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ORIGINAL ARTICLE

Profiles of Antisocial Behavior in School-Based and At-Risk Adolescents in Singapore: A Latent Class Analysis

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Abstract
This study used latent class analysis to examine whether multiple subgroups can be identified based on rule-breaking and aggressive behavior in school-based and at-risk adolescent samples. These groups were tested for differences in behavioral, emotional, personality and interpersonal correlates. Rule breaking and aggressive behavior co-occurred across all classes. School-based adolescents were classified as having minimal, minor or moderate antisocial problems. At-risk adolescents were classified as having mild, medium or severe antisocial problems. Generally, at-risk adolescents had higher levels of antisocial behavior, and greater severity of antisocial behavior was associated with more problems in various domains. Results differed however, for the school-based and at-risk samples with respect to emotional problems, sensation-seeking and peer conformity pressure. There is a need to jointly consider both non-aggressive rule-breaking behavior and aggressive behavior in prevention and intervention work, as it is insufficient to address isolated symptoms and problems in children and adolescents.

Keywords Latent class analysis · Rule-breaking behavior · Aggressive behavior · School-based adolescents · At-risk adolescents

Introduction

For prevention and intervention of child and adolescent antisocial behavior, it is important to enhance our understanding of how we understand and classify these behaviors. Current taxonomies such as DSM-5 [1], use a categorical approach typically with clinical diagnostic interviews whereby disorders are viewed as distinct. Achenbach et al. [2, 3] empirically derived taxonomy views problems on a continuum; theirs is a dimensional approach typically using questionnaires. Both approaches are not necessarily in conflict; distinct disorders can be viewed as having dimensional qualities, and having a dimensional model can include the potential existence of categories [4].

The present research approaches classification using questionnaires from a dimensional perspective, although this does not preclude the acknowledgment of potential categories. Traditionally, many authors use factor analysis to examine the structure of antisocial behavior. However, to investigate taxonomy, it is crucial to determine if groups of people can be identified either based on behavioral symptoms or on severity levels of these behavioral symptoms. Factor analysis is helpful to determine if symptoms or behavioral variables group together, but it does not inform us about whether people can be meaningfully clustered into homogeneous groups. Therefore, latent class analysis (LCA) is the more appropriate and useful procedure if the goal is to group people into their most likely latent class [5, 6]. We provide a brief overview of antisocial behavior. Other emotional and behavioral correlates, together with personality and interpersonal correlates will be discussed with respect to how these relate to antisocial behavior.

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Antisocial Behavior

Antisocial behavior is defined as a wide variety of attitudes and actions that violate the law, social norms, and others' personal or property rights. It includes behaviors such as lying, stealing and vandalism, and ranges in severity from minor offenses to more serious delinquency and crimes, such as violence against another person [7]. Although antisocial behavior includes non-aggressive rule-breaking behavior that violates norms or laws and aggressive behavior that directly victimizes others [7], both kinds of behaviors usually co-occur [8]. During this transition, adolescents need to navigate other behavioral adjustment issues such as internalizing and attention problems, personality related correlates such as sensation seeking, as well as interpersonal aspects such as parent–child conflict, peer pressure and conformity issues. These domains will be reviewed with a focus on how each might be related to antisocial behavior.

Internalizing Problems

Internalizing problems, including anxiety, depression, social withdrawal, and somatic complaints, are prevalent in adolescents, and even subclinical internalizing symptoms can cause significant functioning impairment in adolescents [9]. de Nijs et al. [10] found that clinic-referred adolescents with higher levels of disruptive behavior also have higher levels of a range of internalizing symptoms. Overall, internalizing symptoms often co-occur with delinquent behavior, and adolescents with such comorbidity usually show poorer behavioral and developmental outcomes [9].

Attention Problems

Inattention represents difficulties in sustaining concentration for prolonged periods and hyperactivity/impulsivity represents behavior that lacks careful planning, or responding too quickly to stimuli without reflection [11]. Both are core features of ADHD which is the most prevalent childhood neurobehavioral disorder in childhood. These ADHD related problems can function as a precursor to later antisocial behavior; children and adolescents with high levels of attention problems are likely to display disruptive behavior and are at higher risk of delinquency and criminality [12, 13].

Sensation Seeking Behavior

Sensation seeking is defined as a biosocial dimension of personality characterized by a need for varied, novel, and complex sensations and experiences, representing a willingness to take physical and social risks to obtain such experiences [14, 15]. Sensation seeking is a potent predictor of problematic behaviors such as smoking, drinking, drug use, risky sexual behavior, vandalism, and theft [14, 16]. Sensation seeking sharply increases from late childhood to mid-adolescence, with an age-trend that parallels the increase of delinquent behavior [17].

Parent–Child Conflict

Parents are key socialization agents for children and adolescents even as they enter adolescence. However, during adolescence, peers become important socialization agents as well. Not surprisingly, researchers have documented both increased parent–child conflict and conformity to peers during this phase and these have come to be viewed as hallmarks in adolescence [18]. Negative parenting including harsh discipline, and parent–child conflict have frequently and consistently been found to be associated with antisocial behavior [19–21]. In contrast, adolescents who have good relationships with their parents are less likely to engage in externalizing problems, such as substance use, antisocial and aggressive behavior, and other risky activities [22].

Peer Pressure and Peer Conformity

Friends' influences become particularly prominent in adolescence given the substantial amount of time they spend with peers [23]. Peer conformity is one aspect of peer pressure, described as individuals taking certain actions sanctioned by their peer group [24, 25] and represents the willingness to accede to peer pressure [18]. Compared to younger children or emerging adults, adolescents are more likely to conform to peer norms through following certain peer-prescribed guidelines [18, 24]. Hence, peer conformity is predictive of behaviors such as substance use, risky sexual behavior, and delinquency [25]. Affiliation with deviant peers is a strong predictor of delinquent behavior [17, 23].

Application of Latent Class Analysis and the Present Study

Latent class analysis is a person-centered approach that classifies individuals from a heterogeneous sample into more homogenous, mutually exclusive classes according to multiple characteristics, rather than classifying items like factor analysis. Some studies obtain clusters based on the severity of certain behaviors [26], while others obtain clusters based on the types of symptoms individuals present [27]. Most studies cluster individuals from

either non-referred or referred samples [10], while very few studies classify across diverse samples [28].

This present investigation contributes to theory-building pertaining to taxonomies for child and adolescent antisocial behavior. Groups of individuals can be clustered based on certain behavioral symptoms such as aggression for example. Alternatively, groups of individuals may have co-occurring behavioral symptoms, and these groups are classified and differentiated by severity of symptom levels. Hence, results arising from this study will contribute towards an enhanced understanding of taxonomies for child and adolescent antisocial behavior.

