Patterns of Reactive and Proactive Aggression in Young Adolescents in Singapore

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Abstract

The authors investigated the patterns of reactive and proactive aggression exhibited by young male (N = 604) and female (N = 544) adolescents in Singapore. Self-report measures of reactive and proactive aggression, behavioral and emotional adjustment, parenting styles, and delinquency were administered to students aged 13–14. Using cluster analysis, three distinct patterns of aggression emerged: a low aggressive group, a combined aggressive group with high reactive and proactive aggression, and a reactively aggressive group with low proactive and high reactive aggression. The two aggressive groups showed similar disturbances in adjustment and delinquency, but the combined group showed the greatest disruptions. Findings indicate cross-cultural stability of patterns of aggression as well as the usefulness of the reactive/proactive distinction in early identification of individuals with adjustment problems.

Keywords: reactive and proactive aggression; behavioral and emotional adjustment; delinquency; cluster analysis

Introduction

Childhood aggression is a good early predictor of later conduct problems (e.g., Fite, Raine, Stouthamer-Loeber, Loeber, & Pardini, 2010). However, not all types of aggression in childhood lead to conduct problems later, and those that do have different developmental trajectories (e.g., Tolan, Guerra, & Kendall, 1995). Varying courses indicate that the phenomenon of childhood aggression is heterogeneous. Greater knowledge about subtypes of aggression, their risk factors, and developmental trajectories could lead to a clearer theoretical understanding of aggression.

Numerous classification systems exist for aggression, typically organized around either the form or the function of the aggressive act. For instance, aggressive acts can be distinguished by its forms: physical/verbal, active/passive, direct/indirect,

relational, among others (e.g., Buss, 1961; Warren, Richardson, & McQuillin, 2011). Aggression has also sometimes been classified in terms of its interpersonal dynamics, in terms of the perspective of either perpetrator or victim of the aggression. The lines of work around the *bully*, *victim*, and *bully/victim* roles are examples of this type of classification system (Olweus, 1996).

In other lines of work researchers have found that there are inconsistent heart rate reactions to provocation/threat (e.g., Pelham, Milich, Cummings, & Murphy, 1991 vs. van Goozen et al., 1998) depending on the type of aggression. Thus, the hypothesized (Feshbach, 1964) and now-classic distinction between reactive aggression (RA) and proactive aggression (PA) arose from observations that there are two expressions of aggression. Notably, RA is a 'hot' defensive response that is characterized by anger/ frustration and enacted after prior provocation whereas PA is a 'cold' deliberate aggression, developed through social learning, and in service of instrumental gains (cf. Bandura, 1973). According to aggression researchers (Crick & Dodge, 1996), RA and PA differ in their relationship to social information processing deficits. Specifically, for RA, the individual mistakenly encodes ambiguous environmental cues as hostile whereas for PA, the individual expects positive outcomes from the aggressive act. The RA/PA distinction refers to different functions of the aggressive act—to retaliate against real or imagined provocation (RA) or as a means to obtain instrumental gains (PA).

Importantly, the emotional, cognitive, and behavioral profiles of reactively and proactively aggressive individuals are qualitatively different. The RA individual is impulsive (Raine et al., 2006) and has a hostile attribution bias and poor emotional regulation skills (Hubbard et al., 2002). As a result, RA individuals become easily frustrated when provoked and experience high levels of anger when they retaliate against their provocateurs. In contrast, the PA individual tends to have positive outcome expectancies of aggression as an instrumental means, has a blunted emotional response toward negative interpersonal stimulation, and exhibits a callous/unemotional inter-personal style (Frick, Cornell, Barry, Bodin, & Dane, 2003).

Despite the prevalence of this theoretical distinction, some researchers have questioned the utility of distinguishing between RA and PA. Specifically, some controversies exist for the RA/PA distinction. Firstly, there is the question of whether the theoretical distinction is reflected empirically. The main problem is that RA and PA are seen by some (Bushman & Anderson, 2001) to have too much conceptual convergence, and in fact past studies have demonstrated significant measurement overlap (Poulin & Boivin, 2000). Another controversy is regarding whether the RA/PA distinction has additive predictive value. An important issue is the question of whether early manifestations of RA or PA are relatively worse for future development. Card and Little (2006) argued that RA could be more detrimental for development because RA is likely to manifest earlier in developmental history, thus high levels identified in early adolescence would represent more pervasive emotional and social dysfunction. Additionally, because PA has been associated with more skilled interpersonal adjustment (e.g., Crick & Dodge, 1996), its relation with social, behavioral, and emotional mal-adjustment should decrease with age, particularly after adolescence when the child has had more practice with prosocial behavior and other behavioral norms. Indeed, meta-analytic findings (Card & Little, 2006) show that RA is associated overall with more indicators of adjustment, such as internalizing problems, low prosocial behavior, and poor peer relations whereas PA is more strongly related to delinquency and peer acceptance.

On the other hand, other researchers (e.g., Miller & Lynam, 2006) provided evidence that PA is worse for certain behavioral outcomes such as substance abuse and delinquency and argue that these are particularly important outcomes because they result in significant tangible social and economic costs. Pulkkinen (1996) found that childhood PA but not RA is related to antisocial outcomes in adulthood whereas Vitaro, Gendreau, Tremblay, and Oligny (1998) showed that PA is related to both delinquency and externalizing behaviors, but RA weakens the link between PA and delinquency. A possible explanation for the finding that RA negatively predicts delinquency is that delinquency is exacerbated by deviant peer influence, and RA is sometimes associated with peer rejection and anxiety (Raine et al., 2006), both of which would discourage peer-influenced disruptive behavior.

