

The Schizotypal Personality Questionnaire for Children (SPQ-C): Factor Structure, Child Abuse,
and Family History of Schizotypy.

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Abstract

There is a relative dearth of research on features of schizotypal personality in children, in part due to lack of instrumentation. This study tests five competing models of the factor structure of the self-report Schizotypal Personality Questionnaire for Children (SPQ-C) and examines its relationship family history of schizotypal personality disorder, child abuse, and stability over time. Hypotheses were tested on 442 11-12 year-old schoolchildren and their caregiver. Confirmatory factor analyses supported a three-factor structure of the SPQ-C (cognitive-perceptual, interpersonal, and disorganized). Test-retest stability was relatively robust over three months ($r = .67$), six months ($r = .64$) and 12 months ($.55$), with acceptable internal reliability ($r = .81$). Children with a biological family history of schizotypal personality disorder had higher scores on all three factors ($d = .51$). Abused children had higher schizotypy scores ($d = .55$). A genetic x environment interaction was observed, with schizotypy highest in those with both a family history of schizotypy and also child abuse. Results support the utility of the SPQ-C in future family and clinical studies of schizotypal personality, and provide an avenue for much-needed research into the early childhood antecedents of this condition.

Key words: Schizotypy; family history, abuse, cognitive-perceptual, interpersonal, disorganized

Introduction

While the last two decades have witnessed significant progress in research on adult schizotypy (ref), there is in relative terms a paucity of research on schizotypy in children. This is despite the fact that research on the early antecedents of schizophrenia-spectrum disorders could benefit significantly from understanding the growth and progression of schizotypal features throughout childhood and into the adolescent and adult years. Insufficient instrumentation may be one reason for this significant gap in the literature. This study examines one putative self-report instrument for aiding the assessment of schizotypy in children – the Schizotypal Personality Questionnaire for Children (SPQ-C) with the broader goal of stimulating future research on the early antecedents of schizotypal personality.

The most definitive and comprehensive analysis of the factor structure of the SPQ-B to date tested five different factor models based on 28,426 adult participants drawn from 14 countries (Fonseca-Pedrero, Ortuno-Sierra, et al., 2018). Results supported both the original three-factor structure of Raine & Benishay (1995) and the modified three-factor structure of Raine et al. (1994), and also a new “bi-factor” structure consisting of the original Raine & Benishay (1995) three factor model (cognitive-perceptual, interpersonal, disorganized) with the addition of one general factor (???) upon which all three factors load. These three factors reflect the classic triad of positive, negative and disorganized symptoms frequently observed in individuals with psychosis (Tibber et al., 2018). Based on these prior findings with adults, and because one study using the SPQ-C with Spanish children also confirmed this three-factor structure (Fonseca-Pedrero et al., 2015), we hypothesized in the current study that this same cognitive/interpersonal/disorganized factor structure would produce the best fit to the data.

A second issue concerns the stability of schizotypal personality. In contrast to studies reporting short-term test-retest reliability (Wong et al., 2014), very few studies on schizotypal personality have reported *stability* of schizotypy over a year or longer. In adults, two year test-retest reliability of the adult SPQ has been reported at .53 (Stefanis et al., 2006), with stability for the schizotypy construct being somewhat lower (.41) over six years (Venables & Raine, 2015). Although there is some stability of schizotypy over time in the general population, it has been argued that 75-90% of sub-clinical psychotic features observed in the general population disappear over time (van Os et al., 2009), suggesting significant instability. Developmentally, this argument could be taken even further with child populations who show greater plasticity and developmental change compared to adults. As such, a further line of investigation in the current study concerns the longer-term stability over one year in 11-year-olds.

While the psychometric issues on the SPQ-C is our first objective of this paper, the important question is the antecedence of child schizotypal disorder, the current study sought to address two more substantive etiological issues that speak to spanning the environment and genetics – child abuse and biological family history of schizotypal personality disorder. The significance of parental child abuse lies in the fact that it is not only associated longitudinally with the development of later psychotic symptoms at age 12 (Arseneault et al., 2011), but it furthermore represents the risk factor most commonly associated with persistence of schizotypy in adults (van Os & Reininghaus, 2016). Velikonja et al. (2019) in a large clinical study of 225

individuals diagnosed with SPD found that child trauma was salient in relation to cognitive-perceptual and interpersonal, but not disorganized, features of schizotypy as assessed by the SPQ. Heins et al. (2011) observed positive relationships between child abuse and positive, but not negative, symptoms in patients diagnosed with a psychotic disorder. Similarly, Cicero and Kerns (2010) observed positive relationships between abuse and positive schizotypal features, but not disorganization in non-clinical adults. Other studies on trauma utilizing the adult SPQ have observed significant relations with all three schizotypy factors, but have found stronger effects for cognitive-perceptual (Quide et al., 2018), and weaker effects for disorganization (Fung & Raine, 2012; Gong et al., 2017). To our knowledge, with one exception (Arseneault et al., 2011), no study has assessed the role of abuse in relation to child schizotypy, a gap that this study aims to fill.