The present study is guided by two research questions. First, there are limited studies that cluster individuals based on both rule-breaking and aggressive behavior. To address this research gap, we explored whether multiple subgroups with different profiles of antisocial behavior can be identified based on non-aggressive rule-breaking and aggressive behavior in separate school-based and at-risk adolescent samples. Researchers usually adopt a variable-centered approach and thus only considered variable–variable relationships rather than measuring person-variable relationships using the person-centered approach like LCA. Second, we examined whether distinct classes/groups arising from the LCA findings show differences in anxious/depressed symptoms, withdrawn/depressed symptoms, somatic complaints, attention problems, sensation seeking behavior, parent–child conflict, and peer pressure in both school-based and at-risk samples of adolescents.

Method

Participants

School-Based sample

A total of 4216 nationally representative students, aged 12–18 years ($M = 13.65$, $SD = 1.01$), participated in this study. There was a relatively even spread of participants across gender (50.9% male and 49.1% female) in the sample. All school-based adolescents were recruited from eight secondary schools in Singapore and were from Grades 7 through 9 (Grade 7 = 31.9%, Grade 8 = 33.9%, and Grade 9 = 34.2%). Schools in Singapore are clustered into four zones (East, West, North, South). We conducted a random drawing for all government schools within these respective zones to select schools for possible participation. The eight government schools selected are located across the four zones in residential neighborhoods.

At-Risk Sample

A total of 262 adolescents aged from 12 to 22 ($M = 16.48$, $SD = 1.72$) participated in this study. This sample had more males (77.5%) than females (22.5%). They were between Grade 5 and the Institute of Technical Education (ITE), which is a post-secondary vocational institution in Singapore (Grade 5 = 0.4%, Grade 6 = 1.2%, Grade 7 = 4.8%, Grade 8 = 11.5%, Grade 9 = 22.6%, Grade 10 = 30.6%, Grade 11 = 3.2%, ITE = 23.8%, and Other = 2.0%). Two groups of adolescents comprised this sample. The first group comprised youths who have committed an offense who are either undergoing probation, or ordered to reside in juvenile rehabilitation centers for a period of 12–36 months. The second group comprised at-risk youths who are not offenders but who display serious behavioral problems at home and school, and are placed on statutory supervision for a period of up to 3 years under the Beyond Parental Control program.

Consent and Procedures

Approval of this study was obtained from the Institutional Review Board of Nanyang Technological University, Singapore. For the school-based adolescents, the Ministry of Education in Singapore (MOE), as well as the respective school principals, also approved this study. We worked with the Ministry of Social and Family Development in Singapore (MSF) to identify the at-risk adolescents. Participation in this study was completely voluntary, and adolescents could refuse or discontinue participation at any time without penalty. Written informed consent was obtained from each participant and their parents. All participants were assured of confidentiality of their responses. The questionnaire was administered in English, to both samples, as English is the language of instruction in Singapore. For the school-based sample, we administered a structured self-report questionnaire in an organized classroom setting. For the at-risk sample, we conducted the survey through home visits or group sessions at seven juvenile or children's homes, probation office, or the police stations.

Measures

Youth Self-Report (YSR)

The YSR [3] is a self-report questionnaire to measure behavioral and emotional problems in youths. YSR has been widely validated with excellent psychometric properties. It yields eight narrowband, two broadband (internalizing and externalizing problems), and a total problems score. In calculating the narrowband and broadband scale scores, raw scores were used instead of T-scores. T-scores truncate the range of variation in YSR scores; therefore researchers

have recommended the use of raw scores so as to allow for the full range of variation in conducting data analysis [29]. For the purposes of this study, six narrowband scales were used—anxious/depressed with 12 items (e.g., I am nervous or tense), withdrawn/depressed with 8 items (e.g., I am too shy or timid), somatic complaints with 10 items (e.g., I feel dizzy or lightheaded), attention problems with 9 items (e.g., I have trouble concentrating or paying attention), rule-breaking behavior with 13 items (e.g., I break rules at home, school, or elsewhere), and aggressive behavior with 17 items (e.g., I physically attack people). Adolescents rated each item as 0 (*not true*), 1 (*somewhat or sometimes true*), or 2 (*very true or often true*), with a higher score indicating greater problems. The Cronbach alpha reliability estimates for anxious/depressed, withdrawn/depressed, somatic complaints, attention problems, rule-breaking behavior, and aggressive behavior were 0.84, 0.75, 0.79, 0.78, 0.71, and 0.85 for the school-based sample, and 0.82, 0.80, 0.85, 0.83, 0.85, and 0.89 for the at-risk sample, respectively.

Brief Sensation Seeking Scale for Chinese (BSSS-C)

The BSSS-C [16] is a 5-point scale with 8 items to assess sensation seeking behavior, including experience seeking, boredom susceptibility, thrill and adventure seeking, and disinhibition (e.g., I would do anything as long as it exciting and stimulating). Adolescents rated each item as 1 (*completely disagree*), 2 (*disagree*), 3 (*neutral*), 4 (*agree*), or 5 (*completely agree*). A higher score indicates a higher level of sensation seeking behavior. The Cronbach alpha reliability estimates were 0.74 and 0.80 for the school-based sample and the at-risk sample, respectively.

Parent Environment Questionnaire (PEQ)

The PEQ [30] is a 4-point scale to measure the parent–child relationship from the youth's perspective. PEQ consists of five dimensions: conflict with parent, involvement with parent, regard for parent, regard for child, and structure. In this study, the 12-item subscale of "conflict with parent" (e.g., "My parent often loses her/his temper with me"), was employed to measure the conflict between children and their parents. Adolescents rated each item as 1 (*definitely false*), 2 (*probably false*), 3 (*probably true*), or 4 (*definitely true*) to measure the parent–child conflict, with higher scores indicating more conflict with parents. Good Cronbach alpha reliability estimates were obtained in the school-based ($\alpha = 0.90$) and at-risk samples ($\alpha = 0.93$).

Peer Pressure Inventory (PPI)

The PPI [24] is a 5-point scale that measure five areas of pressure, including peer involvement, involvement in school, involvement with family, conformity to peer norms, and misconduct. The 9-item "conformity to peer norms" subscale (e.g., "How often do you feel the need to be good friends only with people your friends like") was used to measure peer conformity in this study, and adolescents rated each item as 1 (*never*), 2 (*seldom*), 3 (*sometimes*), 4 (*often*), or 5 (*all the time*). A higher score is indicative of greater peer pressure for conformity. The Cronbach alpha reliability estimates were 0.81 and 0.85 for the school-based and at-risk samples respectively.