Finally, other researchers (e.g., Fite, Colder, Lochman, & Wells, 2008) claim that both RA and PA could lead to equally aversive outcomes but through different pathways, for example, substance use and substance initiation are related to both RA and PA, but for RA through peer rejection whereas for PA through association with delinquent peers.

Researchers tend to approach analysis of RA and PA in one of two ways. One way is to assume RA and PA scales tap into different constructs and to study their independent effects (e.g., Hubbard et al., 2002), while the other is to add in one as a covariate when using the other to predict outcomes, thus partialling out the influence of one subtype of aggression on the other's association with the outcome behavior (e.g., Miller & Lynam, 2006). Some authors even specifically leave out analysis of combined proactive/reactive individuals (e.g., Pulkkinen, 1996). None of these techniques sufficiently address the problem that RA and PA are likely to co-occur in individuals. A model that allows co-occurrence of RA and PA would have the strongest predictive value. Moreover, the technique of using residualized scores is slightly problematic because these scores are arguably harder to conceptualize and interpret than 'types' or 'combinations'.

To answer the question about whether the theoretical RA/PA distinction exits in data, in the present research, we ask whether there are identifiable subtypes of people in a population based on their combinations of RA and PA scores. Our hope is that by identifying meaningful subgroups of individuals based on their RA and PA scores, others might establish developmental trajectories for these groups—the data about these trajectories could be important for informing prevention and intervention efforts.

Thus, our research adopts a person-centered approach that aims to place children into meaningful subgroups according to their aggressive behaviors. Person-centered approaches have been suggested by several researchers (e.g., Barker, Tremblay, Nagin, Vitaro, & Lacourse, 2006) to be useful for informing intervention and prevention efforts because variable-centered approaches do not sufficiently take into account the fact that there are multiple pathways for children to develop antisocial behavior.

We follow Crapanzano, Frick, and Terranova's (2010) framework and conduct a cluster analysis of RA and PA in a large sample of young Singaporean adolescents. Crapanzano et al. studied 11- to 13-year-olds ($M = 11.28$, $SD = 1.82$) in North America and found a reactively aggressive cluster and a combined high RA/PA aggressive cluster. In our study, we explore whether Crapanzano et al.'s clusters replicate in the Singapore context and in a group of slightly older children ($M = 13.17$ years; $SD = 0.80$). We selected a sample within this age range because we subscribe to the

idea in developmental psychopathology of sensitive periods or 'turning points' in which developmental processes are particularly susceptible to influences from heterogeneous sources (cf. Mash & Dozois, 2003). Because of the organization of the Singapore education system, children undergo a major emotional and social transition as they move from primary (until the age of 12) to secondary (the age of 13–16) schooling environments. Children entering the Singapore secondary education system are also likely to be experiencing puberty and thus face a major developmental hurdle emotionally and biologically. An objective of the larger study from which the present data are drawn was to investigate and track the effects of school context and peers on the aggressive behaviors of our participants; thus, we surveyed participants as close to the start of their secondary education tenure as we could.

We also seek to validate the clusters using different indicator variables than Crapanzano et al. Their study investigated the association of the cluster profiles with generalized dispositional tendencies such as impulsivity, anger dysregulation, and thrill and adventure seeking (a concept similar to sensation seeking). Here, we test the patterns of relationships for our clusters with self-reported behavioral and emotional adjustment problems, self-reported delinquency, and perceived parenting styles. Thus, although Crapanzano et al. (2010) included emotional and cognitive correlates that would distinguish qualitatively between RA and PA cluster profiles, we extend their work by examining whether there are differences in both the antecedents (parenting) as well as the consequences (symptomology as well as delinquency) of membership in each of the aggression clusters.

Developmental models hypothesize that RA and PA originate from different parenting and home environments (e.g., Barker et al., 2010). Specifically, RA has been theorized as a defensive response to harsh and coercive parenting whereas PA is believed to be nurtured in home environments that provide opportunities and models for the use of aggression in an instrumental manner. We thus included measures for child's perception of authoritarian, authoritative, and permissive parenting styles. Generally, we expected that more hostile, authoritarian parenting would promote both RA and PA, by fostering a threatening home environment and by providing models for learning to use aggression in a goal-directed manner. We also expected that permissive parenting might be related to PA, as permissive home environments afford the child greater autonomy over all their actions, including attempts to wield aggressive and manipulative influence over others. In other words, we hypothesized that cluster profiles with higher RA and PA scores should be characterized by greater amounts of perceived parental authoritarianism whereas cluster profiles with greater PA scores (compared with RA) should be characterized by greater amounts of parental permissiveness.

Given that previous research has shown that both RA and PA are related to a diverse set of negative behavioral and emotional outcomes (e.g., Barker et al., 2006; Fite et al., 2010), we expected both RA and PA to be related to greater disturbances in emotional and behavioral competencies and higher amounts of delinquency. Accordingly, cluster profiles with higher RA as well as PA scores should reflect the greatest emotional and behavioral disturbances and delinquency, compared with other cluster profiles. Specifically, we chose to measure disruptions in emotional and behavioral competencies using empirically derived syndrome scales (youth self-report or YSR; Achenbach & Rescorla, 2001) that allowed us to survey a diverse range of affective, somatic, attentional, and conduct problems. We were particularly interested in whether the identified aggression clusters would reflect different levels of disturbances in the

syndromes related to the behavior disorders category in child psychopathology (such as attention-deficit/hyperactivity disorder and conduct and oppositional defiant disorder; cf. Mash & Barkley, 2003).

