Journal of the Formosan Medical Association 121 (2022) 1739–1747

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.jfma-online.com

Original Article

Psychopathologies mediate the link between autism spectrum disorder and bullying involvement: A follow-up study

Mei-Ni Hsiao [a,b], Yueh-Ming Tai [c], Yu-Yu Wu [d], Wen-Che Tsai [a,e], Yen-Nan Chiu [a,e], Susan Shur-Fen Gau [a,b,e,*]

[a] *Department of Psychiatry, National Taiwan University Hospital, Taipei, Taiwan*
[b] *School of Occupational Therapy, College of Medicine, National Taiwan University, Taipei, Taiwan*
[c] *Department of Psychiatry, Tri-Service General Hospital Beitou Branch, Taipei, Taiwan*
[d] *Yu-Ning Clinic, Taipei, Taiwan*
[e] *Department of Psychiatry, College of Medicine, National Taiwan University, Taipei, Taiwan*

Received 5 July 2021; received in revised form 29 November 2021; accepted 29 December 2021

KEYWORDS
Autism spectrum disorder;
Bullying;
Mediation;
Psychopathology;
Victimization

Background/purpose: Youths with autism spectrum disorder (ASD) are at a high risk of involvement in school bully. The study investigated whether comorbid psychopathologies mediated the link between ASD and bullying involvement.
Methods: We assessed 353 youths (mean age, 11.8 ± 3.1 years), including 121 youths with ASD and 232 typically developing (TD) controls, using semi-structured diagnostic interviews on ASD and other psychiatric conditions. Follow-up assessments took place 2–5 years (37.6 ± 15 months) later. Meanwhile, their parents reported on the Social Adjustment Inventory for Children and Adolescents about bullying involvement statuses. We identified significant mediators by simple mediation models, followed by multiple mediation models to scrutinize the mediation effects of selected mediators.
Results: The results showed a sevenfold increased risk of bullying involvement among youths with ASD compared with TD controls at follow-up. In general, psychopathologies mediated the link between ASD and bullying involvement, even independent of age and sex. Specifically, we found mediating effects of social problems on victimization-only and aggressive behaviors on victimization-perpetration.
Conclusion: Our findings strongly suggest the link between ASD and later bullying involvement is mediated by pre-existing comorbid psychiatric conditions, besides the direct effect of ASD on bullying victimization. Hence, early identification and intervention of these psychopathologies are highly suggested.

* Corresponding author. Department of Psychiatry, National Taiwan University Hospital and College of Medicine, No. 7, Chung-Shan South Road, Taipei 10002, Taiwan.
E-mail address: gaushufe@ntu.edu.tw (S.S.-F. Gau).

https://doi.org/10.1016/j.jfma.2021.12.030

Introduction

School bullying has increased educational and public health concerns worldwide in the past decades, with prevalence rates ranging from 5% to 70% and the latest report of 11% across Asia, Europe, and America.[1,2] Students with disabilities, particularly those with autism spectrum disorder (ASD), are at a higher risk of bullying involvement at school.[3]

Youths with ASD have been particularly vulnerable to victimization as considered to be "perfect victims" by many researchers, given their common characteristics are just those difficulties often exhibited in victims, including poor social cognition and social skills make them stand out from the peer group, and their problem forming relationships and maintaining friendships further denying protective social support from perpetration.[4] Preceding studies even reported 46—94% incidence of victimization in students with ASD, suggesting that the rate of being bullied is around half or more in ASD.[12] In addition to victimization, ASD youths may also be involved in perpetration because their socially inappropriate behaviors may be perceived as aggressive or oppositional.[5] However, some researchers believe that young people with ASD are not usually the perpetrators with clear intention to bully someone due to limited social-problem solving ability and insight, but more likely to be bullied and less likely to bully others when compared with typically developing (TD) children.[6,7] Previous investigations reported the prevalence rates of 12—37.4% for victimization-only, 0—12% for perpetration-only, and 5.4—52% for victimization-perpetration (Supplementary Table 1).[3,8,11] Regardless of ASD or not, victimization and perpetration are associated with various psychological problems, either due to or antecedent to bullying experiences.[9]

Individuals with ASD are more likely to develop other psychiatric conditions or symptoms, such as symptoms and diagnoses of attention-deficit/hyperactivity disorder (ADHD), anxiety disorders, depression, oppositional defiant disorder (ODD), and conduct disorder (CD).[10] More recently, researchers have begun to explore social, emotional, cognitive, and behavioral correlates of bullying involvement among those with ASD. Compared to the substantial evidence showing the relationship of bullying involvement with ASD diagnosis, its ties with ASD symptoms are obscure.[11] Moreover, the associated factors for different types of bullying involvement are inconsistent.[9] The effects of comorbid psychiatric conditions on bullying status also remain unclear.[7] Nonetheless, not all young people with ASD are involved in bullying, and indeed, some of them seem to experience more than others. Previous studies have shown inconsistent results in searching the risk factors for ASD bully involvement.[3,7,11,12] Hence, this longitudinal follow-up study is warranted to identify the potential risk factors for bullying involvement in ASD.