A second etiological issue concerns relationships between the SPQ-C and family biological family history of SPD (schizotypal personality disorder). Adult schizotypy is known to have a heritable basis and to run in families (Siever & Davis, 2004). As such, if the SPQ-C is a valid indicator of child schizotypy, some relationship between this instrument and a family history of SPD should be expected. How strong that relationship should be, and whether it is true for all aspect of schizotypy, is less clear. From an empirical standpoint, the more traditional perspective has been that the more negative features of schizotypy have a somewhat stronger genetic link to schizophrenia (Gunderson et al., 1983; Torgersen et al., 2002). This proposition has since received support from reviews and empirical studies (Calkins et al., 2004; Cohen et al., 2010; Tarbox & Pogue-Geile, 2011; Webb & Levinson, 1993), although there have also been discrepant findings (Kremen et al., 1998; Yaralian et al., 2000). In contrast to this fairly robust adult literature, there appears to be no prior study on family history of SPD in relation to schizotypy in children. Given this prior literature however, we hypothesized that the interpersonal (negative) factor of the SPQ-C would be most related to family history of SPD.

We sought to address the above issues in a sample of 11-year-old children. We hypothesized that a three-factor model would best fit the data, and that the SPQ-C would have adequate reliability. We anticipated stability would be moderate to low given the influence of developmental change at this age and the brief (22 item) length of the instrument. SPQ-C scores were expected to be positively associated with experiencing abuse and a family history of SPD. Based on the prior literature, abuse was tentatively expected to be more associated with positive schizotypy features. Given the mixed prior findings on sub-factors of schizotypy and family history of SPD, this specific analysis remained exploratory.

Methods

Participants.

Full details of participants are given elsewhere (Liu et al., 2013). Briefly, 454 male and female English-speaking children aged 11 to 12 years residing in the urban community in Philadelphia, United States were recruited into the study in 2009. All community dwelling participants who wished to participate were included if they met the following criteria: 11-12 years of age; English-speaking; absence of mental retardation, psychotic disorder, or pervasive

developmental disorders. Written informed consent was obtained from the caregiver, while assent was obtained from the child. Ethnic composition was as follows: Caucasian (12.4%), African-American (79.9%), Latino (0.7%), Asian (0.5%), Native American (0.2%), Multiracial (5.1%), Other (0.9%), with 0.2% declining to answer. Families were recruited using targeted mailings, flyers, advertisements, and personal referrals. The caregiver was compensated financially (\$100) while the child received a gift voucher (\$60). The mean household monthly income of the participants was \$2994.56 (SD = \$3173.39). The sample was at moderate risk for psychopathology due to the urban catchment area and ethnicity. Ethical approval was obtained from both IRB boards at the University of Pennsylvania and also the Philadelphia Department of Health.

Schizotypal Personality Questionnaire – Child (SPQ-C)

Schizotypal personality was assessed using the Schizotypal Personality Questionnaire-Child (SPQ-C) by child self-report. The SPQ-C is a downward extension of the adult Schizotypal Personality Questionnaire-Brief (SPQ-B) (Raine & Benishay, 1995), which in turn is a short form of the full 74-item Schizotypal Personality Questionnaire (Raine, 1991) Consisting of 22 yes-no self-report statements, the SPQ-C contains all items from the SPQ-B with relatively minor modification for use with children aged 9 and above (see Supplemental materials for a copy of the instrument). It measures three main factors of schizotypy – cognitive perceptual, interpersonal, and disorganized features (Raine et al., 1994), together with a total schizotypy score.

Child Abuse

Past child abuse was assessed using a modification of the Conflict Tactics Scale (CTS) (Straus, 1979) by parent report. This scale has been prospectively validated against adults who had been physically abused 20 years previously as demonstrated by official court reports of child abuse (Widom & Shepard, 1996). The instrument showed good discriminant and predictive validity (Widom & Shepard, 1996). A dimensional measure of abuse consisted of the total scores on verbal and physical abuse items, while a categorical measure was developed based on those who had experienced no abuse (N = 135) versus some abuse (N = 306).