To review, the main aims of the present study are to explore whether proactively and reactively aggressive cluster profiles reported in Crapanzano et al. (2010) replicate in an Asian sample of older adolescents, as well as to provide descriptive profiles of perceived parental environment and behavioral and psychological adjustment consequences of membership in these cluster profiles. Specifically, we ask whether profiles with higher levels of combined RA and PA are characterized by perceptions of more harsh and punitive parenting as well as greater self-reported disturbances in emotional, social, and behavioral functioning, compared with other cluster profiles.

Method

Participants

The Adolescent Behaviors and Relationships Survey (ADRS). The Singapore public school system consists of primary (for the ages of 7–12) and secondary schooling (for the ages 13–16). We started the ADRS in 2009 to collect data from a representative set of students entering the secondary education system and follow their development on aggressive and disruptive behaviors, delinquency, and psychological and emotional adjustment every 6 months. Our primary rationale was to study these children beginning from their transition from the primary to secondary education system and track their development through their 4-year secondary education tenure. Specifically, survey participants entering the study came from two different academic levels. One group was just entering their fifth/sixth month of the secondary schooling system (i.e., secondary level 1 students) whereas the second group had already experienced more than 18 months of the system (i.e., secondary level 2 students). The secondary 1 and secondary 2 students could be further subdivided into education streams such as express, normal (academic), and normal (technical), reflecting different types of courses ranging from the traditionally more academic-type courses to those that prepare students for a vocational career. These are formal curricular classifications given by the Singapore Ministry of Education to match each student's academic aptitude and learning interests (based on how well they perform on standardized nationwide examinations given when the children were 12 years old). For the full sample of 1148 students (544 females) surveyed, 44.2 percent were in the express stream, 33.1 percent were in normal (academic), and 22.7 percent were in normal (technical). Except for the parenting styles data which were collected in the first wave of data collection 4–6 months prior, all data presented were gathered during the second wave of data collection (September to October, 2010).

ADRS participants came from four schools in Singapore. These schools were selected specifically to ensure geographical representation in the Northern, Southern, Eastern, and Western regions of the country. These schools were all average ranking schools based on the grades of their incoming first-year cohort (Singapore Ministry of Education, 2011).

The mean age of the participants was 13.17 ($SD = 0.80$). The percentage of male respondents was 52.5 percent and the ethnicity breakdown is as follows: Chinese (67.0 percent), Malay (21.0 percent), Indian (8.1 percent), and Eurasian and others

(3.9 percent). This ethnic breakdown is not significantly different from the national ethnic distribution for members of the Singapore population aged between 10 and 19. Specifically, according to the Singapore population census (Singapore Department of Statistics, Ministry of Trade and Industry, 2010), the ethnic breakdown for this age group is as follows: Chinese (69.7 percent), Malay (18.2 percent), Indian (9.2 percent), and Eurasian and others (2.9 percent).

Because of restrictions set by the schools, we were unable to obtain detailed data for the socioeconomic background of our participants. However, the survey included questions regarding the type of housing that the students were living in, and we used this as a proxy variable for socioeconomic status. There were three discernible stratifications in the type of housing reported: 4 percent of the sample reported living in the lowest cost government-subsidized housing, 86 percent reported living in higher end government-subsidized housing, and 10 percent reported living in privately owned apartments and landed property. According to the Singapore 2010 Census report (Singapore Department of Statistics), the average household size is 3.4 persons, and 74.3 percent of the population lives in higher end government-subsidized housing or in private/landed property. Thus, the socioeconomic status of our sample suggests that our participants are slightly more affluent than the national average.

Procedures

Prior to starting data collection, ethics approval was obtained from the University Institutional Review Board. Approval to collect data on-site was also obtained from the Ministry of Education and the principals of the respective schools. We approached four schools and received consent from principals of all four. Finally, an invitation letter and consent form was mailed to the parents of all the students approximately 2 weeks before survey administration, and informed consent was provided by the parents who returned the signed consent forms to the children's form teachers. On the day of survey administration, only children for whom a signed parental consent form was received were asked to remain in the classroom to take the survey. Accordingly, the participation rate for the survey was 81 percent.

Survey administration took place in classrooms on each school's premises. Either the form teachers or a research assistant associated with ADRS distributed the surveys to and collected the completed surveys from the students. All surveys were administered in English, which is the language of administration and instruction, as well as the vernacular, in Singapore. At the start of each survey session, the students were simply told that the aim of the survey was to 'study adolescents' behaviors and important relationships.' Instructions on the front page of each survey booklet asked the students to try to answer every question in the booklet, to ask the research personnel associated with ADRS any clarifying questions regarding the survey items, and assured the students that their responses would be used only for research purposes and would be handled confidentially. Each survey session lasted approximately 60 min.

Measures

Reactive–proactive aggression questionnaire (RPQ; Raine et al., 2006) is a 23-item, 3-point Likert-type scale. Sample items include 'I get angry when others annoy me' (RA) and 'I use force to get others to do what I want' (PA). Cronbach's alpha was .72 for the RA subscale (11 items) and .71 for the PA subscale (12 items). The scale is a

continuous measure, such that higher scores on the reactive subscale and on the proactive subscale reflect greater tendency to be reactively and proactively aggressive, respectively. To our knowledge, there is no published data on cross-informant reliability of the RPQ; however, other research on antisocial and aggressive behavior reports that there is a moderate yet significant correlation ($p < .05$) between multiple forms of aggression measures. For instance, Baker, Jacobson, Raine, Lozano, and Bezdjian (2007) report correlations between child self-report and caregiver ratings ranging from .13 to .28. Di Giunta et al. (2010) reported that inter-informant agreement is relatively high (zero-order correlations for child–mother ratings ranging from .23 to .49 over 4 years). Importantly, RPQ scores have demonstrated criterion validity across multiple cultures, and scores on the reactive and proactive subscales are differentially correlated with theoretically relevant personality traits, parenting variables, and psychosocial behaviors (Hubbard, McAuliffe, Morrow, & Romano, 2010; Raine et al., 2006; Seah & Ang, 2008).