Data Analytic Plan

The two narrowband YSR scales of rule-breaking behavior and aggressive behavior as latent class indicators of antisocial behavior were used to cluster adolescents using LCA via Mplus version 8 [31]. In line with the approach used by researchers employing CBCL items in LCA [26, 28], we coded rule-breaking and aggressive behavior scales where a score of 0 indicated the absence of this behavior (*not true*), and 1 indicated the presence of this behavior (*sometimes or often true*). A series of LCA models with different number of classes were then compared. Our school-based ($n = 4216$) sample is about 16 times the size of our at-risk ($n = 262$) sample. We selected 15 random independent and non-replacement samples of $n = 262$ each and one random sample of $n = 286$, from the school-based sample and performed LCA on these 16 samples to ensure comparability of sample size across our school-based and at-risk samples when making comparisons. Compared to the school-based samples, the at-risk samples show significant higher levels of rule-breaking behavior ($t = -13.30$, $df = 522$, $p < 0.001$; Cohen's $d = 1.16$), aggressive behavior ($t = -3.56$, $df = 522$, $p < 0.001$; Cohen's $d = 0.31$), and total antisocial behavior including both rule-breaking and aggressive behavior ($t = -7.96$, $df = 522$, $p < 0.001$; Cohen's $d = 0.70$). After controlling for age, the significant differences between the two samples still exist in rule-breaking ($F = 136.31$, $df = 1$, $p < 0.001$; $\eta_p^2 = 0.21$), aggressive ($F = 16.62$, $df = 1$, $p < 0.001$; $\eta_p^2 = 0.03$), and total antisocial behaviors ($F = 57.72$, $df = 1$, $p < 0.001$; $\eta_p^2 = 0.10$).

The primary goal of LCA is to find the smallest number of classes of adolescents with similar patterns of antisocial behavior, and the Akaike information criteria (AIC), the Bayesian information criteria (BIC), and the sample-size adjusted BIC (SSABIC) were examined. A model with lower AIC, BIC, and SSABIC values was preferred. Two likelihood-based indexes—the Lo–Mendell–Rubin likelihood ratio test (LMRT) and the bootstrap likelihood ratio test (BLRT) were used to compare the improvement in fit between a k class model and a $k-1$ class model. Significant p values of the LMRT and BLRT indicate that the k class

model is better than the $k-1$ class model. The classification accuracy (i.e., entropy and class assignment probabilities) is also used to assess different models. Both entropy and class assignment probabilities range from 0 to 1, with a value close to 1 indicating good classification accuracy. Specifically, entropy over 0.80 and the assignment probability of each class over 0.80 are indicative of good classification quality. A reasonable sample size of each class should be over 5% of the total participants [26]. To compare the differences in anxious/depressed symptoms, withdrawn/depressed symptoms, somatic complaints, attention problems, sensation seeking behavior, parent–child conflict, and peer pressure across different classes of adolescents, a series of analysis of variance (ANOVA) was performed using SPSS 25.0. The same data analytic procedures were separately applied to the 16 school-based random subsamples and the at-risk sample.

Results

School-Based Sample

All 16 random subsamples yielded comparable findings. Due to space constraints we present results from only one of the 16 random subsamples. Interested researchers can obtain the results of all the subsamples from the first author. We compared models estimating 2-class through 5-class solutions (see Table 1). Results showed that the BIC of the 3-class solution was lowest in the five solutions, and although the AIC and SSABIC continued to improve through the 5-class solution, these improvements were marginal. The non-significant LMRT of the 4-class solution ($p = 0.535$) indicated that the 4-class solution was not better than the 3-class solution, while the significant LMRT of the 3-class solution ($p = 0.020$) indicated that the 3-class solution was better than the 2-class solution. Meanwhile, the 3-class solution had good classification accuracy value (entropy = 0.859) that is higher than the entropy value of the 4-class (entropy = 0.855). Therefore, the 3-class solution was found to be the best model according to multiple statistical criteria and theoretical interpretability. For the school-based sample, the three classes of adolescents were labeled as those having minimal problems, minor problems, and moderate problems based on their levels of antisocial behavior. The mean probability was 0.945 for the minimal problems class (37.0%, $n = 97$), 0.929 for the minor problems class (45.4%, $n = 119$), and 0.959 for the moderate problems class (17.6%, $n = 46$). Chi square test revealed that the distribution of male and female school-based adolescents in each class is non-significant ($\chi^2 = 1.47$, $df = 2$, $p > 0.05$). Males and females also did not show significant differences in rule-breaking ($t = 0.20$, $df = 260$, $p > 0.05$) and aggressive behavior ($t = -0.13$, $df = 260$, $p > 0.05$).

The smallest group of adolescents who were classified into the moderate problems class displayed the highest level of antisocial behavior in the school-based sample. Table 2 shows the mean number of the 30 items of rule-breaking and aggressive behavior endorsed by each class of the school-based adolescents. The minimal problems class endorsed 0 to 9 indicators, the minor problems class endorsed 7 to 16 indicators, and the moderate problems class endorsed 13.45 to 24 indicators. The three classes of school-based adolescents showed significant differences on the 30 indicators of antisocial behavior ($F = 559.83$, $df = 2$, $p < 0.001$; $\eta_p^2 = 0.81$). The mean scores of the 30 indicators in the school-based adolescents are reported in Table 3. The item endorsement probabilities indicated the probability that members of each latent class would endorse the specific item of rule-breaking and aggressive behavior. Details are presented in Fig. 1.

To compare the differences of different classes on behavioral, emotional, personality and interpersonal

Table 1 Fit indices for latent class analysis in school-based and at-risk adolescents

Number of classes	AIC	BIC	SSABIC	LMRT	BLRT	Entropy
School-based random subsample ($n = 262$)						
2	6974	7192	6998	0.000	0.000	0.863
3	6843	7171	6879	0.020	0.000	0.859
4	6817	7256	6866	0.535	0.000	0.855
5	6803	7352	6864	0.474	0.000	0.877
At-risk sample ($n = 262$)						
2	8399	8616	8423	0.000	0.000	0.915
3	8161	8489	8198	0.088	0.000	0.892
4	8114	8553	8163	0.161	0.000	0.891
5	8083	8633	8144	0.612	0.000	0.885

