

Peer Victimization Partially Mediates the Schizotypy-Aggression Relationship in Children and Adolescents

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While persuasive evidence has accumulated over the past 15 years documenting an association between schizophrenia and violence, there are 3 unresolved issues. First, does a downward extension of this relationship exist at the nonclinical level with respect to schizotypal personality and aggression in children? Second, is aggression more associated with impulsive reactive aggression or with more planned proactive aggression. Third and importantly, does peer victimization mediate the relationship between schizotypy and aggression? A further aim of this cross-sectional study was to examine the utility of a new child self-report measure of schizotypal personality. These issues were examined in a sample of 3804 schoolchildren assessed on schizotypy using the Schizotypal Personality Questionnaire-Child (SPQ-C), reactive-proactive aggression, and peer victimization. A confirmatory factor analysis confirmed the 3-factor structure (cognitive-perceptual, interpersonal, and disorganized) of the SPQ-C. Schizotypy was positively associated with total aggression and reactive aggression but not with proactive aggression. Peer victimization was found to significantly mediate the schizotypy-aggression relationship, accounting for 58.9% of the association. Results are broadly consistent with the hypothesis that schizotypal features elicit victimization from other children, which in turn predisposes to reactive retaliatory aggression. Findings are to the authors' knowledge the first to document any mediator of the schizotypy-aggression relationship and have potential treatment implications for violence reduction in schizophrenia-spectrum disorders. This study also provides initial evidence for the factorial and discriminant validity of a brief and simple measure of schizotypal personality in children as young as 8 years.

Key words: schizotypy/aggression/reactive/proactive/victimization/SPQ-C

Introduction

Although recognition of a relationship between schizophrenia and violence has traditionally been resisted due to the stigmatizing effects of linking violence with this debilitating mental illness,¹ an increasing body of evidence has documented that a relationship truly exists. Large-scale prospective longitudinal studies on adults have demonstrated a correlation between violence and schizophrenia.² While some argue that a substantial proportion of this relationship is attributable to substance use,² others have argued that there are other explanations, including psychosocial influences and schizophrenia symptomatology itself.³ Increasingly, editorials and commentaries are emphasizing that while most individuals with schizophrenia are not violent or dangerous, there is a need to recognize this link in the best interests of patients, their families, and mental health professionals who on average are 5 times more likely to be the victim of violence than the general population^{4,5}

One gap in the literature concerns establishing whether or not a downward extension of the schizophrenia-violence relationship exists at the nonclinical level with respect to schizotypal personality and aggression in children. With respect to adult schizotypy, an analysis of 7 studies indicated a median rate of 19% for antisocial personality disorder in schizotypal patients.⁶ Although there is evidence suggesting that adult schizotypal personality is associated with externalizing behavior problems,⁷ the data on children and adolescents are particularly sparse, despite the potential developmental importance of ascertaining when this comorbid relationship is in place. This is in part due to the lack of suitable measures of schizotypal features in children. One study has documented increased aggression in schizotypal adolescents.⁸ Another important longitudinal study documented that psychotic symptoms in a community sample at age 11 years predicted to adult violence at

age 26 years in those with schizophreniform disorder, accounting for 31.2% of the violence.⁹ This suggests that psychotic-like symptoms in childhood may predispose to later aggression.

A second gap in the literature is the almost complete lack of research on reactive and proactive subforms of aggression in relation to child schizotypy, again attributable to an instrumentation gap for the assessment of schizotypal personality in children. Only 2 studies appear to have been conducted. One found that while both forms of aggression were related to schizotypy in 16-year-old schoolboys, the relationship was stronger for reactive than for proactive aggression.¹⁰ A second study of adolescents replicated this finding and further demonstrated that while schizotypy was associated with reactive aggression after controlling for proactive aggression, no such relationship was observed for proactive aggression.¹¹ The type of aggression exhibited by those with schizophrenia-spectrum disorders may be less likely to be linked to the more planned and regulated proactive form of aggression which in turn has been associated more with psychopathy.^{12,13} This line of reasoning gives rise to the prediction that schizotypal personality will be more related to reactive than to proactive forms of aggression. No study to date, however, has examined this prediction in younger children.