Empirically based syndrome scales of the YSR (Achenbach & Rescorla, 2001) were used to identify degree of emotional and social disturbance for the participants along groups of problems that are associated with taxonomies in the fourth edition of the Diagnostic and Statistical Manual (DSM-IV). The YSR was developed as a self-report measure of the child behavior checklist (Achenbach & Rescorla, 2001), and each of the narrow-band syndrome scales represent statistically identified sets of emotional and behavioral problems that have been found to correspond to taxonomic constructs in child and adolescent psychopathology. Sample items include 'I am unhappy, sad, or depressed' (for anxious/depressed scale) and 'I have a hot temper' (for aggressive behaviors scale). For the purposes of our present analyses, we selected items from the anxious/depressed (eight items, $\alpha = .80$), somatic complaints (four items, $\alpha = .72$), withdrawn/depressed (seven items, $\alpha = .75$), attention problems (five items, $\alpha = .74$), rule breaking (five items, $\alpha = .56$), and aggressive behaviors (seven items, $\alpha = .74$) syndrome scales. Our intention was not to measure diagnostic categories implied by labels such as internalizing or externalizing disorders but to assess emotional and behavioral problems (e.g., 'I would rather be alone than with others' 'I physically attack people') related to theoretical constructs (e.g., withdrawn/depressed and aggressive behavior syndromes) that have shown in published research to be related to poorer adjustment (Achenbach & Rescorla, 2001). We specifically chose these six syndrome scales because they allowed us to survey a diverse range of child/adolescent psychopathological problems such as affective (*anxious/depressed* and *withdrawn/depressed*), somatic (*somatic complaints*), attention (*attention problems*), and conduct and oppositional defiance (*aggressive behavior* and *rule*-breaking) problems. As mentioned earlier, we were particularly interested in whether clusters would differ in their severity on syndromes related to behavior disorders such as oppositional defiant disorder and conduct disorder (CD); thus, we conducted data analyses separately for the group of syndromes (*attention problems*, *aggressive behavior*, and *rule breaking*) theoretically related to behavior disorders and those unrelated to them (*anxious/depressed*, withdrawn/*depressed*, and *somatic complaints*). The factor structure of the YSR is stable across many cultures and has been found to be consistent with those found for parent- and teacher-rated measures (Ivanova et al., 2007). Additionally, cross-informant correlations of the YSR with clinician-scored, parent-completed, and teacher-rated forms are moderate and significant (r ranging from .20 to .46, $p < .05$; Achenbach, Dumenci, & Rescorla, 2002).

A 19-item self-reported delinquency checklist (SRDQ; adapted from Elliott, Huizinga, & Ageton, 1985) of behaviors such as *set a fire without permission*, *kicked others*, and *skipped school* was also administered to assess a wide variety of disruptive behaviors that might not have been captured by the items on the rule-breaking scale on the YSR. For each behavior, participants simply answered whether they had ever committed the act in their lifetime. Cronbach's alpha was .86. The SRDQ was developed using a nationally representative US sample and a longitudinal panel design (Elliott et al., 1985). Whereas no data have been published that directly examines cross-informant reliability for the SRDQ, other research has reported relatively high and significant correlations between self-reported delinquency and official arrests (r between .60 and .83, $p < .05$; Brame, Fagan, Piquero, Schubert, & Steinberg, 2004; Hindelang, Hirschi, & Weis, 1981).

Parental Authority Questionnaire (PAQ; Buri, 1991). Parenting styles were measured using the PAQ, a 30-item, 5-point Likert-type scale assessing three styles of permissive parenting (e.g., 'My parent feels that children can do whatever they like'), authoritarian parenting (e.g., 'My parent feels that parents must use more force to get children to act the way they are supposed to'), and authoritative parenting (e.g., 'My parent always tells me to discuss with them whenever I feel that family rules are too strict'). We instructed the students to answer the questions in reference to the prevailing parenting style in their household, in other words, as exhibited by the primary caregiver. Responses on the PAQ could apply to either the mother/mother figure or the father/father figure, depending on who was considered the main caregiver in the family in relation to the child. Cronbach's alpha for the permissive parenting, the authoritarian parenting, and the authoritative parenting subscales were .66, .76, and .83, respectively. The validity of the PAQ has been established through multidisciplinary expert review (Buri, 1991; Reitman, Rhode, Hupp, & Altobello, 2002), and it has demonstrated convergent validity with theoretically relevant parenting variables and divergent validity with irrelevant variables such as social desirability (Buri, 1991). Additionally, Peterson, Smirles, and Wentworth (1997) showed that parents who scored high on a self-reported measure of authoritarianism were also rated more highly on authoritarian parenting by their children on the PAQ. More importantly, the PAQ demonstrates criterion validity—scores on parental authoritativeness are related to self-esteem whereas scores on parental permissiveness are not (Buri, Louiselle, Misukanis, & Mueller, 1988).