AIC akaike information criterion, *BIC* bayesian information criterion, *SSABIC* sample size-adjusted BIC, *LMRT* Lo–Mendell–Rubin likelihood ratio test, *BLRT* bootstrap likelihood ratio test

correlates, a series of ANOVA were performed (see Table 4). The three classes showed significant differences in anxious/depressed symptoms ($F = 26.68$, $df = 2$, $p < 0.001$; $\eta_p^2 = 0.17$), withdrawn/depressed symptoms ($F = 22.68$, $df = 2$, $p < 0.001$; $\eta_p^2 = 0.15$), somatic complaints ($F = 15.71$, $df = 2$, $p < 0.001$; $\eta_p^2 = 0.11$), attention problems ($F = 47.70$, $df = 2$, $p < 0.001$; $\eta_p^2 = 0.27$), conflict with parents ($F = 32.96$, $df = 2$, $p < 0.001$; $\eta_p^2 = 0.20$), and peer pressure ($F = 7.24$, $df = 2$, $p < 0.01$; $\eta_p^2 = 0.05$), while there is no significant difference in sensation seeking ($F = 1.42$, $df = 2$, $p > 0.05$). Post hoc comparisons revealed that adolescents in the 3 classes can be differentiated as follows. Adolescents in the moderate problems class scored higher on problem behaviors than those in the minor problems class, which in turn, scored higher than those in the minimal problems class for the following—attention problems and parent–child conflict. Although scores increase in sequence from minimal, to minor, to moderate, for anxious/depressed and withdrawn/depressed symptoms and somatic complaints, only adolescents in the moderate and minimal problems classes, and adolescents in the minor and minimal problems classes can be differentiated statistically. For peer pressure, only adolescents in the moderate and minor problems classes and adolescents in the moderate and minimal problems classes can be differentiated statistically. For sensation seeking behavior, the differences among the three classes were not differentiated.

At-Risk Sample

Similarly, a series of 2- to 5-class solutions was examined with LCA (see Table 1) for the at-risk sample. Although AIC and SSABIC decreased with the increased number of classes, the improvement between 3-class and 4-class and between 4-class and 5-class was marginal. The BIC of the 3-class solution was lower than that of both the 2-class solution and the 4-class solution, suggesting that adding additional classes is not parsimonious. The p values of LMRT indicated that the 3-class solution was marginally significantly superior to the 2-class solution, but the 4-class solution did not improve over the 3-class solution. The smallest BIC in the 3-class solution and non-significant LMRT of the 4-class solution favored the selection of the 3-class solution. The three classes of at-risk adolescents were labeled as having mild problems, medium problems, or severe problems. The class structure of the school-based sample was replicated by the at-risk sample although the at-risk sample generally displayed more serious and higher levels of antisocial behavior. At-risk adolescents were assigned into the three classes based on their most likely class membership from 0.938 to 0.963, with mild, medium and severe levels of antisocial behavior respectively. The mild, medium and severe problems classes comprised 35.1% ($n = 92$), 39.7% ($n = 104$), and 25.2% ($n = 66$) of the at-risk adolescents respectively. A small proportion of adolescents who displayed the highest level of antisocial behavior in the at-risk sample were classified into the severe problems class. Table 2 presents the average number of items endorsed by at-risk adolescents in each class. The mild problems class endorsed 0 to 11 indicators, the medium problems class endorsed 8 to 21 indicators, and the severe problems class endorsed 18.62 to 30 indicators which is over 60% of all indicators. The three classes of at-risk adolescents showed significant differences on the 30 indicators of antisocial behavior ($F = 725.61$, $df = 2$, $p < 0.001$; $\eta_p^2 = 0.85$). The mean scores of the 30 indicators in the at-risk adolescents are reported in Table 3. Figure 1 shows the item probabilities of the 30 items of rule-breaking and aggressive behavior for each class. The number of at-risk males was around 3.5 times more than at-risk females. However, 37.3% of females were classified in the severe problems class, compared to only 21.7% of males. Chi

Table 2 Descriptive statistics at each class in school-based and at-risk adolescents

Classes	Mean no. of items/SD (range)	No. of male (%)	No. of female (%)
School-based random subsample ($n = 262$)			
Total ($n = 262$)	9.36/5.30 (0–24)	148 (100)	114 (100)
Minimal ($n = 97$)	4.09/2.01 (0–9)	56 (37.8)	41 (36.0)
Minor ($n = 119$)	10.47/2.27 (7–16)	63 (42.6)	56 (49.1)
Moderate ($n = 46$)	17.59/2.91 (13.45–24)	29 (19.6)	17 (14.9)
At-risk sample ($n = 262$)			
Total ($n = 262$)	13.89/7.54 (0–30)	203 (100)	59 (100)
Mild ($n = 92$)	5.74/2.93 (0–11)	77 (37.9)	15 (25.4)
Medium ($n = 104$)	14.85/3.04 (8–21)	82 (40.4)	22 (37.3)
Severe ($n = 66$)	23.73/2.81 (18.62–30)	44 (21.7)	22 (37.3)

Mean no. of items The average number of the 30 items of rule-breaking and aggressive behavior endorsed by respondents

Table 3 Mean scores of the 30 indicators in school-based and at-risk adolescents

	School-based sample ($n=262$)				At-risk sample ($n=262$)			
	Minimal	Minor	Moderate	Total	Mild	Medium	Severe	Total
Item 1	0.05	0.06	0.09	0.06	0.15	0.37	0.59	0.35
Item 2	0.16	0.22	0.61	0.27	0.17	0.31	0.70	0.36
Item 3	0.06	0.37	0.83	0.34	0.14	0.77	0.97	0.60
Item 4	0.04	0.23	0.52	0.21	0.15	0.59	0.95	0.53
Item 5	0.19	0.56	0.91	0.49	0.08	0.71	0.91	0.54
Item 6	0.28	0.46	0.50	0.40	0.39	0.83	0.89	0.69
Item 7	0.00	0.08	0.15	0.06	0.13	0.22	0.71	0.32
Item 8	0.01	0.04	0.24	0.07	0.02	0.21	0.55	0.23
Item 9	0.00	0.03	0.09	0.03	0.05	0.25	0.61	0.27
Item 10	0.41	0.77	0.91	0.66	0.42	0.85	0.97	0.73
Item 11	0.00	0.02	0.04	0.02	0.44	0.68	0.97	0.67
Item 12	0.00	0.02	0.20	0.04	0.22	0.39	0.91	0.46
Item 13	0.00	0.01	0.00	0.00	0.01	0.04	0.35	0.11
Item 14	0.47	0.87	0.93	0.74	0.35	0.81	0.95	0.68
Item 15	0.11	0.47	0.93	0.42	0.14	0.45	0.74	0.42
Item 16	0.14	0.32	0.59	0.30	0.22	0.43	0.61	0.40
Item 17	0.11	0.23	0.67	0.26	0.10	0.36	0.65	0.34
Item 18	0.02	0.02	0.50	0.10	0.03	0.11	0.48	0.18
Item 19	0.10	0.44	0.74	0.37	0.10	0.58	0.85	0.48
Item 20	0.05	0.29	0.72	0.28	0.11	0.63	0.95	0.53
Item 21	0.03	0.09	0.52	0.15	0.10	0.42	0.97	0.44
Item 22	0.02	0.16	0.61	0.19	0.01	0.25	0.71	0.28
Item 23	0.06	0.52	0.44	0.34	0.09	0.33	0.69	0.34
Item 24	0.33	0.88	0.96	0.69	0.34	0.82	0.91	0.67
Item 25	0.58	0.94	0.98	0.81	0.49	0.82	0.94	0.73
Item 26	0.28	0.73	0.83	0.58	0.38	0.59	0.85	0.59
Item 27	0.19	0.60	0.96	0.51	0.22	0.56	0.86	0.52
Item 28	0.22	0.57	0.89	0.50	0.49	0.76	0.98	0.72
Item 29	0.01	0.08	0.61	0.15	0.02	0.16	0.65	0.24
Item 30	0.17	0.38	0.63	0.35	0.15	0.52	0.83	0.47

square test also supported this uneven gender distribution in at-risk adolescents ($\chi^2=6.57$, $df=2$, $p<0.05$;$\eta_p^2=0.16$). Compared to male at-risk adolescents, females showed significant higher scores in both rule-breaking ($t=3.67$, $df=260$, $p<0.001$; Cohen's $d=0.51$) and aggressive behavior ($t=2.51$, $df=260$, $p<0.05$; Cohen's $d=0.37$).