Numerous studies support the intuitive connection between ADHD symptoms and bullying.[13] Some researchers report the association between attention deficits and bullying involvement, and many studies even emphasize the correlation between hyperactive/impulsive behaviors and perpetration-only or victimization-perpetration.[14,15] Nevertheless still, several recent studies revealing ADHD symptoms, especially hyperactivity/impulsivity, would put the youths at significant risk for victimization or even protect them from perpetration or victimization-perpetration.[16] In addition, aggression has been reported to strongly relate to bullying behaviors, inclusive of pure perpetration and victimization-perpetration.[17]

Social problems refer to occurring challenges in interpersonal interaction and imply having difficulties in overall social competence. A significant amount of research has identified negative consequences associated with social competence deficits, such as peer conflicts and bullying involvement.[18] The research to date indicates that social problems as risk factors for bullying involvement can predict victimization and/or perpetration in the general population.[19] Given the ambivalent and somewhat perplexing relationship of social problems with bullying, their interaction with other variables was believed to be the key to understanding its effect.[14]

Withdrawal often leads to isolation and peer rejection. Then, lacking peer support or protection or having limited opportunities to learn age-appropriate social interaction skills from peers increases the risk of being bullied.[6] Social withdrawal or internalizing behavioral problems were related to victimization in the general population and the ASD population.[20] Moreover, the association between social withdrawal and victimization was bi-directional.[18] Nevertheless, some other researchers did not find such an association.[21]

We conducted this follow-up study to investigate whether ASD diagnosis can predict increasing rates of various bullying involvement statuses, including victimization-only, perpetration-only, and victimization-perpetration at follow-up. Furthermore, we examined the potential mediating roles of comorbid psychopathologies in the link between ASD and bullying involvement. We hypothesize that ASD youths are more likely to be involved in victimization-only. In addition, most of their perpetration-involved condition was related to being bullied (victimization-perpetration) instead of purely bullying others (perpetration-only). Lastly, we anticipate identifying the specific mediators, autistic symptoms, ADHD symptoms, aggressive behaviors, social problems, and withdrawal for the link between ASD diagnosis and three distinct bullying conditions.

Methods

Participants and procedures

The sample consisted of 353 participants (295 males, 83.6%), including 121 youths with ASD and 232 school controls. According to the DSM-IV diagnostic criteria, youth diagnosed with ASD by child psychiatrists were recruited consecutively from the psychiatric clinic in National Taiwan University Hospital, Taipei, Taiwan. Their clinical diagnoses were confirmed by interviewing their parents using the Chinese versions of the Autism Diagnostic Interview-Revised (ADI-R) for ASD diagnosis and the Kiddie epidemiologic version of the Schedule for Affective Disorders and Schizophrenia (K-SADS-E) for the diagnoses of other

psychiatric disorders at the mean age of 10.61 ± 3.32 years old. Their parents (mainly mothers) also reported about the participants' autistic trait on the Chinese versions of the Social Responsiveness Scale (SRS), ADHD-related symptoms on the Swanson, Nolan, and Pelham, version IV scale (SNAP-IV), and other comorbid psychopathological conditions on the Child Behavior Checklist (CBCL).[22–26] A follow-up assessment was held approximately 2–5 years later (37.6 ± 15 months) at the mean age of 13.3 ± 3.5 years old. The parents then reported their children's bullying involvement status on the questions in the Peer Relationship domain of the Chinese version of the Social Adjustment Inventory for Children and Adolescents (SAICA).[27]

A total of 232 TD youths, aged 11.0 ± 2.5 years old, were recruited from similar school districts of ASD youths via teachers. They were clinically evaluated to ensure not having a lifetime diagnosis of ASD, ADHD, or other major psychiatric disorders as assessed through clinical evaluation and the Chinese K-SADS-E interviews with their parents. Their parents also reported their behavioral symptoms on the Chinese version of the SRS, SNAP-IV, and CBCL and their bullying involvement using the Chinese version of the SAICA during the same follow-up assessments as the ASD group.

The study was approved by the Research Ethics Committee of National Taiwan University Hospital (201403109RINC), and informed consent was obtained from all participants and their parents.

Measures

ADI-R

It is a diagnostic interview applied to caregivers of individuals with focuses on reciprocal social interaction, verbal/nonverbal communication, and restricted/repetitive/stereotyped behaviors. It was translated into Chinese and has been widely used in ASD studies.[22,24]

K-SADS-E

It is a semi-structured interview scale for assessing the episodes of mental disorders in children and adolescents. Its Chinese version has been extensively used to make psychiatric diagnoses according to the DSM-IV.[23]

SAICA

It is an interview scale to assess the adaptive functioning of youths in four areas, including school, spare time activities, peer relations, and home behaviors reported by the youths or their parents. The youths with higher scores had either poorer functioning or more severe problems. The Chinese SAICA has good psychometric properties and is widely used.[27] In this study, parents reported their children's bullying involvement experiences. The experience of being bullied and bullying others from the peer relations domain, were selected. Rated 2 (seldom), 3 (frequent) or 4 (always) on the two items were identified as the presence of victimization/perpetration involved.

SRS

It is a scale to measure autistic traits in natural social settings. A higher total score on the SRS indicates greater severity of autistic traits. The Chinese SRS has demonstrated excellent psychometric properties and has been widely used.[24]

SNAP-IV

SNAP-IV is a scale to assess inattention, hyperactivity-impulsivity, and oppositional symptoms based on the ADHD and oppositional defiant disorder (ODD) criteria in the DSM-IV. The Chinese SNAP-IV has good psychometric properties and is extensively used.[25]

CBCL

It is a parent-report questionnaire assessing a broad range of psychopathology in children. Eight narrow-band subscales include attention problems, anxious/depressed syndrome, aggressive behavior, delinquent behavior, social problems, somatic complaints, thought problems, and withdrawal. The Chinese CBCL is standardized and widely used.[26]

Potential mediators of psychopathologies

Since prior research has found that involvement in bullying is a risk factor for subsequent psychosocial problems such as depression, anxiety and thought problems, and also somatic problems.[3,15,30] Among them, anxiety was even stated as having no predictive effect on bullying.[14] In addition, we do not want to have the construct of the potential mediators overlapped with each other. For the above reasons, we believe that anxiety/depression, somatic complaints and thought problems are considered as undesirable outcomes rather than potential risk factors of bullying involvement. Moreover, given the overlapping concepts and high collinearity among opposition/defiance on the SNAP-IV and delinquent behavior and aggressive behavior on the CBCL, the aggressive behavior subscale was exclusively selected because of more relative to interpersonal interaction of its items. Therefore, based on hypothesis-driven analyses, we selected the 6 potential mediators, which were autistic symptoms, inattention, hyperactivity/impulsivity symptoms, aggressive behaviors, social problems, and withdrawal, to the following multiple mediation analysis (Table 3).