The meticulous work establishing a clear relationship between aggression and schizophrenia has been of critical clinical importance. At the same time, research in this field has become almost fixated on the initial stage of establishing whether a relationship exists. Crucially, the research field has not penetrated the more important question of why adult schizophrenia and violence are interrelated.^{9,14} Correlates that are common to both violence and schizophrenia have been identified¹⁵ and recent research has suggested that substance abuse moderates the schizophrenia-violence relationship,² but a mediating role does not appear to have been statistically tested. Gaining some understanding of the mediating mechanisms at the child and adolescent level that underlie schizotypy-aggression relationships may be particularly important from an intervention and prevention standpoint. This more ambitious level of research consists of the identification of risk factors that give rise to both disorders. Such research would be doubly invaluable if: (1) it identified risk factors operating relatively early in life and (2) these factors are not fixed and static but are amenable to change.

One such potential candidate as an early mediator of the putative schizotypy-aggression relationship is peer victimization. Mediators need to be related to both constructs of interest. With respect to aggression, aggressive children have been consistently found to not just perpetrate aggression but to be victimized.¹⁶ Furthermore, victimization has been found to be more strongly associated with reactive aggression than with proactive aggression.^{16,17} Given the preliminary literature suggesting

a stronger relationship with schizotypy for reactive than proactive aggression, victimization is a possible candidate as a mediator of the reactive aggression-schizotypy relationship. Regarding schizotypy, reviews have documented initial evidence for an association between adult schizotypy and child abuse and trauma.⁷ Nevertheless, there has been surprisingly little research on peer victimization and schizotypy in either childhood or adolescence. Regarding psychotic symptoms, recent research has documented links with childhood bullying and trauma.^{18,19} The only study conducted to date on schizotypal personality in children showed that all forms of peer victimization (physical, verbal, social manipulation, attack on property) are associated with schizotypal personality in both males and females across all age groups in childhood and adolescence.²⁰ The linkage of victimization with schizophrenia-spectrum disorders receives further support from the limited work on adult schizophrenia patients. It was documented that although community schizophrenia patients have twice the national rate of police contacts, they are 14 times more likely to be the victims of a violent crime.²¹ Because victimization is linked to both schizophrenia-spectrum disorders and aggression, it is a potential candidate as a mediator of the schizotypy-aggression relationship.

A primary goal of the present study is to test the theoretical model that peer victimization partly mediates the schizotypy-aggression relationship. In the test of this model, schizotypal traits in children are hypothesized to give rise to victimization by other children, and this victimization is hypothesized in turn to precipitate aggressive behavior. A second goal of the study was to examine the utility of a new child self-report measure of schizotypal personality, the Schizotypal Personality Questionnaire-Child (SPQ-C). It was hypothesized that like its parent instrument (SPQ),²² confirmatory factor analysis (CFA) would support a 3-factor model of cognitive-perceptual, interpersonal, and disorganized features for this brief self-report measure of schizotypal personality in children.²³ From a construct validity standpoint, it was further hypothesized that schizotypy would relate more strongly to the unregulated reactive form of aggression than with the more predatory psychopathic form of proactive aggression.

Methods

Participants

Participants consisted of 3804 schoolchildren (2112 male, mean [SD] age 11.7 [2.0] years; 1678 female, mean [SD] age 12.04 [2.0] years) aged 8–16 years drawn from 10 primary and 10 secondary schools in Hong Kong.²⁰ Schools were selected for participation to ensure representativeness of the sample in terms of geographic location, school size, gender distribution, and socioeconomic diversity.²⁴ Ethical approval was provided by the Research

Committee of the City University of Hong Kong. Parental written informed consent was obtained from participants. Approval was also obtained from all principals, vice-principals, and schools administrators of participating schools.