We tested the mean differences among the different classes on behavioral, emotional, personality and interpersonal correlates (see Table 5). The three classes have significant differences in anxious/depressed symptoms ($F=49.22$, $df=2$, $p<0.001$; $\eta_p^2=0.28$), withdrawn/depressed symptoms ($F=42.81$, $df=2$, $p<0.001$; $\eta_p^2=0.25$), somatic complaints ($F=21.14$, $df=2$, $p<0.001$; $\eta_p^2=0.14$), attention problems ($F=68.52$, $df=2$, $p<0.001$; $\eta_p^2=0.35$), sensation seeking behavior ($F=4.79$, $df=2$, $p<0.01$; $\eta_p^2=0.04$), and parent–child conflict ($F=28.77$, $df=2$, $p<0.001$; $\eta_p^2=0.18$) except for peer pressure ($F=0.26$, $df=2$, $p>0.05$). This implied that all at-risk adolescents, no matter what class they belonged to, reported similarly high levels of peer pressure. Post hoc comparisons further revealed that adolescents in the severe problems class displayed the most anxious/depressed and withdrawn symptoms, somatic complaints, and attention problems, and reported most conflicts with their parents out of the three classes. Additionally, adolescents in the medium problems class displayed more anxious/depressed and withdrawn symptoms, somatic complaints, attention problems, and conflicts with their parents than adolescents in the mild problems class. However, for sensation seeking, only adolescents in the severe and mild problems classes can be differentiated statistically.

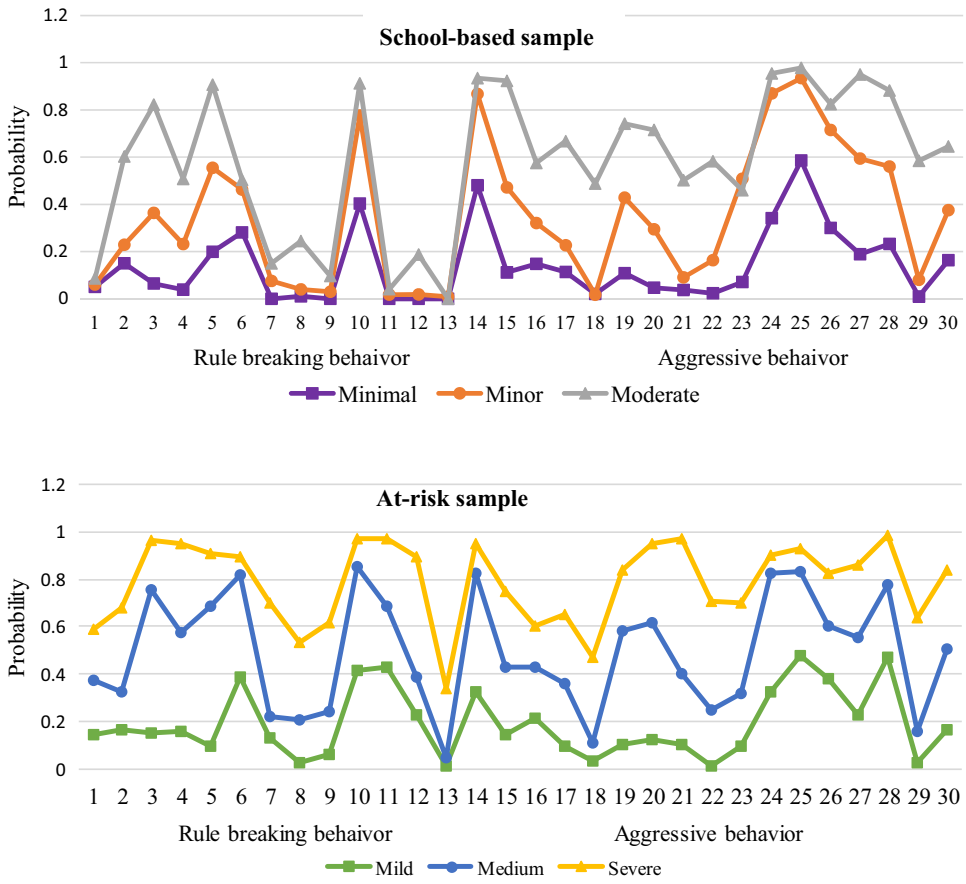

Fig. 1 Estimated probabilities for latent classes in school-based ($n=262$) and at-risk adolesents ($n=262$). Rule breaking behavior: (*1* I drink alcohol without my parents' approval. *2* I don't feel guilty after doing something I shouldn't. *3* I break rules at home, school, or elsewhere. *4* I hang around with kids who get in trouble. *5* I lie or cheat, *6* I would rather be with older kids than kids my own age. *7* I run away from home. *8* I steal at home. *9* I steal from places other than home. *10* I swear or use dirty language. *11* I smoke, chew, or sniff tobacco. *12* I cut classes or skip school. *13* I use drugs for non-health purposes. Aggressive behavior: *14* I argue a lot. *15* I am mean to others. *16* I try to get a lot of attention. *17* I destroy my own things. *18* I destroy things belonging to others. *19* I disobey my parents. *20* I disobey at school. *21* I get in many fights. *22* I physically attack people. *23* I scream a lot. *24* I am stubborn. *25* My moods or feelings change. *26* I am suspicious. *27* I tease others a lot. *28* I have a hot temper. *29* I threaten to hurt people. *30* I am louder than other kids

Table 4 Comparisons of the three classes in school-based adolescents ($n=262$)