Family History of Schizotypal Personality Disorder

Family history information was obtained from an interview with the primary caregiver by interviewers trained in semi-structured clinical interviews. Interviewers were kept blind to SPQ-C scores. Diagnoses on first- and second-degree biological relatives of the child (mother-father, grandmother, grandfather) were made using an update of the FH-RDC diagnostic criteria (Andreasen et al., 1986). Positive responses to questions were followed up with probe questions. Final consensus diagnoses were arrived at in consultation with the first author who was also kept blind to SPQ-C scores. Those whose parent or grandparent met criteria for DSM 4 (American Psychiatric Association, 1994) schizotypal personality disorder were assigned to the family history positive group, while others were assigned to the family history negative group.

Statistical Analyses.

Confirmatory factor analysis (CFA) using the weighted least squares means- and variance-adjusted (WLSMV) estimator for skewed dichotomous data was conducted in *MPlus* 7.4 for Mac (Muthén & Muthén, 2012) to determine the psychometric properties of the SPQ-C. Based on prior literature, five competing models were tested (see Table 1): one factor (schizotypy total), two inter-correlated factors (positive and negative schizotypy), three inter-correlated factors (cognitive-perceptual, interpersonal, disorganized; Raine & Benishay, 1995), three inter-correlated factors with 4 paranoid items cross-loading on cognitive-perceptual and interpersonal subscales, and a bi-factor model of schizotypy with all items loading onto both a general factor (schizotypy total) and three latent factors (cognitive-perceptual, interpersonal, disorganized) from the Fonseca-Pedrero et al (2018) paper. Standardized betas and 6 fit indices were reported in all models. A high comparative fit index (>.90), high Tucker–Lewis index (>.90), low root mean squared error of approximation (<.06), chi-squared significance difference test for nested models ($\chi^2_{diff} = \chi^2_s - \chi^2_l$; $df_s - df_l$, where ‘s’ denotes the *smaller* model with fewer parameters and ‘l’ denotes the *larger* model) and the lowest Akaike Information Criterion (1974) (calculated by $\chi^2 - 2*(\text{degrees of freedom})$) among non-nested model comparisons indicate a good-fitting model.

Correction of the attenuation of stability coefficients due to measurement error was conducted using Spearman’s correction for attenuation (Spearman, 1904). Binary logistic regression was used to assess SPQ-C differences between abused and non-abused groups using the forward Wald stepwise selection method with entry testing based on the significance of the score statistic, with the Wald statistic used to test variable removal, and the Nagelkerke R^2 statistic used as an effect size. Because prior work has shown that those with scores in the top 10% of the SPQ have high rates of schizotypal personality disorders (Raine, 1991; Stefanis et al., 2006), we adopted this cutting point on schizotypy scores in logistic regression.

To test the interaction between abuse and family history of SPD, binary logistic regression using the forward stepwise Wald method was used, with high/low schizotypy group as the dependent variable and abuse, family history, and the interaction term between these latter two variables as predictors. A significant interaction was broken down using t-test comparisons. Odds ratios were derived from the exponentiation of the beta coefficient (ratio-change in the odds of the event of interest for a one-unit change in the predictor).

Results

Testing Models of Factor Structure

Fit indices for the five models of the PQ-C factor structure are given in Table 1. More detailed figures for each model that also provide item loadings are given in the online Supplement. Broadly-speaking all models gave acceptable fits, with RMSEA at .051 or below and both CFI and TLI above .90. Nevertheless, some models were better fits than others (see Table 1). The original and modified three-factor models were both better fits than two and one factor models χ^2 DIFFERENCE STATS HERE (OR SOME OTHER STATISTICAL COMPARISON)??, and were virtually indistinguishable from one another in terms of fit STATS HERE ?? . The best fitting model was the bifactor model (Fonseca-Pedrero, Ortuno-Sierra, et al., 2018) STATS HERE?? which consisted of the Raine et al. (1994) three-factors and one overarching general factor.

Factor Intercorrelations.

Factor intercorrelations were as follows: cognitive-perceptual with interpersonal ($r = .56$), cognitive-perceptual with disorganized ($r = .53$), interpersonal with disorganized ($r = .47$). These indicate overlapping shared variance but also separable identities for the three schizotypy factors.

Internal reliability.