Measures

Schizotypal Personality. Schizotypal personality was assessed using the SPQ-C. The SPQ-C is a downward extension of the adult Schizotypal Personality Questionnaire-Brief (SPQ-B)²⁵. The SPQ-B in turn is a short form of the full 74-item SPQ.²² Consisting of 22 yes-no statements, the SPQ-C contains all items from the SPQ-B with minor modification for use with children (see online supplementary materials for a copy of the instrument).

The SPQ-C measures 3 main factors of schizotypy—cognitive perceptual, interpersonal, and disorganized features,²³ together with a total schizotypy score. Evidence for convergent and discriminant validity for the SPQ-C is provided in Seah and Ang.¹¹ Consistent with heritability estimates of adult schizotypy,⁷ each of the 3 factors of the SPQ-C is modestly heritable at ages 11–13 years (heritability ranging from 45% to 49%) and also at ages 14–16 years (heritability ranging from 45% to 62%).²⁶ The longitudinal stability across these 2 ages is 0.56, and 70.5% of this developmental stability is explained by genetic influences.²⁶ Mean scores and internal reliability (coefficient alpha) for the total scale and subscales are given in table 1. Internal reliability for 2 of the scales (interpersonal and disorganized) were modest, likely reflecting the small number of items that define them compared with the other longer measures reported in table 1.

Peer Victimization. Victimization by school peers was assessed using the Multidimensional Peer Victimization Scale,²⁷ a 16-item self-report scale assessing physical victimization, social manipulation, verbal victimization, and attack on property. The overall total score ranges from 0 to 32, with higher scores representing greater victimization. Coefficient alpha in this sample was .90.

Reactive and Proactive Aggression. Reactive and proactive aggression was assessed using the 23-item Reactive-Proactive Aggression (RPQ), a self-report scale developed to distinguish between RPQ.¹⁰ Scores are summed to form measures of RPQ, together with an overall score of total aggression. The RPQ takes approximately 3 minutes to complete, has a reading age of 8 years, and is appropriate for use with children, adolescents, and adults. Data on convergent, discriminant, criterion, factorial, and construct validity are provided in Raine et al.¹⁰

For this study, the RPQ was translated into Chinese by the second author, back translated into English, and checked for accuracy by the first author (A.R.). Minor changes in wording were then conducted. Children com-

pleted all instruments in a classroom setting under the supervision of a research assistant. Data on reliability, validity, and cross-cultural reliability of the RPQ in an East Asian population are reported in Fung et al's study.²⁴

Callous-Unemotional Traits. Because the above measures are self-report and reflect negative traits, method bias could potentially account for any observed mediation effects. To test for this methodological issue, we also assessed another self-report measure of negative personality—callous-unemotional traits.²⁸ This self-report subscale of the Antisocial Personality Screening Device reflects antisocial psychopathic-like behavior in children²⁹ and has possible conceptual linkages with both aggression with respect to antisocial personality and also with schizotypy in terms of blunted affect.

Statistical Analyses

Mediational Analyses. The first set of analyses focused on which form of aggression (reactive or proactive) was most associated with schizotypy. The Steiger statistic (Z1*)³⁰ was used to test the difference in size of 2 dependent correlations from the same population. The second set of analyses focused on the extent to which victimization mediated the relationships between schizotypy and aggression. We applied a strict 4-step criteria to assess whether true mediation was present as outlined by Baron and Kenny.³¹ The paths between independent, dependent, and mediator variables were assessed by ordinary least squares (regression). The Sobel test³² was used to test whether the mediator significantly attenuated the influence of the independent variable on the dependent variable. Finally, a 2-step regression analysis was conducted in which any remaining relationship between schizotypy and aggression was still significant after controlling for the victimization mediator. To test whether method error accounted for any mediation, analyses were rerun using callous-unemotional traits in place of peer victimization as the mediator.