	Minimal ($n=97$)	Minor ($n=119$)	Moderate ($n=46$)	Overall test (F values)	Group comparisons (mean difference)		
	Mean (SD)	Mean (SD)	Mean (SD)		1 versus 2	1 versus 3	2 versus 3
Anxious/depressed	$4.84^{2,3}$ (3.88)	8.55^{1} (5.04)	9.91^{1} (4.27)	26.68***	−3.71***	−5.07***	−1.36
Withdrawn	$3.69^{2,3}$ (2.63)	5.82^{1} (3.17)	6.77^{1} (2.63)	22.68***	−2.12***	−3.07***	−0.95
Somatic complaints	$2.67^{2,3}$ (2.89)	4.82^{1} (3.93)	5.76^{1} (3.38)	15.71***	−2.15***	−3.09***	−0.94
Attention problems	$4.47^{2,3}$ (2.88)	$7.31^{1,3}$ (3.19)	$9.33^{1,2}$ (2.57)	47.70***	−2.84***	−4.86***	−2.02***
Sensation seeking	28.25 (4.81)	28.91 (5.36)	29.78 (5.34)	1.42	−0.67	−1.54	−0.87
Parent–child conflict	$20.83^{2,3}$ (6.23)	$26.14^{1,3}$ (7.06)	$30.40^{1,2}$ (7.70)	32.96***	−5.30***	−9.57***	−4.27**
Peer pressure	18.56^{3} (4.72)	19.60^{3} (5.99)	$22.37^{1,2}$ (6.27)	7.24**	−1.04	−3.81**	-2.78*

Significant differences between different groups are marked in superscript

Class 1 minimal problems, *Class 2* minor problems, *Class 3* moderate problems. Class comparisons include Class 1 versus Class 2, Class 1 versus Class 3, and Class 2 versus Class 3

***$p<0.001$, **$p<0.01$, *$p<0.05$

Table 5 Comparisons of the three classes in at-risk adolescents ($n = 262$)

	Mild ($n = 92$)	Medium ($n = 104$)	Severe ($n = 66$)	Overall test (F values)	Group comparisons (mean difference)		
	Mean (SD)	Mean (SD)	Mean (SD)		1 versus 2	1 versus 3	2 versus 3
Anxious/depressed	$3.21^{2,3}$ (3.07)	$6.78^{1,3}$ (4.13)	$9.39^{1,2}$ (4.67)	49.22***	−3.58***	−6.19***	−2.61***
Withdrawn	$2.87^{2,3}$ (2.50)	$5.65^{1,3}$ (3.25)	$7.39^{1,2}$ (3.64)	42.81***	−2.78***	−4.52***	−1.74**
Somatic complaints	$1.84^{2,3}$ (3.01)	$3.56^{1,3}$ (3.26)	$5.72^{1,2}$ (5.02)	21.14***	−1.73**	−3.89***	−2.16**
Attention problems	$3.77^{2,3}$ (3.08)	$7.29^{1,3}$ (3.42)	$10.24^{1,2}$ (4.04)	68.52***	−3.52***	−6.48***	−2.96***
Sensation seeking	28.08^{3} (6.69)	29.74 (5.05)	30.81^{1} (4.83)	4.79**	−1.66	−2.73**	−1.07
Parent–child conflict	$20.96^{2,3}$ (7.08)	$24.22^{1,3}$ (7.63)	$30.35^{1,2}$ (8.61)	28.77***	−3.26*	−9.39***	−6.13**
Peer pressure	21.01 (7.71)	21.47 (6.78)	21.82 (6.51)	0.26	−0.46	−0.81	−0.35

Significant differences between different groups are marked in superscript

Class 1 mild problems, *Class 2* medium problems, *Class 3* severe problems. Class comparisons include Class 1 versus Class 2, Class 1 versus Class 3, and Class 2 versus Class 3

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$

Discussion

This study examined clusters of antisocial behavior in both school-based and at-risk samples. Both samples were classified into three different classes using LCA based on their non-aggressive rule-breaking behavior and aggressive behavior. Neither a pure rule-breaking behavior class nor a pure aggressive behavior class was found. The finding that rule breaking and aggressive behavior co-occurred across all classes is noteworthy. Based on the severity of antisocial behavior, the school-based adolescents were classified into three classes: minimal, minor or moderate problems; and the at-risk adolescents were also classified into three classes: mild, medium or severe problems. A higher class represented a subgroup with a higher level of rule-breaking and aggressive behavior. In our classification, rule-breaking and aggressive behavior occurred jointly instead of separately in both samples. This result is in line with a finding that rule-breaking and aggressive behavior showed high comorbidity in referred adolescents to mental health agencies [10]. Arnett [14] also argued that aggressive behavior is not an isolated behavior and is associated with multiple domains of reckless delinquent behavior. Our findings also resonate with Bartels et al.'s [8] position that aggressive and rule-breaking behaviors often co-occur empirically; more than half of all children who have aggressive behavior also have rule-breaking behavior, and vice versa.

As expected, generally, the at-risk adolescents had higher levels of antisocial behavior compared to the school-based adolescents. Naturally, the classification labels given to the classes reflect this across both samples. A majority of the school-based sample were classified into either the minimal or minor problems classes for a combined total of more than 80% in the first two classes and less than 20% were classified into the moderate problems class. For the at-risk sample, close to 75% were classified into the mild and medium classes, while slightly more than 25% were classified into the severe class. With respect to the gender ratio for antisocial behavior, males usually exhibit relatively higher levels of rule-breaking delinquent behavior [22] and aggressive behavior than females [32, 33]. In our samples, while there was an approximately equal proportion of males and females among school-based adolescents, there were more males in the at-risk sample. Interestingly, we had 37.3% of females and 21.7% of males classified in the severe problems class for the at-risk sample even though we had more males (77.5% males) in the at-risk sample, and female at-risk adolescents showed more antisocial behavior than their male counterparts We posit that when at-risk females display severe antisocial behavior, their presentation of antisocial behavior appear more problematic than males and this could be due to their criminogenic needs. Our results aligned with Chu et al's [34] study of youth offenders in Singapore; results showed that the female youth offenders were rated higher on the YLS/CMI 2.0 total score and most of the other subscales compared to their male counterparts and the researchers suggested that female youth offenders in Singapore have a higher level of criminogenic needs when they enter the juvenile justice system. Similarly, female offenders have been found to be more aggressive than male offenders in previous research [35]. Wadsworth et al. [28] also found that referred females exhibited more severe levels of emotional problems than referred males.