Results

The means, standard deviations, and inter-correlations between main study variables are presented in Table 1. The proactive and reactive subscales of the RPQ were positively correlated ($r = 0.50$, $p < .001$), in line with published figures showing statistical overlap between the two constructs (cf. Merk, de Castro, Koops, & Matthys, 2005). Additionally, both RA and PA are significantly positively correlated with all indicators of emotional and social disturbances assessed by the YSR, as well as to self-reported delinquency. These findings are in line with published findings that aggression scores are related to disturbances in other aspects of the adolescent's socio-emotional and behavioral functioning (e.g., Brendgen, Vitaro, Tremblay, & Wanner, 2002). RA scores are significantly positively correlated with greater perceived parental authoritarianism whereas PA scores are significantly positively correlated with both perceived parental authoritarianism and permissiveness, and significantly

Table 1. Means, Standard Deviations, and Intercorrelations for Reactive/Proactive Aggression, Syndrome Scales, Parenting Styles, and Delinquency (N = 1148)

	Mean (SD)	1	2	3	4	5	6	7	8	9	10	11	12
1. Reactive aggression	7.19 (3.78)	—											
2. Proactive aggression	1.35 (2.18)	.50**	—										
Syndromes related to behavior disorders													
3. Aggressive behavior	1.66 (2.05)	.59**	.61**	—									
4. Rule-breaking	1.14 (1.15)	.45**	.55**	.57**	—								
5. Attentional problems	2.80 (2.14)	.49**	.33**	.55**	.43**	—							
Other syndromes													
6. Anxious/depressed	5.56 (3.47)	.44**	.16**	.38**	.30**	.55**	—						
7. Somatic complaints	1.21 (1.59)	.28**	.27**	.38**	.34**	.45**	.42**	—					
8. Withdrawn/depressed	3.45 (2.78)	.26**	.23**	.40**	.34**	.51**	.66**	.44**	—				
Parenting styles													
9. Permissive	14.52 (4.28)	.03	.10**	.08*	.08*	-.02	-.01	.03	.03	—			
10. Authoritarian	26.01 (6.34)	.12**	.08*	.14**	.11**	.15**	.12**	.07*	.17**	-.02	—		
11. Authoritative	25.44 (6.79)	-.02	-.06*	-.10*	-.13***	-.12***	-.07*	-.07*	-.12**	.22**	.04	—	
12. Delinquency	2.16 (3.09)	.45**	.55**	.54**	.56**	.35**	.20**	.24**	.22**	.05	.11**	-.08*	—

Note: **$p < .001$; *$p < .05$.

negatively correlated with parental authoritativeness. These findings are consistent with our hypotheses that more authoritarian and more permissive parenting styles should encourage greater levels of both RA and PA.

Defining Aggression Clusters

Clustering techniques were used to determine the nature of aggression profiles within clusters in the sample population. The RPQ scores were first converted to standardized *z*-scores, before K-means cluster analysis was performed on the sample population. The results of the 2-, 3-, 4- and 5-cluster solutions were analyzed to find the optimal cluster solution.

The four- and five-cluster solutions were deemed inappropriate because of the instability of the cluster identities. This instability was determined by the fact that there were inconsistent cluster centers generated from sorting the data randomly 200 times and repeating the K-means algorithm 500 times for the four- and five-cluster solutions using *R* statistical package. The two- and three-cluster solutions converged 500 times, indicating that the centroid characteristics of the clusters remained consistent across all 500 runs. However, the four- and five-cluster solutions converged only 77 percent and 91 percent, respectively, across the 500 runs, indicating that the cluster groupings are unstable. Hence, the three-cluster solution consistently showed a clear division of three different clusters with the aggression profiles described earlier. We also explored another indicator of cluster characteristics, notably the sum of squares (within) for each cluster solution, which is an indicator of the dispersion of data points within a cluster. Ideally, a cluster grouping should have minimal sum of squares (SS) (within) indicating that elements of that cluster are less likely to belong to another cluster grouping. Accordingly, for the two-cluster solution, SS (within) were estimated to be 1134.95, for the three-cluster solution, SS (within) were 741.05, for the four-cluster solution, SS (within) were 546.08, and finally, for the five-cluster solution, SS (within) were estimated to be 436.01. Thus, there is a dramatic drop in SS (within) between the two-cluster and the three-cluster solutions, and the subsequent drops in SS (within) between the three-cluster and four-cluster solutions and between the four-cluster and five-cluster solutions start to show a leveling-off effect. This suggests that the three-cluster solution is a more optimal solution compared with the 2-, 4-, or 5-cluster solutions. The three-cluster solution also coincided with previous findings (Crapanzano et al., 2010) and generated a low aggression group (N = 669), a group high on both PA and RA (N = 44) and a group that is high only on RA (N = 347).