Statistical analysis

The Statistical Package for Social Science version 24 (SPSS Inc., Chicago, Illinois, USA) was used for statistical analyses. Two sample t-test (Cohen's *d* for effect size) and chi-square test (logistic regression) were used to examine the differences of continuous and categorical variables, respectively, between the ASD (n = 121) and TD (n = 232) groups (Table 1). We then conducted mediation analyses and calculated mediation effects, or indirect effects, according to the suggestion by Preacher and Hayes.[28] Fig. 1 presents the simple mediation model to be tested, and paths a and b represent the indirect effects of ASD diagnosis on follow-up bullying involvement through autistic symptoms and comorbid psychiatric conditions, including inattention, hyperactivity/impulsivity, aggressive behaviors, social problems, and withdrawal. We tested the indirect effects (i.e., ab path) by generating the 95% confidence intervals using 5000 bootstrap samples and

estimated single-step indirect effects (i.e., the path a and b). Significant a and b, coupled with significant ab, suggested stronger evidence of mediation effect than significant ab alone.[29] To avoid biased parameter estimates and to consider the effects from other mediators simultaneously, we further performed a multiple mediation model to test the significance of each mediator while considering other mediators within the model (Fig. 2A—C). Age and sex of the participants were included in the analyses as covariates.

Results

Group comparison of demographics and study variables

There was no significant group difference in sex distribution, but youths with ASD were older than TD youths at follow-up assessment (Table 1). Compared to TD, youths with ASD had more severe autistic symptoms (SRS), ADHD/ODD symptoms (SNAP-IV), and behavioral/emotional problems (CBCL), after adjusting for sex and age. ASD youths were more likely than TD to have all kinds of bullying involvements (76.0% for ASD and 11.6% for TD; odds ratio = 24.1; 95% confidence intervals = (13.5, 43.0)) except for perpetration-only (p = 0.508). Among youths with ASD, 90 (74.4%), 22(18.2%), 21(17.4%), and 69 (57.0%) involved any victimization, any perpetration, both victimization and perpetration, and victimization-only, respectively (Supplementary Table 2). Only one youth with autism involved perpetration without victimization (Table 1); therefore, we did not further analyze perpetration-only.

Psychiatric conditions as mediators on bullying involvement

There were significant correlations between age, autistic symptoms (SRS total and subscores), ADHD-related symptoms (SNAP-IV), and emotional and behavioral problems (CBCL) in Supplementary Table 3). In the simple mediation model (Table 2), we only interpreted the mediators selected based on the literature and our hypotheses (i.e., autistic symptoms, inattention, hyperactivity/impulsivity symptoms, aggressive behaviors, social problems, and withdrawal). We found that autistic symptoms, inattention, hyperactivity/impulsivity symptoms, aggressive behaviors, social problems, and withdrawal individually significantly mediated the pathway from ASD diagnosis to victimization-perpetration and victimization-only, independent of age

Table 1 Comparison of demographic characteristics and bullying involvement statuses between the ASD and TD groups.

	ASD	TD	*t* value or χ^2	*p* value	Effect size (Odds ratio [95%CI] or Cohen's *d*)
Mean (SD)	(n = 121)	(n = 232)			
Sex (male %)	107 (88.43%)	188 (81.03%)	$\chi^2 = 3.17$	0.075	1.79 [0.94—3.42]
Mean age at the 1st assessment	10.27 (3.32)	11.03 (2.50)	$t = -2.36$	0.019	0.251
Mean age at the 2nd assessment	13.34 (3.48)	11.03 (2.50)	$t = 7.15$	<0.001	0.802
Parent-reports on bullying involvement status					
Bullying Involvement[a]	92 (76.03%)	27 (11.64%)	$\chi^2 = 147.57$	<0.001	24.09 [13.50—42.98]
any Victimization[a]	90 (74.38%)	23 (9.91%)	$\chi^2 = 152.96$	<0.001	26.38 [14.58—47.75]
any Perpetration[a]	22 (18.18%)	10 (4.31%)	$\chi^2 = 57.69$	<0.001	4.93 [2.25—10.81]
Victimization-Perpetration[a]	21 (17.36%)	6 (2.59%)	$\chi^2 = 66.82$	<0.001	7.91 [3.10—20.20]
Victimization-only[a]	69 (57.02%)	17 (7.33%)	$\chi^2 = 136.22$	<0.001	16.78 [9.11—30.92]
Perpetration-only[a]	1 (0.83%)	4 (1.72%)	$\chi^2 = 0.26$	0.508	0.48 [0.05—4.30]
SRS					
Autistic Symptoms	89.7 (27.98)	28.5 (14.46)	$t = 27.09$	<0.001	3.05
SNAP-IV					
Inattention	4.40 (2.90)	0.90 (1.75)	$t = 14.17$	<0.001	1.23
Hyperactivity/Impulsivity	2.90 (2.80)	0.53 (1.27)	$t = 10.92$	<0.001	1.12
Opposition/Defiance	2.63 (2.59)	0.54 (1.35)	$t = 9.96$	<0.001	1.61
CBCL					
Aggressive Behavior	11.38 (8.23)	4.04 (4.65)	$t = 10.65$	<0.001	1.21
Anxiety/Depression	8.87 (6.68)	2.46 (2.94)	$t = 12.45$	<0.001	1.41
Attention Problems	10.66 (4.38)	2.76 (2.91)	$t = 20.84$	<0.001	2.27
Delinquent Behavior	3.85 (3.22)	1.29 (1.69)	$t = 9.77$	<0.001	1.11
Social Problems	7.34 (3.32)	1.52 (1.77)	$t = 21.37$	<0.001	2.42
Somatic Complaints	2.6 (3.56)	1.13 (1.98)	$t = 4.98$	<0.001	0.56
Thought Problems	4.24 (2.71)	0.74 (1.19)	$t = 16.68$	<0.001	1.89
Withdrawal	6.47 (3.94)	1.61 (1.95)	$t = 15.43$	<0.001	1.75