Confirmatory Factor Analysis. The 22 items of the SPQ-C were subjected to CFA using EQS 6.³³ Due to significant kurtosis for some items (Mardia's normalized multivariate kurtosis at 117 was greater than 3), the heterogeneous kurtosis estimation method with the geometric mean approach to heterogeneous kurtosis estimation was used to estimate the distribution of covariances in the evaluation of all models.³⁴

Two models based on prior research with the adult SPQ were evaluated: a 1-factor model (general schizotypy) and a 3-factor model (cognitive-perceptual, interpersonal, and disorganized subfactors [table 1]). Four commonly used goodness-of-fit indices were reported to assess the fit of the models: chi-square, the Akaike information criterion,³⁵ the root mean squared error of approximation (RMSEA) index,³⁶ and the comparative

Table 1. Correlations Between Study Variables, Together With Means, SDs, and Internal Reliability (Coefficient Alpha).

	Victimization	Reactive Aggression	Proactive Aggression	RPQ Total	SPQ Interpersonal	SPQ Disorganized	SPQ Cognitive-Perceptual	SPQ Total
Victimization	—							
Reactive aggression	0.38***	—						
Proactive aggression	0.29***	0.60***	—					
Total RPQ	0.39***	0.94***	0.84***	—				
SPQ-interpersonal	0.29***	0.30***	0.16***	0.28***	—			
SPQ-disorganized	0.30***	0.31***	0.23***	0.31***	0.45***	—		
SPQ-cognitive-perceptual	0.35***	0.34***	0.21***	0.32***	0.51***	0.47***	—	
Total SPQ	0.39***	0.39***	0.24***	0.37***	0.84***	0.75***	0.82***	—
Pure residualized proactive	—	—	—	—	-0.06***	0.01	-0.03	-0.04*
Pure residualized reactive	—	—	—	—	0.27***	0.24***	0.28***	0.33***
Mean	8.90	4.49	0.95	5.44	2.69	1.07	2.21	5.97
SD	11.27	3.55	2.26	5.23	1.97	1.42	1.78	4.18
Coefficient alpha	.90	.83	.86	.88	.65	.60	.71	.81

Note: RPQ, Reactive-proactive aggression; SPQ-C, Schizotypal Personality Questionnaire-Child. *** $P < .001$; ** $P < .01$; * $P < .05$

fit index (CFI).³⁷ High values for CFI (eg, $CFI > 0.90$) and low values for RMSEA (eg, <0.06) are indicative of a good-fitting model.³⁸ Direct comparisons were made between the 1- and 3-factor models that are in hierarchical relationship (ie, nested) using the difference chi-square ($\Delta \chi^2$) test,³⁹ with the 1-factor model nested within the 3-factor model.

Residualization of Proactive and Reactive Measures. In addition to raw proactive, reactive, and total aggression scores, residualized measures of proactive and reactive aggression were created using regression analysis in order to assess the correlates of “pure” proactive aggression independent of reactive aggression and of “pure” reactive aggression independent of proactive aggression.

Results

CFA of the SPQ-C

Support was obtained for a 3-factor structure to the SPQ-C. Goodness-of-fit indices for the 3-factor model and 1-factor models (general schizotypy), for all children ($n = 3804$) are presented in table 2 and 3, together with factor loadings for the 3-factor model. While factor loadings were generally high, the 4-paranoid items hypothesized to load on 2 factors were lower in magnitude, albeit in the predicted direction. The χ^2 difference test indicated a significantly better fit for the 3-factor model over the 1-factor model ($\Delta \chi^2 = 1092$, $df = 3$, $P < .0001$). All fit indices were without exception superior for the 3-factor model than the 1-factor model. Fit indices for the 3-factor

model were good with an RMSEA of 0.06, indicating a reasonably good fit.

Schizotypy-Aggression Relationships

Relationships between main study variables are outlined in table 1. All correlations were positive, significant, and in the predicted direction. In particular, the candidate mediator (victimization) was positively correlated with both independent (schizotypy) and dependent (aggression) variables. The relationship between reactive aggression and total schizotypy ($r = .39$, $P < .0001$) was higher than the relationship between proactive aggression and schizotypy ($r = .24$, $P < .0001$). The difference between these correlations was statistically significant (Steiger statistic, $Z1^* = 10.83$, $P < .0001$, 2-tailed), indicating that schizotypy was almost 3 times more strongly related to reactive aggression (15.2% of the variance explained) than to proactive aggression (5.8% of variance explained).