Comparing the Aggression Clusters

The aggression clusters were first compared on age, gender, ethnicity, and education stream (see Table 2). The clusters differed significantly on age, $F(2, 1057) = 3.65$, $p < 0.05$. The clusters also differed in the percentage of Indian students, χ^2 $(df = 2) = 8.18$, $p < 0.05$, percentage of normal (technical) students, χ^2 $(df = 2) = 6.27$, $p < 0.05$) and percentage of females, χ^2 $(df = 2) = 13.04$, $p < 0.05$). Specifically, the combined aggression group had a lower mean age and had no Indian students as compared with the low aggression and RA group (9 percent and 8 percent, respectively). The combined aggression group had a greater percentage of normal (technical) students (34 percent) than the low aggression and RA groups (20 percent and 26 percent, respectively). The combined aggression group also had a greater percentage of males

Table 2. Demographic Variables for Each Cluster (*n* = 1060)

	Low (N = 669)	High reactive (N = 347)	Combined (N = 44)
Age			
Mean *(SD)*	13.20 (.82)	13.16 (.75)	12.86 (.80)
Gender			
Male	50.2%	53.9%	77.3%
Female	49.8%	46.1%	22.7%
Ethnicity			
Chinese	66.8%	66.3%	70.5%
Malay	20.0%	21.9%	27.3%
Indian/Pakistani/Sikh	8.7%	8.1%	0%
Eurasian and others	4.0%	3.5%	2.3%
Educational stream			
Express	47.1%	39.8%	34.1%
Normal academic	32.4%	34.6%	31.8%
Normal technical	20.5%	25.6%	34.1%

(77 percent) as compared with the low aggression and RA groups (50 percent and 54 percent, respectively). Hence, in all subsequent analyses, we controlled for age, gender, ethnicity, and education stream.

In further analyses, we sought to discover descriptive profiles of the three aggression clusters on the syndrome scales, delinquency, and parenting styles. The combined and reactively aggressive group showed higher scores for reactive (*M* = 12.37, *SD* = 3.88 for combined group; *M* = 10.82, *SD* = 2.34 for reactive group) and proactive (combined group only; *M* = 9.07, *SD* = 2.83) aggression compared with the low aggression group (RA: *M* = 4.98, *SD* = 2.32; PA: *M* = .42, *SD* = .77). Additionally, the combined aggression group had the highest mean scores (*M* range from 3.02 to 6.98, *SD* range from 1.61 to 4.79) for all the syndrome scales related to behavior disorders (aggressive behavior, rule breaking, and attentional problems), and for self-reported delinquency, compared with the other two cluster groups (*M* range from .77 to 3.74, *SD* range from .93 to 3.39). The combined and reactively aggressive groups showed similar means (*M* range from 1.60 to 7.29, *SD* range from 1.75 to 3.69) for syndrome scales related to internalizing symptoms (such as anxious/depressed, somatic symptoms, and withdrawn/depressed), and both groups' means for these syndrome scales were substantially greater than that of the low aggression group (*M* range from .92 to 4.68, *SD* range from 1.38 to 3.19). Finally, both the combined and the reactively aggressive group showed similar scores for parental authoritarianism (combined group: *M* = 27.60, *SD* = 6.72; reactive group: *M* = 26.26, *SD* = 6.03) and permissiveness (combined group: *M* = 16.32, *SD* = 4.99; reactive group: *M* = 14.37, *SD* = 4.05) that were higher than those for the low aggression group (parental authoritarianism: *M* = 25.63, *SD* = 6.47; parental permissiveness: *M* = 14.41, *SD* = 4.25). From these descriptive data, the picture is that purely reactively aggressive children and children who are both reactively and proactively aggressive tend to have worse outcomes compared with minimally aggressive

children, but the children in the combined aggression cluster have much more behavioral and conduct problems compared with the other two groups.

Because we take a person-centered perspective, analyses of variance techniques are appropriate because they allow us to examine differences in group means on the dependent variables between the three aggression clusters. Additionally, because we wished to control for the demographic variables of age, gender, ethnicity, and education stream, we conducted a series of multivariate analyses of covariance (MANCOVAs) and an analysis of covariance (ANCOVA). Three MANCOVAs were performed on the clusters to compare them on (1) syndrome scales of anxious/depressed, somatic complaints, and withdrawn/depressed; (2) syndrome scales related to behavior disorders of rule-breaking behavior, attentional problems, and aggressive behavior; and (3) permissive, authoritarian, and authoritative parenting styles. Lastly, an ANCOVA was performed on the clusters with delinquency as the dependent variable.

Detailed results of the MANCOVAs and the ANCOVA are depicted in Table 3. Box's *M*-test was significant for all the MANCOVA analyses. Accordingly, we have reported Pillai's trace criterion (instead of Wilk's lambda) for the multivariate tests below, as it is the most resistant to violation of test assumptions compared with other indicators (cf. Algina, Oshima, & Tang, 1991; Sheehan-Holt, 1998). The overall MANCOVA was significant for the three syndrome scales of anxiety/depressed, somatic complaints, and withdrawn/depressed (Pillai's trace $F(6, 2094) = 30.86$, $p < 0.001$, $\eta^2 = 0.08$). The accompanying follow-up ANCOVAs were also significant (η^2 of 0.12, 0.08 and 0.09 for anxious/depressed, somatic complaints, and withdrawn/depressed syndromes, respectively). *Post hoc* pairwise *t*-tests were next conducted to determine if clusters differed from each other on the three syndromes. For somatic complaints and withdrawn/depressed scales, pairwise tests showed significant differences among the three clusters ($p < .05$), with the combined aggression group showing the most somatic complaints and withdrawn/depressed disturbances, followed by the RA group and finally the low aggression group. Although anxious/depressed syndromes followed the same trends, there were no significant differences between the combined aggression and the reactively aggressive group; however, the low aggression group had significantly lower scores as compared with the other two aggressive groups ($p < .05$).

The overall MANCOVA was significant for the syndromes related to behavior disorders (Pillai's trace $F(6, 2094) = 103.10$, $p < 0.001$, $\eta^2 = 0.22$). Follow-up ANCOVAs were also significant (η^2 of 0.23, 0.16, and 0.36 for rule breaking, attentional problems, and aggressive behavior respectively). Pairwise *t*-tests ($p < .05$) demonstrated significant differences in all three syndromes within the different clusters, with the combined aggression cluster showing the highest level of rule-breaking behavior, attentional problems, and aggressive behaviors, followed by the RA cluster and then the low aggression cluster.