Internal reliability (coefficient alpha) were as follows: total score ($r = .84$), cognitive-perceptual ($r = .71$), interpersonal ($r = .69$), disorganized ($r = .67$). Item-total correlations were as follows: total score ($r = .30$ to $.51$); cognitive-perceptual ($r = .27$ to $.52$); interpersonal ($r = .27$ to $.44$), disorganized ($r = .33$ to $.48$).

Stability over time

Test-retest stability for the total SPQ-C score was relatively strong over three months ($r = .67$, $p < .001$), six months ($r = .64$, $p < .001$) and 12 months ($.55$, $p < .001$). Correcting for measurement error resulted in the following stability coefficients: three months ($r = .80$), six months ($r = .76$), 12 months ($r = .65$). One-year stability coefficients were slightly lower for the three subfactors with shorter scale length, ranging from $.43$ to $.45$ when uncorrected and $.59$ to $.66$ when corrected for measurement error attenuation (see Supplement for full details).

Family History of Schizotypy

Children with a family history of schizotypal personality disorder had higher total SPQ-C scores than controls using t-test comparisons, with an effect size d of $.51$ (see Table 2 - upper). All three SPQ factors were approximately equally associated with family history of schizotypal personality disorder as follows: cognitive-perceptual ($d = .46$), interpersonal ($d = .36$), disorganized ($d = .47$).

Binary logistic regression analyses indicated that the disorganized factor was the best predictor of family history (Wald $\chi^2 = 9.93$, $df = 1$, $p = .002$), after which there was only a trend for cognitive perceptual ($p = .099$) and no effect for interpersonal ($p = .24$).

Child Abuse

Regarding analyses on abused versus non-abused groups (Table 2 - lower), T-tests indicated that abused children compared to non-abused children had significantly higher total SPQ-C scores ($d = .55$). All three SPQ factors were all associated with family history of schizotypal personality disorder at a relatively equal level as follows: cognitive-perceptual ($d = .48$), interpersonal ($d = .44$), disorganized ($d = .41$).

Binary logistic regression modeling analyses indicated that the cognitive-perceptual factor was the best predictor of abuse (Wald $\chi^2 = 19.45$, $df = 1$, $p < .0001$). The interpersonal factor improved model fit slightly (Wald $\chi^2 = 4.02$, $df = 1$, $p = .045$), but the Disorganized factor did not improve model fit ($p = .13$).

Regarding dimensional analyses, total schizotypy scores correlated significantly ($r = .31$) with caregivers physically and verbally abusing their children (see Table 1). Schizotypy factors all positively and significantly correlated with abuse ($r = .32$ to $.22$). Linear regression using the stepwise method in which all three factors were entered as predictors of abuse indicated that cognitive-perceptual was primarily associated with abuse (F change = 49.28, $df = 1$, $p < .0001$), after which no other factor added significantly to the prediction equation ($p = .12$). As such, but binary logistic regression analyses and linear regression analyses confirmed the primary finding of high cognitive-perceptual scores in relation to abuse.

Interaction between abuse and family history of schizotypal personality.

The interaction between abuse and family history of SPD in predicting schizotypy grouping was significant (Wald $\chi^2 = 6.03$, $df = 1$, $p = .014$, odds ratio = 7.50). The moderating effect of family history of SPD on the abuse – schizotypy relationship is illustrating in Figure 1 where it can be seen that the highest SPQ-C scores were observed when abuse coincided with a family history of SPD. Independent t-tests comparing those with a family history of SPD versus those without documented significant differences in total SPQ-C scores when abuse was present ($t = 0.11$, $df = 105$, $p = .91$), but not when abuse was absent ($t = 3.46$, $df = 232$, $p = .001$). Taken together, abuse, family history of SPD, and their interaction explained 31.1% of the variance in schizotypy group membership ($\chi^2 = 24.32$, $df = 3$, $p < .0001$, correctly classifying 71.0% of all cases).

Analyses were repeated on the three SPQ-C factors. The interaction was significant for cognitive-perceptual (Wald $\chi^2 = 4.65$, $df = 1$, $p = .031$, odds ratio = 3.91), interpersonal (Wald $\chi^2 = 4.44$, $df = 1$, $p = .035$, odds ratio = 6.16), and disorganized (Wald $\chi^2 = 10.47$, $df = 1$, $p = .001$, odds ratio = 7.12). These interactions are illustrated in Figure 1, and are all in the same direction as for total scores, with the highest level of schizotypy in those children who had been abused and also having a family history of SPD. Full details of breakdowns for these interactions are provided in the online Supplement.

Can the Effect of Abuse be Accounted for by Genetic Transmission of Schizotypy?