Generally, as the severity of antisocial behavior increased, the school-based adolescents in the higher classes displayed significantly more internalizing and attention problems. School-based adolescents in higher classes also showed more conflicts with parents, and reported more conformity pressure from peers than their counterparts in the lower classes. These classification results obtained in the school-based sample were mostly mirrored in the at-risk sample. Existing literature suggests that antisocial behavior is often

comorbid with internalizing and attention problems [3, 9, 27]. Our classification results demonstrated that adolescents in the higher antisocial classes reported more parent–child conflict. This finding is in alignment with existing work—for example, Pepler et al. [36] found that adolescents who have more conflicts with parents tend to report lower self-esteem and greater levels of depression, and are more likely to have substance abuse issues, health problems, and aggression. Furthermore, in a latent class analysis of family characteristics linked to youth offending outcomes in Singapore, researchers found a three-class solution—intact functioning families, families with criminality and poorly managed families [37]. In the poorly managed families class, these youths received the poorest parenting with inadequate parental supervision, inconsistent discipline and poor parent–child relationships. In a meta-analysis of 161 studies, Hoeve et al. [38] found that approximately 70% of youths who have parents with negative parenting styles showed higher levels of delinquency.

Our classification results differed however, for the school-based and at-risk samples with respect to sensation-seeking and peer conformity pressure. For the school-based sample, adolescents from the three antisocial classes were similar on sensation seeking. However, in the at-risk sample, the difference between the mild problems and the severe problems classes was significant, although the difference between the two consecutive classes were not distinct. One plausible reason could be that the adolescents from the school-based sample have lower overall levels of sensation seeking, and thus individual variations of sensation seeking within the school-based classes are relatively smaller. Engaging in delinquent behavior is a socially problematic expression of sensation seeking [17]. Higher sensation seekers usually hold positive beliefs about the consequences of the risky behavior and are inclined to have stronger intentions to conduct risky actions casually and regularly [39].

Another difference between the school-based and at-risk adolescents is that of peer conformity pressure. Significantly lower levels of peer pressure was reported for the lowest and middle antisocial class in the school-based sample of adolescents compared with the highest antisocial class. In comparison, for the at-risk adolescents, they had similarly high levels of peer conformity pressure across all three antisocial classes. Peer conformity pressure is associated with misconduct, delinquency, and aggressive behavior for both boys and girls [18]. One possible explanation for the difference across samples may be due to the mechanism through which group norms are transmitted. Peer pressure is one mechanism to transmit group norms and to maintain the commitment of group members [24]. At-risk delinquent and aggressive adolescents usually have more delinquent friends [23] and they are more likely to obey deviant group norms and values as deviant groups exert stronger pressure for cohesion and conformity compared to non-deviant groups [40]. At-risk adolescents are more likely to voluntarily conform to their peers' behaviors as they chose to be part of a deviant group based on shared antisocial norms and values. These reasons may account for different classes of at-risk adolescents showing similarly high levels of peer conformity pressure.

Our results show that within an Asian Singaporean context, behavioral symptoms across aggressive behavior and rule-breaking are very much interconnected and subgroups of adolescents are clustered and differentiated not by type of problem behavior but based on severity levels. Our findings have clinical implications and shed light on the key issues to be considered for the planning of school and community-based, targeted prevention and intervention programs. School-based adolescents in the moderate problems class were found to have treatment needs, as did at-risk adolescents. LCA results revealed that prevention and intervention of antisocial behavior should concurrently focus on both non-aggressive rule-breaking and aggressive behavior, as these two kinds of antisocial behaviors occurred simultaneously across all classes in both samples. Clinically, it is insufficient to address single or isolated symptom/problems, as adolescents with antisocial behavior usually display different problems intertwined across individual and interpersonal domains. On an individual level, prevention and treatment of adolescents' internalizing symptoms is equally important since adolescents with antisocial behavior are more vulnerable not just to sensation seeking and attention problems but also to internalizing problems such as anxious/depressive symptoms, withdrawn behavior and somatic issues [9]. On an interpersonal level, positive, supportive and healthy relationships with parents and peers may mitigate against adolescents' engagement in antisocial behavior [22]. Positive parenting is a protective factor for adolescents at risk of delinquent behavior [9], and having prosocial peers engaged in meaningful school and community related activities would be another protective factor against problematic behavior [23]. For the at-risk adolescents in particular, we should pay attention to their sensation seeking behavior and peer conformity, as all classes in this population have relatively similar and high levels of sensation seeking and peer conformity.

While this is a unique study classifying individuals into different classes based on non-aggressive rule-breaking and aggressive behavior simultaneously, some limitations should be noted. First, we relied solely on adolescents' self-report to measure their antisocial behavior and related individual and interpersonal problems, and social desirability bias may be present. Future work can include other sources, such as parents, teachers, peers, and official records, to validate the class membership of school-based and at-risk adolescents. Second, we estimated the latent classes of antisocial behavior separately, and the latent class solutions could not be compared

directly across the school and at-risk samples. Third, the mean age of adolescents in schools was about 3 years younger than the at-risk adolescents. Involving school-based adolescents from older age groups would allow us to reexamine whether similar three classes can be established for both samples. Fourth, both school-based and at-risk adolescents are from Singapore, an Asian country, thus limiting generalizability of the findings to Western societies given potential cultural differences.

Nonetheless, despite these limitations, strengths of this study included a large-scale sample of school-based adolescents and a relatively large group of at-risk adolescents which permitted analyses of two diverse and different populations in a single study. This study has also extended the literature on the continued investigation of taxonomies of child and adolescent antisocial behavior through classifying adolescents based on their non-aggressive rule-breaking and aggressive behavior, and results have potential benefits for the design of targeted prevention and tailored intervention across school-based and at-risk adolescents.

Summary

Antisocial behavior is an important educational and public health issue impacting individuals and society. This study used LCA to reveal the diversity in the school-based and at-risk adolescents through classifying homogeneous individuals into three different classes, and also described the characteristics of each class through examining the differences across individual and interpersonal domains. We included both school-based and at-risk samples in a single study to uncover antisocial profiles across different populations. In general, at-risk adolescents had higher levels of antisocial behavior. Greater severity of antisocial behavior was associated with more problems in various domains. Results differed however, for the school-based and at-risk samples with respect to emotional problems, sensation-seeking and peer conformity pressure. For prevention and intervention work with children and adolescents, it is insufficient to treat symptoms and problems in isolation; rather, non-aggressive rule-breaking behavior and aggressive behavior should be considered jointly.