The overall MANCOVA was significant for styles of authoritarian, authoritative, and permissive parenting (Pillai's trace $F(6, 2094) = 2.92$, $p < 0.01$, $\eta^2 = 0.01$). Follow-up ANCOVAs were not significant for authoritarian or authoritative parenting, but they were significant for permissive parenting (η^2 of 0.00, 0.00, and 0.01, respectively). Specifically, pairwise *t*-tests ($p < .05$) demonstrated significant differences in permissive parenting between the combined aggression cluster and the other two clusters, such that students in the combined reactive and proactive aggressive cluster were exposed to significantly more permissive parenting than their peers who were in the non-aggressive and the reactively aggressive clusters.

Table 3. Differences Between Clusters on Syndrome Scales and Delinquency (*n* = 1060)

	Low (N = 666)	Combined (N = 44)	High reactive (N = 346)	Cluster effect	η^2
Syndromes related to behavior disorders				Pillai's trace $F_{(6, 2094)}$ = 103.1***	.23
Rule-breaking	.77 (.04)[a]	2.99 (.15)[b]	1.62 (.05)[c]	$F_{(2, 1049)}$ = 155.88***	.23
Aggressive behavior	.85 (.06)[a]	5.97 (.25)[b]	2.67 (.09)[c]	$F_{(2, 1049)}$ = 300.45***	.36
Attentional problems	2.19 (.08)[a]	5.00 (.30)[b]	3.75 (.11)[c]	$F_{(2, 1049)}$ = 99.02***	.16
Other syndromes				Pillai's trace $F_{(6, 2094)}$ = 30.86***	.08
Anxious/depressed	4.64 (.13)[a]	7.58 (.49)[b]	7.04 (.17)[b]	$F_{(2, 1049)}$ = 71.05***	.12
Somatic complaints	.91 (.06)[a]	2.66 (.23)[b]	1.60 (.08)[c]	$F_{(2, 1049)}$ = 42.63***	.08
Withdrawn/depressed	2.83 (.10)[a]	5.76 (.40)[b]	4.35 (.14)[c]	$F_{(2, 1049)}$ = 54.42***	.09
Parenting styles				Pillai's trace $F_{(6, 2094)}$ = 2.92**	.01
Permissive	14.40 (.16)[a]	16.45 (.64)[b]	14.37 (.23)[a]	$F_{(2, 1049)}$ = 4.98**	.01
Authoritarian	25.68 (.25)[a]	27.25 (.96)[a]	26.22 (.34)[a]	$F_{(2, 1049)}$ = 1.81	.00
Authoritative	25.79 (.26)[a]	26.55 (1.01)[a,b]	24.98 (.36)[b]	$F_{(2, 1049)}$ = 2.21	.00
Delinquency	1.17 (.11)[a]	6.95 (.41)[b]	3.45 (.15)[c]	$F_{(2, 1049)}$ = 149.74***	.22

Note: ***p < .001; **p < .01. Groups with identical superscripts ([a], [b], [c]) are not significantly different from each other (i.e., p > .05).

An ANCOVA performed on self reported delinquency was significant, $F(2, 1049) = 149.74$, $p < 0.001$, $\eta^2 = 0.22$. Pairwise *t*-tests ($p < .05$) demonstrated significant differences within the different clusters, with the combined aggression cluster showing the highest level of delinquency, followed by the RA cluster and then the low aggression cluster.

Discussion

Three distinct groups of aggressive individuals emerged from cluster analysis: a low aggressive group, a combined aggressive group with high levels of both RA and PA, and a reactively aggressive group with low PA and high RA. The present study provided profiles, based on self-report data, of perceived parenting styles and behavioral and psychological adjustment of these non-aggressive, reactively aggressive, and proactively and reactively aggressive adolescents.

These findings corroborate Crapanzano et al. (2010) and indicate cross-cultural stability of patterns of aggressive displays. Importantly, we demonstrated that the two aggressive groups showed similar disturbances in delinquency, rule-breaking behavior, aggressive behavior, attentional problems, anxious/depressed problems, withdrawn/depressed problems, and somatic complaints, but the individuals with the combined profile of high RA and PA had the greatest deficits. These findings suggest that there may be some merit in identifying subgroups of proactively-aggressive youths with adjustment problems that might benefit from early intervention.

An interesting finding is that the proportion of individuals in the combined RA/PA cluster is substantially fewer than individuals in the other two clusters, and the mean values of PA for the majority of the population (over 95 percent) are close to zero (see Table 3). This suggests that there is little evidence for pure PA for a non-clinical sample in this age group.