SRS: Social Responsiveness Scale, SNAP-IV: Swanson, Nolan, and Pelham, version IV scale, CBCL: Child Behavior Checklist.
[a] The χ^2 is result of comparing with non-bullying involvement group.

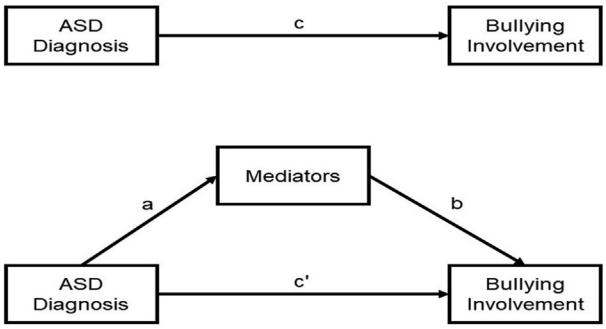

Figure 1 A concept of mediation model of autism spectrum disorder (ASD) diagnosis predicting various statuses of bullying involvement. The total effect (c) is the regression coefficient of ASD on bullying involvement. The indirect effect (ab) of mediators equals the product of regression coefficients of ASD to mediators (a) and mediators to bullying involvement (b). The direct effect (c') equals the remained regression coefficient after excluding effects of mediators.

and sex, in single mediation analyses (Table 2). The single mediation analyses of other clinical variables not selected for this analysis are presented in Supplementary Table 4.

Multiple Mediation models with 6 mediators included for the link from ASD to bullying involvements (Table 3, Fig. 2A) showed that social problems mediated the link between ASD and victimization-only, and ASD still maintain a significant direct effect on the risk of school bullying victims (Table 3, Fig. 2B). The model also showed that aggressive behaviors mediated the prediction of ASD to victimization-perpetration. After considering the mediating effect of aggressive behaviors, ASD had no further direct effect on victimization and perpetration (Table 3, Fig. 2C). Supplementary Fig. 1 presents further details in the mediation models between ASD diagnosis and five different bullying involvement statuses (i.e., bullying involvement, any victimization, any perpetration, victimization-perpetration, and victimization only).

To control the follow-up period's effect, we further performed a multiple mediation analysis (Supplementary Table 5) with follow-up duration. Again, the results are similar, regardless of adding follow-up duration as a covariate or not.

Discussion

The current study provides information about specific comorbid psychiatric conditions in the causal pathway between ASD and bully outcomes with follow-up design and mediation analysis. Our finding of an increased likelihood of having victimization but not perpetration in youths with ASD lends evidence to support our first hypothesis and is consistent with the literature.[3,6,7,11] Regarding psychopathological mediators for the pathway from ASD to bully, while controlling the confounding effects from sex and age, our results based on examining individual mediating factors support our hypothesis that comorbid psychiatric conditions mediated the link between ASD and bullying involvements. Our significant contribution is that ASD directly affects victimization-only without perpetration even after considering the significant mediation effect from social problems. In contrast, co-occurring social problems and aggressive behaviors can partially explain the prediction of ASD in having both victimization and perpetration.

Our findings are consistent with the growing body of literature supporting that students with ASD are more likely to have bullying experiences than comparison students. Being the targets for bullying may be explained by their pervasive difficulties in social communication and interactions. Moreover, ASD diagnosis may keep youths from asserting themselves against being perpetrated by others.[3,6,7,11]

As the diagnosis of ASD was confirmed to predict bullying involvement by the current study, here comes the question of whether the severity of autistic symptoms has a mediating effect on this casual pathway. Our results did not provide any evidence to support the mediating role of autistic symptom severity on this link. Related forgoing literature remains unclear about the relationship between ASD symptoms and bullying involvement.[11] In contrast, youth with ASD may also exhibit multiple added features, including salient comorbid emotional/behavioral problems that may increase their risk of being targeted by perpetrators.[31] ADHD symptoms, aggressive behavior, anxiety, depression, social problems, and withdrawal were common proposed risk factors for bullying involvement reported by epidemiological studies in the general population to date.[13]

Social problems are common traits and undergird the array of ASD diagnosis.[6] High social difficulties and low social competence were the essential personal predictors of victimization.[18,32] Restricted experiences for modifying inappropriate behavior and limited opportunities for learning proper behaviors, which is undoubtedly a reciprocal process, further the cycle; hence, social problems make ASD children easy and tempting targets of bullying while lacking quality friendship to protect them. The significant mediating effects of social problems on victimization, including victimization-only and victimization-perpetration, in ASD, agree with these past documents reporting that youths with ASD are thought to be more vulnerable to victimization.[16]