Table 2. Model-Fitting Results Comparing the 1-Factor (General Schizotypy) Model with the 3-Factor (Cognitive-Perceptual, Interpersonal, and Disorganized) Model.

Model	χ^2	df	AIC	CFI	RMSEA
One-factor	4142	209	3724	0.89	0.07
Three-factor	2897	202	2493	0.93	0.059

Note: AIC, Akaike Information Criterion; CFI, Comparative Fit Index; RMSEA, Root Mean Squared Error of Approximation. All χ^2 values are statistically significant ($P < .0001$).

Table 3. Factor Loadings on the 3-Schizotypy Factors From the Confirmatory Factor Analysis.

Items	Factor 1 (Cognitive-Perceptual)	Factor 2 (Interpersonal)	Factor 3 (Disorganized)
I am a bit unfriendly and cold		0.31	
I have sometimes felt that there was a person or ghost around me, even though there was no one there	0.43		
I sometimes act oddly			0.47
I sometimes think that other people can read my mind	0.36		
I sometimes find that common events or objects have a special message for me	0.32		
I am a strange person			0.41
I feel I have to be on my guard even with friends	0.32	0.12	
I sometimes ramble on when I am talking			0.57
I often pick up on hidden threats or put-downs from what people say or do	0.36	0.13	
I get the feeling that other people are watching me when I am out playing or shopping	0.45		
I feel very uncomfortable in social situations involving people I do not know		0.49	
I have had experiences like seeing flying saucers or knowing something will happen before it does	0.27		
I sometimes use words in unusual ways			0.53
I find it best not to let other people know too much about me	.10	0.36	
I often keep in the background on social occasions		0.49	
I sometimes feel distracted by far-off sounds that I'm not normally aware of	0.52		
I often have to stop people from taking advantage of me	0.28	0.16	
I find it hard to make close friends		0.43	
I am an odd, unusual person			0.48
I find it hard getting people to understand what I am saying			0.59
I feel very uneasy talking to people I do not know well		0.48	
I tend to keep my feelings to myself		0.51	

To assess whether schizotypy was specific to one form of aggression, residualized scores of RPQ were correlated with schizotypy. Results are given in table 1. It can be seen that the residualized reactive but not residualized proactive aggression scores positively correlated with schizotypy. Consequently, reactive aggression related to increased schizotypy independent of its association with proactive aggression. Conversely, the positive low-level raw correlation between proactive aggression and schizotypy can be entirely attributed to the reactive aggression that is comorbid with proactive aggression.

Peer Victimization as a Mediator of the Schizotypy-Aggression Relationship

Total Aggression and Schizotypy. After controlling for victimization, the amount of variance in total aggression explained by self-report schizotypy was reduced from

13.9% ($F_{1,3794} = 611.54, P < .0001$) to 5.8%. The Sobel test confirmed that this was a statistically significant reduction in variance explained ($z = 15.31, P < .0001$). Nevertheless, regression analysis also indicated that the residual variance in aggression explained by schizotypy after controlling for victimization remained statistically significant ($F_{1,3782} = 274.77, P < .0001$). Consequently, victimization partly mediated the schizotypy-aggression relationship, significantly accounting for 58.3% of the common variance between these 2 measures. This mediation effect applied to all 3 factors of schizotypy (see online supplementary information).

Reactive Aggression and Schizotypy. After controlling for victimization, the variance in reactive aggression explained by self-report schizotypy was reduced from 15.4% ($F_{1,3795} = 689.80, P < .0001$) to 6.8%. The Sobel test confirmed this statistically significant reduction in

variance explained ($z = 15.76$, $P < .0001$). Nevertheless, regression analysis again indicated that the residual variance in reactive aggression explained by schizotypy after controlling for victimization remained statistically significant ($F_{1,3783} = 330.03$, $P < .0001$). Consequently, victimization partly mediated the schizotypy-reactive aggression relationship, accounting for 55.8% of the common variance between these 2 measures.