Logistic regression analyses were run to evaluate (a) the effect of abuse on schizotypy (dependent variable) controlling for family history, and (b) the effects of family history on schizotypy controlling for abuse. Abuse remained a significant predictor of total schizotypy after controlling for family history of SPD (Wald $\chi^2 = 10.36$, $df = 1$, $p = .001$). Similarly, family history remained significant after controlling for abuse (Wald $\chi^2 = 4.91$, $df = 1$, $p = .027$). Both processes acted as relatively independent predictors of schizotypy. Results for the three schizotypy factors point to the same conclusions (see online Supplement).

Discussion

This study aimed to assess the utility of the SPQ-C as a self-report measure of child schizotypy. The factor structure of the instrument mirrored that of the adult SPQ-B, reflecting cognitive-perceptual, interpersonal, and disorganized features. As with the adult instrument, adequate internal reliability was observed for this brief assessment tool. Reasonable stability

over one year was observed, establishing the trait nature of schizotypy captured by the instrument. Construct validity was documented in two ways, with both abuse and family history of SPD being associated with higher SPQ-C scores. Schizotypy was highest in those children with both a family history of SPD and who had also experienced some degree of abuse. The finding of gene x environment interaction in developing schizotypal personality disorder, is the first to our knowledge, to document in children. Findings suggest that the SPQ-C can be usefully employed either as a brief screen, a dimensional tool, or a supplement to clinical interviewing to further prospective longitudinal research into the progression and course of schizotypy from childhood, to adolescence, and into adulthood.

Five competing models of the factor structure were examined. All five provided acceptable fits to the data, although the three models that included three factors produced better fits. Within these, the best-fitting model consisted of the three-factor model (Raine et al., 1994) as first-order factors combined with a second-order general factor, a model first reported by Fonseca-Pedrero, Ortuno-Sierra, et al. (2018). This latter model has the advantage of parsimony and practicality – one single measure for broad investigations of the schizotypy construct and yet three dimensions for more fine-grained analyses. The fact that CFA findings from the child SPQ model those observed from many countries with the adult SPQ (Fonseca-Pedrero, Debbane, et al., 2018; Fonseca-Pedrero, Ortuno-Sierra, et al., 2018) both provides support for factorial validity of the SPQ-C, and also supports the use of both child and adult versions of the SPQ in future child-parent research.

Acceptable internal reliability for the SPQ-C was obtained. Reliability for the total scale score of .84 compares favorably to the two original adult samples from which the SPQ-B scale originated ($r = .80, .83$). Subscale reliabilities are inevitably lower (.67 to .71) due to reduced item length (6-8), but are in the acceptable range, particularly given consistent item-total correlations were obtained for all three subscales (all $r = .27$ to $.52$). Furthermore, factor intercorrelations were in the anticipated range ($r = .47$ to $.56$), indicating a moderate relationship between symptom sub-types.

We had hypothesized that stability of child schizotypy over one year would be low to moderate for several reasons, including the importance of developmental change in children, the short scale length (22 items) that results in just modest reliability, and the modest (.53) prior findings on more developmentally stable adults using a much longer SPQ (74 items) version of the SPQ (Stefanis et al., 2006). This hypothesis was only partially supported. Stability for the total SPQ-C score was somewhat higher than anticipated at .55, and correcting for measurement error it increased to .65. At one level this supports stability of the schizotypy trait even in childhood. Two important caveats are that stability may be lower (a) at later adolescent ages when peer influences become even more important, and (b) over longer time periods. Unlike the prior findings of Stefanis et al (2006) who observed stronger stability for negative schizotypy, and Debbane et al. (2013) who reported greater instability for cognitive-perceptual features, all three dimensions showed equivalent levels of one-years stability (see Supplement). Future longitudinal studies of children, even covering modest periods of time, could further address the

issue of stability and importantly factors that influence the exacerbation and diminution of schizotypy symptoms over time.

Construct validity for the SPQ-C was provided by child abuse being significantly associated with higher schizotypy scores. While abuse was positively associated with all three schizotypy factors, regression analyses found the strongest effects for the cognitive-perceptual factor, after which interpersonal was minimally related and disorganization was not related. Similar findings have been observed in reviews and empirical studies by other researchers, (Arseneault et al., 2011; Cicero & Kerns, 2010; Heins et al., 2011; Velikonja et al., 2015). From a theoretical perspective it had earlier been hypothesized in one review of schizotypy that cognitive-perceptual features reflect a form of schizotypy that has more of an etiological foundation in early psychosocial influences (including abuse) compared to other schizotypy factors (Raine, 2006). With some exceptions, findings since that time on adult schizotypy have supported this prediction. The fact that similar findings are also obtained at the child level with the SPQ-C both provide some degree of convergent validity for this child instrument across ages and also encourage further research on the differential correlates of schizotypy factors.