Aggressive behaviors associated with symptoms of ADHD, ODD or CD, are also more likely to be observed in individuals with ASD than those without.[5] Although the literature documents that ASD individuals are not likely to conduct perpetration,[33] in addition to validating the link between ASD and victimization, the present study also showed that ASD youths were more likely to have both victimization and perpetration. Some ASD individuals who were bullied might use aggressive behavior as an instrument to fight back or cool down, which in turn, can be labeled as perpetration even in the absence of insight into the impact of their own overreact behavior.[34] Our finding of the significant mediating effect of aggressive behaviors

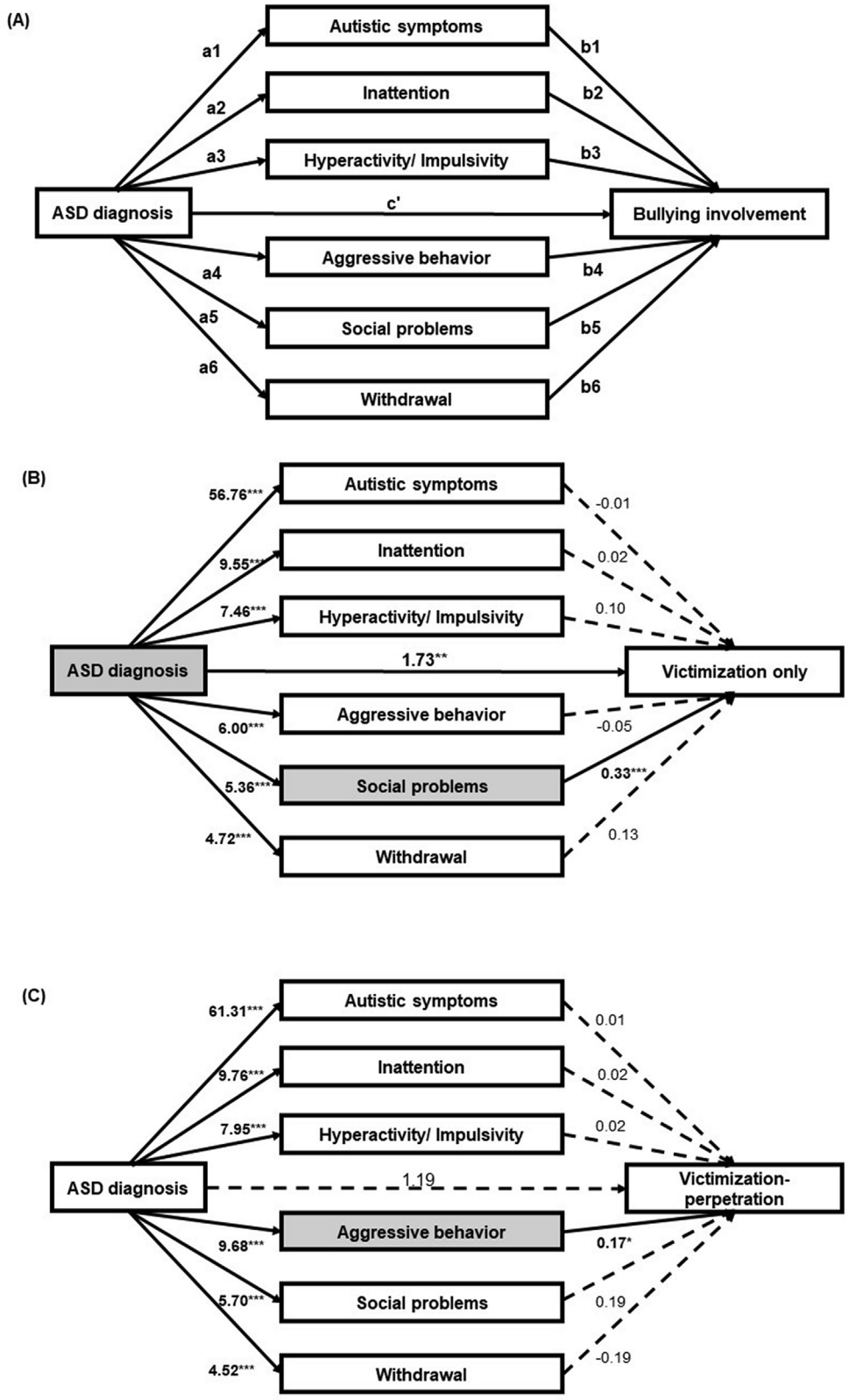

Figure 2 Multiple mediation models with all six potential mediators for the link between ASD and various bullying involvement statuses. (A) Potential mediators tested in the same model (as detailed in Figure 1), (B) victimization-only as the outcome variable, and (C) victimization-perpetration as the outcome variable.

Table 2 Single mediator mediation analysis with autism spectrum disorder on various bullying involvement statuses based on the concept diagram in Fig. 1.

