigby, 1993). Future work would also benefit from teasing apart bullying victimization into different categories (e.g., teasing vs. bullying) (Cornell et al., 2013), and using continuous measures that extend outside self-report (Vargas, Zou, et al., 2019). While the sample size afforded adequate statistical power to detect medium effect sizes for the main research questions, additional studies with larger samples and longitudinal designs are needed. In addition, a critical future direction is assessing sex differences in smiles and bullying victimization (Barlett & Coyne, 2014; Turner et al., 2013). Finally, assessing facial expressions and links with bullying victimization between subgroups (e.g., genetic, attenuated positive symptoms, brief intermittent psychotic symptoms) is an important future direction and can inform vulnerability models and treatments (Fusar-Poli et al., 2016).

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ENDNOTES

[1] The CHR group also displayed fewer genuine smiles (i.e., frequency) when compared to controls, $t(82) = -5.00$, $p = <.001$. There was no difference in the frequency of non-genuine smiles, $t(82) = -0.84$, $p = .41$.

[2] The relationship between frequency of genuine smiles and bullying in the CHR group was not significant, $r = 0.07$, $p = .74$.

DATA AVAILABILITY STATEMENT

Data Availability Statement The data that support the findings of this study are available from the corresponding author upon request.

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