A second form of construct validity for the SPQ-C was found with respect to biological family history of SPD. As anticipated, all three factors were associated with a family history of SPD. This suggests a genetic influence on schizotypal traits, although these family history findings may best be considered as “quasi-genetic” in that they reflect environmental as well as genetic processes. We have previously found that 70.5% of the developmental stability of the SPQ-C over three years can be explained by genetic influences, providing more concrete and direct support for heritable influence on child schizotypy (Ericson et al., 2011). While we had hypothesized that more negative features of schizotypy (i.e. the interpersonal factor) would be most strongly related to family history. This hypothesis was not supported. In contrast to findings for abuse, regression analyses indicated that disorganization had the strongest link to family history after which cognitive-perceptual was only marginally significant, while the interpersonal factor was no longer a significant predictor. Because the current findings appear to be the first to report on child schizotypy and family history of SPD, it is unclear at this point whether they point to a developmental discontinuity with the adult literature, or alternatively reflect spurious findings, an issue that requires resolution in further studies of child schizotypy.

Perhaps the most striking finding in relation to construct validity concerns the interaction between abuse and family history of SPD. Schizotypy scores were highest when both risk factors were present, and this was true for all three factors. While such interactions have not to our knowledge been investigated in child schizotypy, studies of adult schizotypy do suggest gene x environmental effect. Alemany et al. (2011) similarly observed a gene x environment interaction in Spanish adults such that child abuse combined with carrying the BDNF *MET* allele (negatively affecting brain growth and neuronal survival) in predisposing to increased psychotic-like experiences. Two other molecular genetic studies on adults have produced similar findings (Cristobal-Narvaez et al., 2016; Savitz et al., 2010). Stronger effects were again found for disorganization, although interactions held for all three schizotypy factors. Findings provide some additional support for construct validity for the SPQ-C and encourage further examination of

which psychosocial risk factors interact with genetic influences in predisposing to early schizotypal traits.

Abuse and family history operated as relatively independent processes in this study. In contrast, Berenz et al. (2013) found only a small positive relationship between abuse and presence of schizotypal personality disorder, and this relationship was abolished after controlling for genetic influences using a discordant twin design, leading authors to conclude that focusing on child trauma may not be a fruitful endeavor. Our current finding is however consistent with a prior longitudinal study showing that the link between abuse in childhood and psychotic-like experiences at age 12 could not be accounted for by genetic risk for psychotic-like experiences (Arseneault et al., 2011). As such, on balance we draw an alternative conclusion to Berenz et al. (2013), suggesting that rather than representing an artefact of genetic influences, child abuse may be an active influence in predisposing to child schizotypy.

An important question concerns whether there is any value in considering sub-dimensions of schizotypy in developmental research. It is notable that the DSM throughout its development has ignored the notion that schizotypy may have separable components, all of which may have clinical value. As argued by Debbane and Barrantes-Vidal (2015), prospective longitudinal research to date has focused more on positive symptoms and bypassed the potential predictive role of negative schizotypal traits. This is despite the fact that initial clinical developmental studies have shown that different dimensions of schizotypy interact (Debbane & Barrantes-Vidal, 2015), and that differential correlates of schizotypy factors have been uncovered (Meller et al., 2019). The three sub-dimensions of cognitive-perceptual, interpersonal, and disorganized features are factors that are repeatedly observed in CFAs of positive and negative symptoms of schizophrenia (Tibber et al., 2018). By examining how these three substrates emerge in childhood, unfold in adolescence, and manifest themselves as separable processes in schizophrenia could be a viable model for future research. Conceivably, a greater focus on child schizotypy may provide more persuasive evidence than hitherto for recognition of these different processes and provision of clinical utility for a multidimensional consideration.

Limitations in this study need to be recognized. First the sample was at moderate risk for psychopathology and does not constitute a representative sample of the US population. Second, we did not have a diagnostic measure of child schizotypy to provide further validation for the SPQ-C, although this would be highly desirable. Third, we only assessed two forms of abuse (physical and verbal) and as such similar findings may or may not be observed with emotional and sexual abuse.