Bullying involvement status	Mediators[a]	Unstandardized estimates (SE)				Indirect effects			
								Bootstrap	
		a	b	c	c'	ab	ab	SE	95% CI
Victimization-Perpetration	Autistic symptoms	60.64 (2.91)***	0.05 (0.01)***	3.30 (0.53)***	0.81 (0.84)	3.032	2.75***	0.96	[1.09–4.61]
	Inattention	9.68 (0.84)***	0.15 (0.04)***	3.46 (0.55)***	2.38 (0.62)***	1.452	1.46***	0.51	[0.57–2.49]
	Hyperactivity/Impulsivity	7.95 (0.72)***	0.22 (0.05)***	3.45 (0.55)***	1.97 (0.65)**	1.749	1.77***	0.65	[0.74–3.15]
	Aggressive Behavior	10.05 (0.97)***	0.18 (0.04)***	3.37 (0.54)***	2.09 (0.63)**	1.809	1.84***	0.64	[0.84–3.24]
	Social Problems	5.70 (0.36)***	0.43 (0.10)***	3.37 (0.54)***	1.40 (0.70)	2.451	2.45***	0.84	[1.13–4.38]
	Withdrawal	4.42 (0.43)***	0.23 (0.08)*	3.37 (0.54)***	2.67 (0.59)***	1.017	1.04*	0.44	[0.27–2.0]
Victimization-only	Autistic symptoms	57.12 (2.49)***	0.02 (0.01)***	3.37 (0.37)***	2.15 (0.53)***	1.142	1.38***	0.51	[0.46–2.46]
	Inattention	9.48 (0.67)***	0.11 (0.03)***	3.45 (0.38)***	2.62 (0.43)***	1.043	1.09***	0.39	[0.32–1.86]
	Hyperactivity/Impulsivity	7.46 (0.59)***	0.14 (0.04)***	3.44 (0.38)***	2.63 (0.42)***	1.044	1.07***	0.34	[0.49–1.84]
	Aggressive Behavior	6.24 (0.68)***	0.06 (0.03)	3.40 (0.37)***	3.09 (0.40)***	0.374	0.37	0.25	[-0.11–0.9]
	Social Problems	5.35 (0.29)***	0.36 (0.08)***	3.40 (0.37)***	1.92 (0.47)***	1.926	1.92***	0.52	[0.99–3.01]
	Withdrawal	4.62 (0.34)***	0.18 (0.06)***	3.40 (0.37)***	2.72 (0.42)***	0.832	0.83***	0.34	[0.17–1.53]

CI, confidence interval; SE, standard error.
*Adjusted with sex and age at the 2nd assessment.
*$p < 0.5$; **$p < 0.01$; ***$p < 0.001$ with 5,000 bootstrapping sampling.
[a] Age and sex were controlled as covariates.

on the link between ASD diagnosis and victimization-perpetration status in line with a prior investigation revealing perpetration in ASD individuals are more likely to stem from other factors, such as behavioral problems rather than ASD per se.[7] Such victimization-perpetration individuals are different from pure perpetrators who use proactive and goal-directed aggression to control others and gain social power in the school environment.[7,32]

Our results lend evidence to support that ASD diagnosis per se is significantly associated with victimization but not with perpetration after controlling for comorbid psychopathology,[7] and comorbidities may increase the risk for victimization-perpetration[11] or victimization-only[13] in those with ASD. Hence, it appears clear that among youths with ASD involved in bullying, most victims purely stay in victimization as passive victims, but a proportion of victims also engage in perpetration as aggressive victims; however, almost all perpetrators are victimized as well, displaying reactive rather than proactive aggression. Our findings of social problems and aggressive behaviors mediating the link between ASD and victimization and victimization-perpetration, respectively, strongly suggest that the developmental process of victim-perpetrators may be incredibly complicated and a more in-depth understanding of youths with ASD is necessary for clinical and school settings.[35] More investigations into the role of comorbid conditions in youth with ASD are needed to clarify the mechanisms that maintain or exacerbate bullying. Furthermore, identifying and treating comorbid psychiatric conditions in youths with ASD is suggested to offset their bullying outcomes.

Given no mediation effects from other psychopathologies in the multivariate mediation models, our further analyses showed that bullying involvement was associated with subsequent psychiatric conditions such as more anxiety, depression, withdrawal, thought problems, and behavior problems (Supplementary Table 4). Our findings are in line with most previous research.[3] Some even indicated a bidirectional relationship between bullying and mental health problems.[36] Thus, our ongoing third wave longitudinal study will investigate the direction of the relationships between bullying involvement and further developing psychopathologies.

Several limitations necessitate being addressed. First, only one follow-up assessment prevents us from interpreting the trajectory of bullying involvement. Second, because the aim of this paper is to test the mediation effect of psychopathology on the bully involvements rather than to examine psychopathologies or their changes as the outcomes or to explore the impact of psychopathological changes on the bully involvements, the psychopathologies were not explicitly assessed at follow-up. For a better follow-up study design, it is suggested that the same psychopathologies should be included in the follow-up assessment, which will be done at our next wave of follow-up. Third, the bullying involvement status assessed in the present study should be interpreted with caution due to the limited number of SAICA items assessing different involvement statuses in bullying. Reliance on only one question would raise issues regarding both reliability and measurement error. Future studies should use the measures designed for assessing school bullying and use both at the

Table 3 Multiple mediation analysis in the link between autism spectrum disorder and various bullying involvement statuses.