The theoretical model of antisocial behavior is that (1) it is a chronic and persistent display of behavior that begins in childhood and worsens over time; and (2) there are two distinct profiles of individuals who engage in anti-social and aggressive behavior—mainly, a larger cohort of *adolescence-limited* individuals who show an age-normative dramatic increase in aggressive and antisocial behavior during adolescence, and a small subset of individuals who engage in *life-course persistent* antisocial and aggressive behavior at every life stage (e.g., Moffitt, 2007). Previous findings that show that PA is related to delinquency in adolescence and to psychopathy in adulthood (e.g., Pulkkinen, 1996) are important because they support this theorized progression from early disruptive displays to later antisocial behavior. Our findings are that (1) individuals with a combination of RA and PA are prone to worse subclinical and behavioral disruptions than non-aggressive children or children who are reactively aggressive only; (2) there are much fewer children with combined high RA/PA profiles than those with purely RA profile or a low aggression profile; (3) there was no evidence for a purely PA group; and finally (4) membership in the combined high RA/PA group was correlated negatively with age. Our findings are consistent with Moffitt's (2007) view that the early to mid-adolescent period is one in which some aggressive behavior is normative—as our participants move into mid-adolescence, they begin to show increases in (reactively) aggressive behavior. This could explain why there was a negative correlation with age for membership in the combined RA/PA cluster. Additionally, our findings are also consistent with the perspective that adolescents who display more severe forms of aggression (combined reactive and proactive) that are

associated with greater cognitive, behavioral, and emotional disruptions represent only a small subset of non-clinical adolescent samples. There is thus practical value in identifying people in the type, scale, and pattern of their aggressive behavior.

Our results also show that children who perceive more permissive and authoritarian parenting in their households also exhibit greater levels of aggression. Compared with the other clusters, the combined RA/PA aggression cluster were most likely to report greater parental permissiveness in combination with high parental authoritarianism. These results suggest that although the experience of parental authoritarianism could prompt teenagers to aggress reactively (perhaps as an age-normative reactance to parental control), greater parental permissiveness is more detrimental because it also promotes PA on top of the reactive aggressive acts. This information may be helpful for public education efforts or intervention programs that target the entire family unit.

There are at least two possible interpretations of the association between permissiveness and higher PA. One is that more permissive home environments involve less parental control, which allows adolescents greater freedom to experiment with using aggression as an instrumental act and less recrimination for doing so. The other is that more permissiveness environments could also be more neglectful ones that are associated with lower perceived parental nurturance, which may spur the child to negative role models, such as deviant peer groups. Future research could examine the relative contributions of lax parental controls versus parental neglect in the development of PA.

A number of limitations need to be acknowledged. Firstly, our research relies solely on self-reported data. Although the measures used have been well validated, and available data suggests moderate levels of cross-informant reliability, the need remains to collect data from multiple sources. This point is particularly important as aggressive behaviors possess only moderate shared environmental variance between informants; there is an influence of rater's perspective on the level and type of aggression being reported (Baker et al., 2007). For this reason, self-reported data are also valuable, particularly if it can be supplemented later with data collected from other sources.

Related to this issue of self-reports, we used child's report data for the parenting variables. This allowed us to examine similarities between the non-aggressive, reactively aggressive, and combined aggressive groups in terms of their perceptions of their parents' parenting styles. Based on previous research indicating relative congruence (Buri, 1991), we assumed relative agreement between child and parent reports of parenting styles. However, future research could also examine whether the child's perceptions of the parenting environment align with the parents' perceptions, in case any discrepancies are indicative of larger communication problems between parents and children, which might in turn contribute to the progression of aggressive behaviors.

Another possible limitation is that we used a non-clinical sample to examine the effects of the cluster profiles on social and emotional disruptions and delinquent behaviors. Nonetheless, we believe that the study of non-clinical populations is valuable for revealing developmental pathways of these problem behaviors. However, we acknowledge that practitioners and clinically minded researchers may need to interpret our results with caution when applying it to clinical populations.

Finally, to understand the developmental significance of these cluster profiles, we need to take into account the effect of peer interactions on the development of adolescent aggression (e.g., Sijtsema et al., 2010). Thus, we need to closely monitor development over time for each of these identified groups of aggressive individuals. Although the results we have reported here are cross-sectional, they represent the first

waves of a longitudinal study conducted on fairly large sample of Asian children with a fairly nationally representative demographic composition. Due to the longitudinal design of ADRS (one additional wave of data collection has since been completed), we will hopefully also be able to see how the RA-only aggressive, combined RA- and PA-aggressive, and non-aggressive individuals progress, and explore the role of contexts (e.g., peer groups, school and family environments) in deepening the developmental progression from early conduct problems and aggressive behaviors to oppositional defiance disorders (ODD) and CD.

 Research on subtypes and combinations expressed in populations parallel the ongoing vigorous discussion of clinical diagnosis criteria. The attention-deficit/ hyperactivity disorder and disruptive behaviors disorders work group for the development of the fifth edition of the Diagnostic and Statistical Manual (DSM-5) (cf. Pardini, Frick, & Moffitt, 2010) identified some major areas of inquiry in distinguishing between ODD and CD diagnoses, among these being, (1) the developmental progression between ODD/CD and associated temperaments and subclinical behaviors; and (2) decisions about defining clinical thresholds, which will depend on the availability of longitudinal data about clinical as well as subclinical behaviors related to ODD and CD. The identification of subtypes of qualitatively different aggressive individuals is potentially important for distinguishing clinical and subclinical aggressive behavior from normative childhood and adolescent behaviors. For instance, we can imagine mapping trajectories for each of these aggression clusters, in terms of their progression on delinquency, externalizing and internalizing symptomology, and adult antisocial behaviors. This line of work should be helpful for screening applications. Because our sample is a large and relatively representative non-clinical one, we would expect most of our participants to exhibit low levels of aggression that are normative during adolescence. Moffitt (2007) has stated that more longitudinal data that tracks individuals from adolescence into adulthood is needed to understand the multiple pathways that aid in the development of antisocial behaviors throughout adolescence. We believe that ADRS, being a longitudinal study of a non-clinical sample and which investigates temperament, subclinical behaviors (aggression, low-level indicators of delinquency, and emotional disruptions) as well as peer and parent relationships, will help provide much needed data to fulfill this goal.

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