In conclusion, the current study provides construct validity support for the potential usefulness of the SPQ-C in screen/assessing schizotypal features in children. Because this instrument can be completed by children in as little as three minutes, it can be easily incorporate into larger survey studies, family studies, and used as an adjunct to other clinical assessment tools. The promise is that such instrumentation can provide a vehicle for researching the childhood antecedents of schizotypy on larger populations than hitherto in a manner to enrich our understanding of developmental underpinnings of schizophrenia-spectrum disorders.

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Table 1 Fit indices for the five different factor models of the SPQ-C (N = 446).

Model	χ^2 (df)	CFI	TLI	RMSEA (90% CI)	<i>P</i>	WRMR	AIC ($\chi^2 - 2df$)
1. Single factor	450.06 (209)	.914	.905	.051 (.044 - .057)	0.405	1.234	32.06
2. Two factors Positive vs Negative	439.306 (208)	.918	.909	.050 (.043 - .056)	0.497	1.217	23.306
3. Original Three Factors ¹ Cog, Int, Dis	324.360 (206)	.958	.953	.036 (.028 - .043)	1.00	1.017	-87.64
4. Modified Three Factors ² Cog, Int, Dis	317.636 (202)	.959	.953	.036 (.028 - .043)	0.99	0.999	-86.362
5. Bifactor ³ Cog, Int, Dis, Gen	221.606 (183)	.986	.983	.022 (.008 - .031)	1.00	0.784	-144.394