Bullying involvement status	Mediators[a]	Unstandardized estimates (SE)				Indirect effects			
							Bootstrap		
		a	b	c	c'	ab	ab	SE	95% CI
Victimization-Perpetration	Autistic symptoms	61.31 (2.99)***	0.01 (0.02)	3.45 (0.56)***	1.19 (1.08)	0.62	0.78	2.79	[-5.67; 5.08]
	Inattention	9.76 (0.82)***	0.02 (0.08)			0.18	0.23	1.75	[-2.27; 3.65]
	Hyperactivity/Impulsivity	7.95 (0.72)***	0.02 (0.09)			0.14	0.13	1.41	[-3.17; 2.16]
	Aggressive behavior	9.68 (0.98)***	0.17 (0.08)*			1.58	1.68*	1.92	[-1.21; 4.4]
	Social problems	5.70 (0.37)***	0.19 (0.17)			1.12	1.08	2.06	[-2.7; 4.51]
	Withdrawal	4.52 (0.43)***	−0.19 (0.16)			−0.94	−0.86	1.46	[-3.73; 1.05]
Victimization-only	Autistic symptoms	56.76 (5.09)***	−0.01 (0.01)	3.44 (0.38)***	1.73 (0.59)**	−0.61	−0.72	0.93	[-2.57; 1.08]
	Inattention	9.55 (0.66)***	0.02 (0.05)			0.19	0.19	0.66	[-1.1; 1.51]
	Hyperactivity/Impulsivity	7.46 (0.59)***	0.1 (0.06)			0.67	0.76	0.48	[-0.15; 1.63]
	Aggressive behavior	5.99 (0.68)***	−0.05 (0.05)			−0.29	−0.31	0.41	[-1.09; 0.47]
	Social problems	5.35 (0.30)***	0.33 (0.1)***			1.92	1.79**	0.67	[0.56; 3.07]
	Withdrawal	4.72 (0.35)***	0.13 (0.09)			0.6	0.59	0.55	[-0.53; 1.68]

CI, confidence interval; SE, standard error.
*Adjusted with sex and age at the 2nd assessment.
*$p < 0.5$; **$p < 0.01$; ***$p < 0.001$ with 5,000 bootstrapping sampling.
[a] Age and sex were controlled as covariates.

first assessment and follow-up period to evaluate the change during the period. Fourth, bullying behaviors were measured in general without the full spectrum of different types (e.g., physical, verbal, relational bullying). Lastly, a small number of girls were relative to boys, hindering the comprehensive examination of gender differences. Future studies recruiting more female participants with ASD are needed.

Despite these shortcomings, this study used a longitudinal follow-up study design to identify the psychopathological mediators to predict ASD to bullying involvement. Our study has some interesting clinical implications for evaluation, prevention, and intervention regarding the mediation effects of social problems and aggressive behaviors. Early identification of comorbid conditions, in general, and specifically, may give parents, teachers, and health professionals a better opportunity to prevent bullying by early intervention. While individuals with ASD were recognized as victims, it is recommended to deal with their victimization and pay attention to whether they responded with bullying other more vulnerable targets. On the other hand, if those with ASD were identified as perpetrators, it should be inquired into their possible victimizing experiences and working on their problematic perpetrating behaviors. It is also an unavoidable duty of health professionals to better understand the complex dynamics among personal characteristics of ASD and bullying behaviors timely. Regarding intervention, which is beyond the scope of this paper, one of our next steps is to conduct an intervention trial of social skill training to test the efficacy of improving social interactions and relationships as well as the prevention of school bully involvement among adolescents with ASD.

Funding

This work was supported by grants from the National Science Council (NSC98-3112-B-002-004; NSC101-2627-B-002-002; NSC 101- 2314-B-002-136-MY3) for Time 1 data collection and the National Health Research Institutes (NHRI-EX104-10404PI, NHRI-EX105-10404PI, NHRI-EX106-10404PI, NHRI-EX107-10404PI, NHRI-EX108-10404PI), Taiwan, for follow-up data collection.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

Acknowledgment

The authors thank all the families for their participation and contribution to this study. The authors declared no potential conflicts of interest relevant to this article.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jfma.2021.12.030.