Proactive Aggression and Schizotypy. After controlling for victimization, the amount of variance in proactive aggression explained by self-report schizotypy was reduced from 6.0% ($F_{1,3794} = 240.58$, $P < .0001$) to 1.9%. The Sobel test confirmed that this was a statistically significant reduction in variance explained ($z = 8.58$, $P < .0001$). Nevertheless, regression analysis indicated that the residual variance in proactive aggression explained by schizotypy after controlling for victimization, while small, remained statistically significant ($F_{1,3782} = 86.56$, $P < .0001$). Consequently, victimization partly mediated the schizotypy-proactive aggression relationship, accounting for 68.3% of the common variance between these 2 measures.

Aggression and Schizotypy Subfactors. Victimization was found to mediate the relationship between aggression and all 3 subfactors of schizotypy, accounting for 62.1% of the cognitive-perceptual relationship, 61.8% of the interpersonal relationship, and 56.7% of the disorganized relationship (see online supplementary material for full details).

Mediation in Males and Females. The above mediation effects of victimization of the schizotypy-aggression relationship applied to males ($z = 9.68$, $P < .0001$) as well as females ($z = 10.78$, $P < .0001$). Figure 1 illustrates the shared variance between schizotypy and aggression before and after controlling for victimization for all 3-aggression measures. Overall, victimization accounted for on average 57.26% (58.46% for males; 56.05% for females) of the schizotypy-aggression relationship, with this effect from one independent sample (males) replicating in another independent sample (females).

Control for Possible Method Bias. It is conceivable that method bias could account for the significant mediation results above. That is, measures are self-report and reflect negative traits, and thus may be artificially correlated. To test this possibility, we replaced peer victimization with callous-unemotional traits as a mediator and ran the mediator model. Sobel's test was nonsignificant for total aggression ($z = 0.22$, $P = .82$), for reactive aggression ($z = 0.22$, $P = .83$), and for proactive aggression ($z = 0.22$, $P = .82$).

Discussion

The key finding of this study is that peer victimization significantly mediates the relationship between schizotypy-

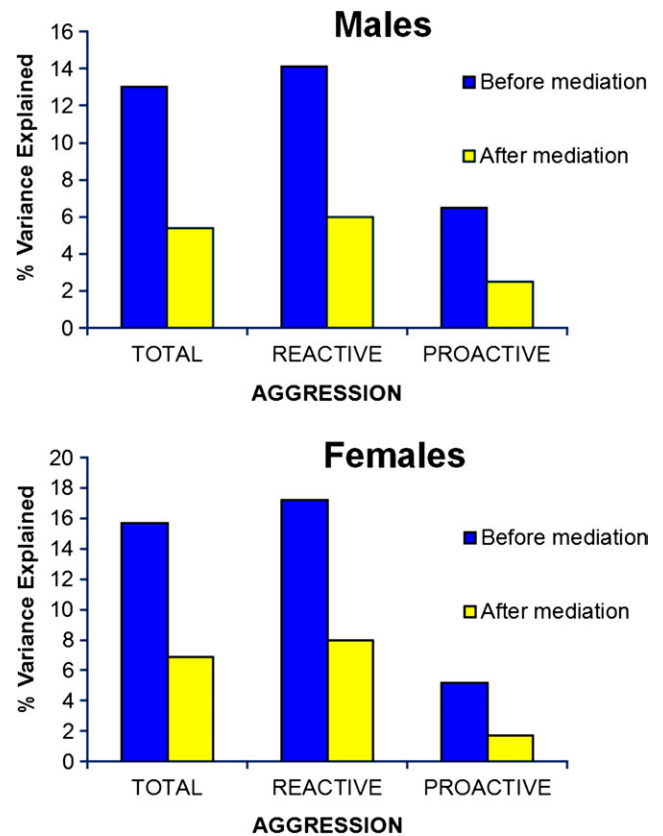


Fig. 1. The amount of variance explained by schizotypal personality in reactive, proactive, and total aggression both before and after controlling for victimization in males (upper half) and females (lower half).