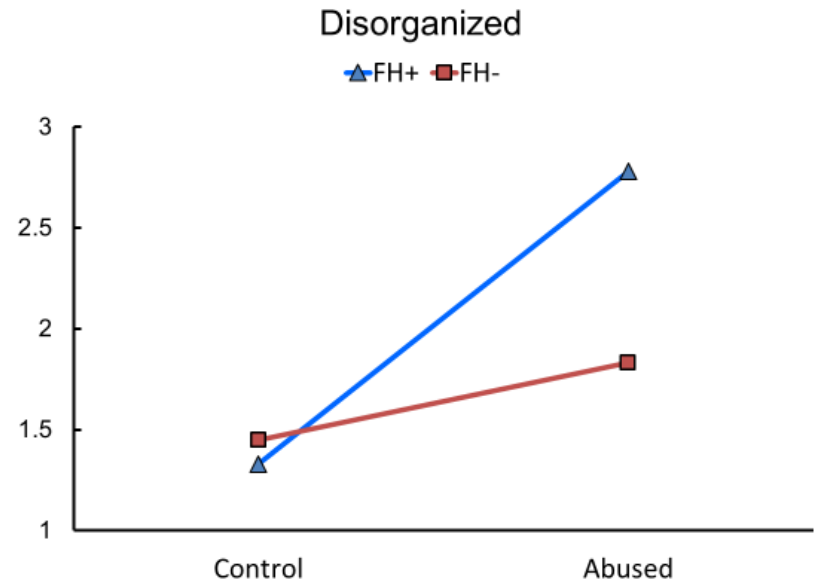
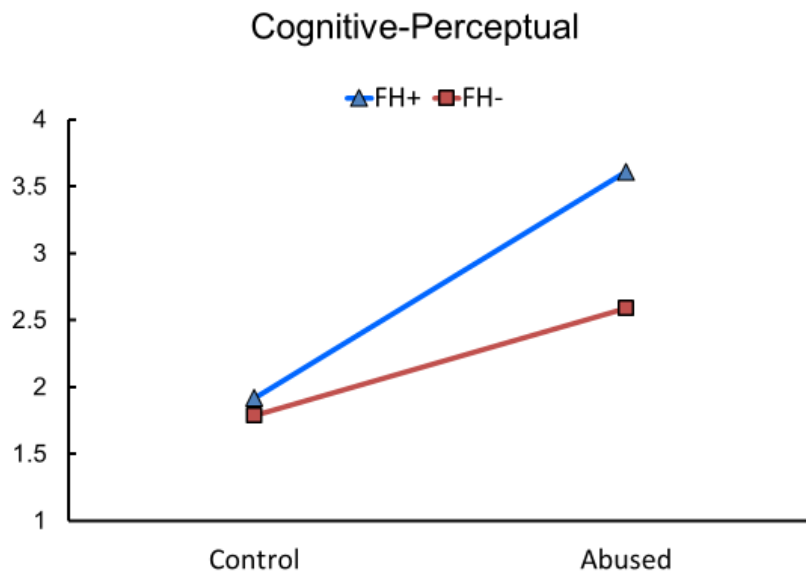
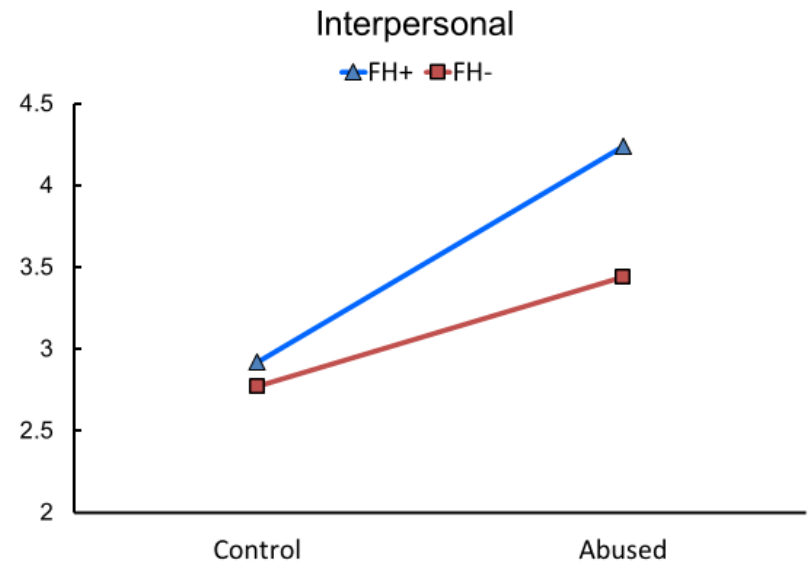
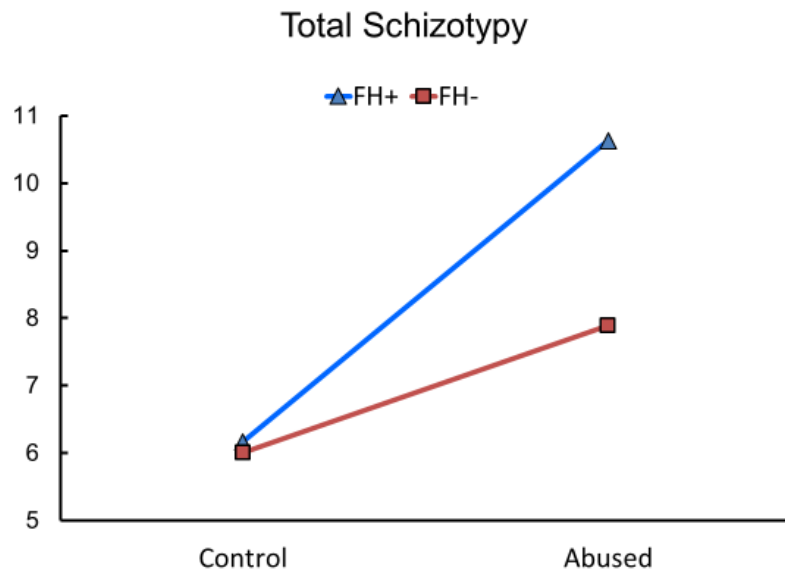
Note. $P < .01$ for all χ^2 statistic. ¹ Original three-factor model of Raine & Benishay (1995). ² Modified three-factor model of Raine et al. (1994). ³ Bifactor model from Fonseca-Pedrero et al (2018).

Table 2. Schizotypy scores and group comparisons in those with and without a family history of SPS (upper half) and those with and without a history of child abuse (lower half).

	Family History + (N = 58)	Family History - (N = 287)	t	p	d
SPQ-C					
Total	9.71 (5.18)	7.24 (4.76)	3.54	.000	.51
Cognitive-Perceptual	3.26 (2.29)	2.32 (2.03)	3.16	.002	.46
Interpersonal	3.97 (2.23)	3.21 (2.11)	2.45	.015	.36
Disorganized	1.69 (1.63)	2.58 (1.79)	3.30	.001	.47
	Abused	Non-Abused	t	p	d
SPQ-C					
Total	8.57 (4.86)	5.99 (4.37)	5.27	.000	.55
Cognitive-Perceptual	2.82 (2.11)	1.83 (1.93)	4.62	.000	.48
Interpersonal	3.72 (2.14)	2.81 (1.97)	4.19	.000	.44
Disorganized	2.01 (1.66)	1.53 (1.52)	3.95	.000	.41

Figure Legend

Figure 1. Illustration of the interaction between child abuse and family history of schizotypal personality disorder for total schizotypy and the three factor scores. FH+ = family history positive. FH- = family history negative.



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