References

1. Due P, Holstein BE, Lynch J, Diderichsen F, Gabhain SN, Scheidt P, et al. Bullying and symptoms among school-aged children: international comparative cross sectional study in 28 countries. *Eur J Publ Health* 2005;**15**(2):128—32.
2. Growing up unequal: gender and socioeconomic differences in young people's health and well-being. In: Inchley J, Currie D, Young T, Samdal O, Torsheim T, Augustson L, et al., editors. *Health Behaviour in School-aged Children (HBSC) study: international report from the 2013/2014 survey*. Copenhagen: WHO Regional Office for Europe; 2016.
3. Sterzing PR, Shattuck PT, Narendorf SC, Wagner M, Cooper BP. Bullying involvement and autism spectrum disorders: prevalence and correlates of bullying involvement among adolescents with an autism spectrum disorder. *Arch Pediatr Adolesc Med* 2012;**166**(11):1058—64.
4. Humphrey N, Symes W. Peer interaction patterns among adolescents with autistic spectrum disorders (ASDs) in mainstream school settings. *Autism* 2011;**15**(4):397—419.
5. Kanne SM, Mazurek MO. Aggression in children and adolescents with ASD: prevalence and risk factors. *J Autism Dev Disord* 2011;**41**(7):926—37.
6. van Roekel E, Scholte RH, Didden R. Bullying among adolescents with autism spectrum disorders: prevalence and perception. *J Autism Dev Disord* 2010;**40**(1):63—73.
7. Hwang S, Kim YS, Koh YJ, Leventhal BL. Autism spectrum disorder and school bullying: who is the victim? who is the perpetrator? *J Autism Dev Disord* 2018;**48**(1):225—38.
8. Chou WJ, Hsiao RC, Ni HC, Liang SH, Lin CF, Chan HL, et al. Self-reported and parent-reported school bullying in adolescents with high functioning autism spectrum disorder: the roles of autistic social impairment, attention-deficit/hyperactivity and oppositional defiant disorder symptoms. *Int J Environ Res Publ Health* 2019;**16**(7):1117.
9. Hebron J, Oldfield J, Humphrey N. Cumulative risk effects in the bullying of children and young people with autism spectrum conditions. *Autism* 2017;**21**(3):291—300.
10. Hwang-Gu SL, Lin HY, Chen YC, Tseng YH, Hsu WY, Chou MC, et al. Symptoms of ADHD affect intrasubject variability in youths with autism spectrum disorder: an ex-Gaussian analysis. *J Clin Child Adolesc Psychol* 2019;**48**(3):455—68.
11. Zablotsky B, Bradshaw CP, Anderson CM, Law P. Risk factors for bullying among children with autism spectrum disorders. *Autism* 2014;**18**(4):419—27.
12. Fink E, Olthof T, Goossens F, van der Meijden S, Begeer S. Bullying-related behaviour in adolescents with autism: links with autism severity and emotional and behavioural problems. *Autism* 2018;**22**(6):684—92.
13. Winters RR, Blake JJ, Chen S. Bully victimization among children with attention-deficit/hyperactivity disorder: a longitudinal examination of behavioral phenotypes. *J Emot Behav Disord* 2018;**28**(2):80—91.
14. Álvarez-García D, García T, Núñez JC. Predictors of school bullying perpetration in adolescence: a systematic review. *Aggress Violent Behav* 2015;**23**:126—36.
15. Wan Ismail WS, Nik Jaafar NR, Sidi H, Midin M, Shah SA. Why do young adolescents bully? Experience in Malaysian schools. *Compr Psychiatr* 2014;**55**:S114—20.
16. Fanti KA, Kimonis ER. Bullying and victimization: the role of conduct problems and psychopathic traits. *J Res Adolesc* 2012;**22**(4):617—31.
17. Felipe MT, De Ossorno García S, Babarro JM, Arias RM. Social characteristics in bullying typology: digging deeper into description of bully-victim. *Procedia Soc Behav Sci* 2011;**29**:869—78.
18. Fox CL, Boulton MJ. The social skills problems of victims of bullying: self, peer and teacher perceptions. *Br J Educ Psychol* 2005;**75**(2):313—28.
19. Smith PK, Kwak K, Toda Y, editors. *School bullying in different cultures: eastern and western perspectives*. Cambridge: Cambridge University Press; 2016.
20. Paul A, Gallot C, Lelouche C, Bouvard MP, Amestoy A. Victimisation in a French population of children and youths with autism spectrum disorder: a case control study. *Child Adolesc Psychiatr Ment Health* 2018;**12**:48.
21. Hanish LD, Guerra NG. Predictors of peer victimization among urban youth. *Soc Dev* 2000;**9**(4):521—43.
22. Gau SS, Chou MC, Lee JC, Wong CC, Chou WJ, Chen MF, et al. Behavioral problems and parenting style among Taiwanese children with autism and their siblings. *Psychiatr Clin Neurosci* 2010;**64**(1):70—8.
23. Gau SS, Chong MY, Chen TH, Cheng AT. A 3-year panel study of mental disorders among adolescents in Taiwan. *Am J Psychiatr* 2005;**162**(7):1344—50.
24. Gau SS, Liu LT, Wu YY, Chiu YN, Tsai WC. Psychometric properties of the Chinese version of the social responsiveness scale. *Res Autism Spectr Disord* 2013;**7**:349—60.
25. Gau SS, Shang CY, Liu SK, Lin CH, Swanson JM, Liu YC, et al. Psychometric properties of the Chinese version of the Swanson, Nolan, and Pelham, version IV scale - parent form. *Int J Methods Psychiatr Res* 2008;**17**(1):35—44.
26. Yang HJ, Soong WT, Chiang CN, Chen WJ. Competence and behavioral/emotional problems among Taiwanese adolescents as reported by parents and teachers. *J Am Acad Child Adolesc Psychiatry* 2000;**39**(2):232—9.
27. Gau SS, Shen HY, Soong WT, Gau CS. An open-label, randomized, active-controlled equivalent trial of osmotic release oral system methylphenidate in children with attention-deficit/hyperactivity disorder in Taiwan. *J Child Adolesc Psychopharmacol* 2006;**16**(4):441—55.
28. Preacher KJ, Hayes AF. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behav Res Methods* 2008;**40**(3):879—91.
29. Mackinnon DP, Fairchild AJ, Fritz MS. Mediation analysis. *Annu Rev Psychol* 2007;**58**(1):593—614.
30. Geoffroy MC, Boivin M, Arseneault L, Renaud J, Perret LC, Turecki G, et al. Childhood trajectories of peer victimization and prediction of mental health outcomes in midadolescence: a longitudinal population-based study. *Can Med Assoc J* 2018;**190**(2):E37—43.
31. Erath SA, Tu KM, El-Sheikh M. Socially anxious and peer-victimized preadolescents: "doubly primed" for distress? *J Abnorm Child Psychol* 2012;**40**(5):837—48.
32. Jara NM, Casas JA, Ortega-Ruiz R. Proactive and reactive aggressive behavior in bullying: the role of values. *Int J Educ Psychol* 2017;**6**(1):1—24.
33. Sofronoff K, Dark E, Stone V. Social vulnerability and bullying in children with Asperger syndrome. *Autism* 2011;**15**(3):355—72.
34. Hodgins Z, Kelley E, Kloosterman P, Hall L, Hudson CC, Furlano R, et al. Brief report: do you see what i see? the perception of bullying in male adolescents with autism spectrum disorder. *J Autism Dev Disord* 2020;**50**(5):1822—6.
35. Sung YH, Chen LM, Yen CF, Valcke M. Double trouble: the developmental process of school bully-victims. *Child Youth Serv Rev* 2018;**91**:279—88.
36. Fekkes M, Pijpers FI, Verloove-Vanhorick SP. Bullying: who does what, when and where? involvement of children, teachers and parents in bullying behavior. *Health Educ Res* 2005;**20**(1):81—91.