pal personality and aggression in children. This partial mediation effect was strong, accounting for 59% of the relationship. Mediation occurred in females as well as males, providing cross-gender independent replication of findings. Mediation applied to all 3 subfactors of schizotypy, and findings could not be accounted for by method bias. A second finding was that schizotypy was most strongly associated with reactive aggression; after controlling for this form of aggression, the schizotypy-proactive aggression relationship was nullified. Third, the 3-factor structure to the SPQ-C was confirmed. Findings are to the authors' knowledge the first to document a mediator of the schizotypy-aggression relationship and also provide further evidence for the utility of the SPQ-C as a brief and simple measure of schizotypal personality in children. Findings have potential implications for the consideration of influences other than substance abuse as a cause of increased aggression in schizophrenia-spectrum disorders,³ including schizotypal symptomatology itself and consequent victimization.

The current findings support a model in which schizotypal traits elicit victimization from other children, which in retaliatory turn stimulates reactive aggression. This model is based on a very large sample and was tested using

a statistical test of mediation (Sobel's z), which is viewed as very conservative.⁴⁰ One question arising from this model concerns how the disorganized, interpersonal, and cognitive-perceptual features of schizotypy could give rise to peer victimization. Odd behavior and odd speech could result in a child being called names, while lack of close friends and blunted affect may result in a child drifting toward the periphery of social interactions and ultimately being socially excluded from games. Magical thinking could similarly result in a child being made fun of, while paranoid ideation and social anxiety could result in a child being kept at a social distance and ultimately ostracized. It is furthermore conceivable that relatively mild forms of victimization (in the forms of social exclusion and verbal abuse) could result in an exacerbation of some schizotypal features (eg, social anxiety, no close friends, paranoid ideation) which further precipitates escalating victimization, including attack on property and physical victimization. The schizotypy-victimization relationship may be less of a unidirectional relationship and more of an escalating viscous cycle between these 2 constructs that eventually propels the schizotypal child into reactive aggression, a form of aggression conceptualized as a fear-induced, irritable, and hostile affect-laden defensive response to provocation.^{41,42}

A second question raised by the results concerns why schizotypy should be more related to reactive than proactive aggression. As illustrated in figure 1, reactive aggression was approximately 3 times more strongly related to schizotypy than was proactive aggression. Furthermore, the small positive proactive-schizotypy relationship was abolished after controlling for schizotypy and rendered slightly negative (ie, higher schizotypy-lower proactive aggression). To understand this selective relationship with reactive aggression, schizotypy is characterized by information-processing deficits.⁴³ In turn, theoretical perspectives on reactive aggression have emphasized information processing deficits^{44,45} and the lack of regulatory control over behavior.⁴⁵ Specifically, reactively aggressive children show deficits in the early encoding, processing, and interpretation stages of social information processing, resulting in a hostile attributional bias to incoming cues.⁴⁴ Such social information-processing deficits could also give rise to more pervasive fundamental information-processing deficits, such as the symptoms of unusual perceptual experiences, ideas of reference, and paranoid ideation symptoms, which can also be viewed as errors in encoding social cues.^{10,23} Heightened and diffuse sensory awareness, loss of reality testing, ideational, and delusional thinking represent 4 core traits of reactive aggression,⁴⁶ traits which also characterize individuals with schizotypal personality disorder. Social anxiety and paranoid ideation are schizotypal features that are consistent with the fact that reactively aggressive individuals are hypervigilant to stimuli that could be perceived as threatening.^{47,48} While the schizophrenia-violence relationship has been extensively researched, there is little

or no research on whether the form of violence is reactive or proactive in nature. The present findings on schizotypy give rise to the hypothesis that violence in schizophrenia may in general be more likely to be reactive than proactive.