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References

1. American Psychiatric Association (2013) Diagnostic and statistical manual of mental disorders. American Psychiatric Association, Washington, DC
2. Achenbach TM (1995) Empirically based assessment and taxonomy: applications to clinical research. Psychol Assess 7:261–274
3. Achenbach TM, Rescorla LA (2001) Manual for the ASEBA school-age forms and profiles. University of Vermont, Burlington
4. Mash EJ, Barkley RA (2003) Child psychopathology, 2nd edn. Guilford Press, New York
5. Bartholomew DJ, Knott M, Moustaki I (2011) Latent variable models and factor analysis: a unified approach. Wiley, London
6. McCutcheon AL (1987) Latent class analysis. Sage, Newbury Park
7. Burt SA, Larson CL (2007) Differential affective responses in those with aggressive versus non-aggressive antisocial behaviors. Personal Individ Differ 43:1481–1492
8. Bartels M, Hudziak JJ, Van den Oord EJCG, Van Beijsterveldt CEM, Rietveld MJH, Boomsma DI (2003) Co-occurrence of aggressive behavior and rule-breaking behavior at age 12: multi-rater analyses. Behav Genet 33:607–621
9. Perrino T, Pantin H, Huang S, Brincks A, Brown CH, Prado G (2016) Reducing the risk of internalizing symptoms among high-risk Hispanic youth through a family intervention: a randomized controlled trial. Fam Process 55:91–106
10. de Nijs PF, van Lier PA, Verhulst FC, Ferdinand RF (2007) Classes of disruptive behavior problems in referred adolescents. Psychopathology 40:440–445
11. Harty SC, Galanopoulos S, Newcorn JH, Halperin JM (2013) Delinquency, aggression, and attention-related problem behaviors differentially predict adolescent substance use in individuals diagnosed with ADHD. Am J Addict 22:543–550
12. Barkley RA (1998) Attention-deficit hyperactivity disorder: a handbook for diagnosis and treatment, 2nd edn. Guilford Press, New York
13. Defoe IN, Farrington DP, Loeber R (2013) Disentangling the relationship between delinquency and hyperactivity, low achievement, depression, and low socioeconomic status: analysis of repeated longitudinal data. J Crim Justice 41:100–107
14. Arnett JJ (1996) Sensation seeking, aggressiveness, and adolescent reckless behavior. Personal Individ Differ 20:693–702
15. Zuckerman M (1979) Sensation seeking: beyond the optimal level of arousal. Lawrence Erlbaum, Hillsdale
16. Chen X, Li F, Nydegger L, Gong J, Ren Y, Dinaj-Koci V et al (2013) Brief sensation seeking scale for Chinese-cultural adaptation and psychometric assessment. Personal Individ Differ 54:604–609
17. Mann FD, Patterson MW, Grotzinger AD, Kretsch N, Tackett JL, Tucker-Drob EM, Harden KP (2016) Sensation seeking, peer deviance, and genetic influences on adolescent delinquency: evidence for person-environment correlation and interaction. J Abnorm Psychol 125:679–691
18. Brown BB, Clasen DR, Eicher SA (1986) Perceptions of peer pressure, peer conformity dispositions, and self-reported behavior among adolescents. Dev Psychol 22:521–530
19. Klahr AM, Klump KL, Burt SA (2014) The etiology of the association between child antisocial behavior and maternal negativity varies across aggressive and non-aggressive rule-breaking forms of antisocial behavior. J Abnorm Child Psychol 42:1299–1311
20. Trentacosta CJ, Criss MM, Shaw DS, Lacourse E, Hyde LW, Dishion TJ (2011) Antecedents and outcomes of joint trajectories of mother-son conflict and warmth during middle childhood and adolescence. Child Dev 82:1676–1690
21. Yeh KH (2011) Mediating effects of negative emotions in parent-child conflict on adolescent problem behavior. Asian J Soc Psychol 14:236–245
22. Sarracino D, Presaghi F, Degni S, Innamorati M (2011) Sex-specific relationships among attachment security, social values, and sensation seeking in early adolescence: implications for adolescents' externalizing problem behaviour. J Adolesc 34:541–554

23. Ang RP, Huan VS, Li X, Chan WT (2018) Functions of aggression and delinquency: the moderating role of parent criminality and friends' gang membership. J Interpers Violence 33:3531–3550
24. Clasen DR, Brown BB (1985) The multidimensionality of peer pressure in adolescence. J Youth Adolesc 14:451–468
25. Santor DA, Messervey D, Kusumakar V (2000) Measuring peer pressure, popularity, and conformity in adolescent boys and girls: predicting school performance, sexual attitudes, and substance abuse. J Youth Adolesc 29:163–182
26. Williams S, Dahan J, Silverman WK, Pettit JW (2013) Heterogeneous classes of co-occurring externalizing symptoms in a sample of youth referred for anxiety disorders. J Anxiety Disord 27:340–346
27. Pang JS, Ang RP, Kom DM, Tan SH, Chiang AQ (2013) Patterns of reactive and proactive aggression in young adolescents in Singapore. Soc Dev 22:794–812
28. Wadsworth ME, Hudziak JJ, Heath AC, Achenbach TM (2001) Latent class analysis of child behavior checklist anxiety/depression in children and adolescents. J Am Acad Child Adolesc Psychiatry 40:106–114
29. Thurber S, Sheehan W (2012) Note on truncated T scores in discrepancy studies with the Child Behavior Checklist and Youth Self Report. Arch Assess Psychol 2:73–80
30. Elkins IJ, McGue M, Iacono WG (1997) Genetic and environmental influences on parent-son relationships: evidence for increasing genetic influence during adolescence. Dev Psychol 33:351–363
31. Muthén LK, Muthén BO (2017) Mplus user's guide, 8th edn. Muthén & Muthén, Los Angeles
32. Li X, Fung ALC (2015) Reactive and proactive aggression in mainland Chinese secondary school students. J Soc Work 15:297–316
33. Moffitt TE (2003) Life-course persistent and adolescence-limited antisocial behavior: a research review and a research agenda. In: Lahey B, Moffitt TE, Caspi A (eds) The causes of conduct disorder and serious juvenile delinquency. Guilford Press, New York, pp 113–125
34. Chu CM, Lee Y, Zeng G, Yim G, Tan CY, Ang Y et al (2015) Assessing youth offenders in a non-Western context: the predictive validity of the YSL/CMI ratings. Psychol Assess 27:1013–1021
35. Cauffman E, Lexcen FJ, Goldweber A, Shulman EP, Grisso T (2007) Gender differences in mental health symptoms among delinquent and community youth. Youth Violence Juv Justice 5:287–307
36. Pepler D, Waddell J, Jiang D, Lamb J, Craig W, Connolly J (2006) Aggressive girl's health and parent daughter conflict. Womens Health Urban Life 5:25–41
37. Chng GS, Chu CM, Zeng G, Li D, Ting MH (2016) A latent class analysis of family characteristics linked to youth offending outcomes. J Res Crime Delinq 56:765–787
38. Hoeve M, Dubas JS, Eichelsheim VI, Van der Laan PH, Smeenk W, Gerris JR (2009) The relationship between parenting and delinquency: a meta-analysis. J Abnorm Child Psychol 37:749–775
39. Stephenson MT, Hoyle RH, Palmgreen P, Slater MD (2003) Brief measures of sensation seeking for screening and large-scale surveys. Drug Alcohol Depend 72:279–286
40. Papachristos AV (2006) Social network analysis and gang research: theory and methods. In: Short JF, Hughes LA (eds) Studying youth gangs. Altamira Press, Oxford, pp 99–116