A second aim of the study was to further assess the utility of the SPQ-C. Its internal reliability at .82 is very similar to reliabilities of .80 and .83, previously reported,²⁵ and to that of 0.81 reported by Seah and Ang.¹¹ More importantly, even though this child instrument is brief (22 items) compared with the adult SPQ (74 items—Raine 1991), we were able to confirm the 3-factor structure originally obtained with longer adult instrument,²³ demonstrating support for a downward extension of this adult structure of schizotypy into childhood. The confirmation of the hypothesized differential relationship with reactive but not proactive forms of aggression also provides initial evidence for construct validity, further supporting the construct and discriminant validity previously shown for this instrument.^{11,26} Construct validity is further provided by the current mediation findings. Because there has been a dearth of research on childhood schizotypy, the SPQ-C provides a promising self-report instrument to further investigate in children the correlates of the early manifestation of schizotypal personality and can be provided upon request to the first author.

It should be clarified that one cannot easily extend downwards from adult schizophrenia and violence to childhood schizotypy and aggression. The findings presented here parallel the adult literature but do not exactly model it. In addition, one meta-analysis has found while schizophrenia patients lacking comorbidity with substance abuse are at higher risk for violence (OR 2.1) and those with comorbidity for substance abuse show a higher risk for violence (OR 8.9), indicating the importance of adult substance abuse in moderating schizophrenia-violence relationships.² Substance abuse cannot easily be held accountable for the link we document here between childhood schizotypy and aggression, particularly because the younger children (age 11 years and below) show if anything a stronger relationship between schizotypy and aggression than those aged 11–16 years where mild levels of substance abuse might be suspected (see online supplementary materials). At least at this age, peer victimization would appear to be a more viable explanation of the schizotypy-aggression comorbidity although future studies need to consider other explanations of this relationship, including confounding variables.

Five limitations of this study should be acknowledged. First, only partial mediation was demonstrated. Clearly, peer victimization is only one of a number of social as well as neurobiological processes that may explain the schizotypy-aggression relationship. Second, the current findings pertain to individual differences in schizotypal personality and need to be extended to children with clinical manifestations of schizotypy. Third, this study

focused on children and it remains to be seen if the same findings can be observed with adults. Fourth, while the establishment of the expected factor structure to the SPQ-C suggests some degree of cross-cultural generalizability, findings on victimization and aggression from this East Asian sample need to be generalized to Western samples. Fifth, although we statistically tested a mediating model that implies causality, true causality cannot be demonstrated without experimental manipulation; future prospective longitudinal research may however help better tease out the temporal ordering of variables used in this correlational study to further substantiate what must be treated as an initial model.

Set against these limitations are a number of strengths. To the authors' knowledge, this is the first study to identify a mediator of the schizotypy-aggression relationship using a statistical mediational model. Although only a partial mediator, the effect was nevertheless substantial, explaining more than half of the schizotypy-aggression relationship. The fact that this mediator is a psychosocial process provides support for the relevance of social processes in understanding schizotypy and its relationship with aggression.⁷ The sample size was also very large, and replication was shown across independent samples (males and females). Findings were not found to be a function of method error. This study also offers a new, brief, instrument for self-report schizotypy for use in children and adolescents.

The mediation findings in turn have potential prevention implications. Victimization is a risk factor for aggression that is preventable.⁴⁹ Recognition by mental health professionals that those with schizotypy and other schizophrenia-spectrum disorders may be subject to victimization which in turn could fuel retaliatory aggressive and violent behavior that could facilitate interventions which would be predicted to reduce the likelihood of reactive aggression and potentially ameliorate schizotypal symptomatology. The individual difference approach employed here with community children and adolescents provides a new model that provides an initial basis for substantiation and replication in future longitudinal clinical research on adults in Western cultures. Finally, better understanding and remediation of aggressive behavior in schizophrenia-spectrum patients may help reduce the stigma associated with this disorder.^{1,50}

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Supplementary Material

Supplementary material is available at <http://schizophreniabulletin.oxfordjournals.org>.

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