

## Research Article

# Reactive and Proactive Aggression as Meaningful Distinctions at the Variable and Person Level in Primary School-Aged Children<sup>1</sup>

Annemaree Carroll, The University of Queensland, School of Education, Brisbane Queensland.

Molly McCarthy 0000-0003-4702-5523, The University of Queensland, School of Education,  
Brisbane Queensland; Griffith Criminology Institute, Griffith University, Brisbane, QLD.

Stephen Houghton, The University of Western Australia, Graduate School of Education, Perth WA;  
School of Psychological Sciences and Health,  
University of Strathclyde, Scotland.

Emma Sanders O'Connor, The University of Queensland, School of Education, Brisbane  
Queensland.

&

Corinne Zadow, The University of Western Australia, Graduate School of Education, Perth, WA.

**Word Count:** 8,214

### Corresponding Author

Dr Annemaree Carroll

Email: a.carroll@uq.edu.au

Telephone: +61 07 3365 6476

Fax: +61 07 3365 7199

### Funding

This work was supported by the Australian Research Council Discovery Grants Scheme under Grant Number DP0663491. There is no conflict of interest for any of the authors.

### Acknowledgements

We would like to thank the principals, teachers, guidance officers, parents and children who participated in this study. Ethical clearance was obtained from relevant institutions and written consent was obtained from parents/guardians of all children who participated.

**Keywords:** proactive aggression, reactive aggression, children, antisocial behavior, impulsivity

<sup>1</sup> This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi:[10.1002/ab.21763](https://doi.org/10.1002/ab.21763)

## Abstract

Reactive and proactive aggression is a dichotomous classification of aggression in adults and children. This distinction has been supported by a number of variable-based and factor analytic studies. Due to high inter-correlations, however, the reactive - proactive aggression distinction may not be entirely useful for understanding how group or individual aggressive behavior varies in children and adolescents. Drawing on a sample of primary school-aged children (N=242) aged 7 to 12 years, this study sought to determine whether reactive and proactive aggression could be distinguished at the variable-level and the person-level in children. Exploratory Factor Analysis of data from an aggression instrument measuring both functions and forms of aggression, found a two-factor construct of aggression constituted by a reactive and proactive aggression factor. A person-based analysis was then conducted after classifying children according to the presence of reactive and/or proactive aggression. Discriminant function analysis was used to discern whether classifications on the basis of aggression function produced meaningful distinctions in terms of antisocial traits and emotional valence and intensity measures. Two functions were identified which distinguished children with different combinations of reactive and proactive aggression. Reactive-only aggressive children were defined primarily by high levels of impulsivity, while proactive-only children were defined primarily by higher levels of antisocial traits. Children high in both types of aggression exhibited both the presence of antisocial traits and impulsivity. Contrary to recent findings, this suggests that differences in aggression functions remain meaningful at the person level in children. Implications for interventions are discussed.

Aggressive behavior is a major source of referral to child and adolescent mental health clinicians (Rutter et al., 2009) and individuals with such a presentation can cost society up to 10 times more than their healthy counterparts in aggregate health care and social service expenditures (Blair, 2013). The consequences of aggression are wide ranging for both perpetrators (e.g., multiple social problems, isolation, criminal behavior, unemployment in adulthood) and victims (e.g.,

development of PTSD, anxiety, depression, substance abuse, and suicide) (see Brugman et al., 2017).

Generally considered to be multidimensional and heterogeneous (Dodge & Coie, 1987; Little, Brauner, Jones, Nock, & Hawley, 2003a; Raine et al., 2006) aggression is frequently distinguished as being reactive or proactive (see Smeets et al., 2017). Reactive aggression refers to impulsive, hostile, and emotional-driven reactions to perceived threats or provocations (e.g., in the context of a heated argument; Glenn & Raine, 2009). Also known as hot blooded aggression, this form of aggression is initiated without regard for any potential goal or object. Conversely, proactive aggression refers to a purposeful, planned and coercive act that serves the purpose of obtaining a personal goal or object (e.g., obtaining possessions of victims, or elevating one's status). Proactive aggression, also known as premeditated, instrumental, predatory, or cold-blooded aggression (Blair, Peschardt, Budhani, Mitchell & Pine, 2006; Kempes, Mattyhs, de Vried, & van Engeland, 2005), usually occurs in the absence of a strong emotional response (Glenn & Raine, 2009).

Considerable overlap between both types of aggression has been found (see Dodge & Coie, 1987), with systematic reviews reporting correlations up to  $r = 0.87$  (see Card & Little, 2006). High correlations have also been reported from meta-analyses, such as the one of 51 studies focussing on children and adolescents by Polman, Orobio de Castro, Koops, van Boxtel, and Merk (2007). In this instance, a high correlation ( $r = .64$ ) was reported between the two aggression functions.

Nevertheless, the distinct behavioral, neurocognitive and treatment profiles which exist, suggest a clear distinction between the two constructs. Reactive aggression has been shown to be related to problems with anxiety, depressive symptoms, suicidality, attention, emotions, peer relationships, and problem solving, while proactive aggression has been associated with delinquency, lower levels of victimization and positive outcome expectancies, lack of moral emotions, and higher levels of self-efficacy regarding aggression (Blair, 2013; Cima & Raine, 2009; Fite, Stoppelbeing, & Greening, 2009a; Merk et al., 2005; Smeets et al., 2017; Vitaro, Brendgen & Barker, 2006). Further

strong support for a distinction between reactive and proactive aggression comes from factor analytic studies (e.g., Little, Jones, Henrich, & Hawley, 2003b; Poulin & Boivin, 2000).

Some investigations have examined the meaningfulness of differences in the form aggression takes (direct, overt, and physical compared to indirect, relational or verbal) as well as the function (proactive compared to reactive), often examining differences in the distribution of aggression forms between the genders. Although physical and indirect (non-physical) aggression have been found to be exhibited by both boys and girls (e.g., Broidy et al., 2003; Cote, Vaillancourt, LeBlanc, Nagin, & Tremblay, 2006), the evidence suggests that boys are more likely to use physical and overt aggression (e.g., kicking, hitting, and threatening) whereas girls tend to use relational aggression (the purposeful manipulation of or damage to peer relationships via gossiping, spreading rumours, and telling lies to hurt others with the intent to harm (see Card, Stucky, Sawalani, & Little, 2008; Fite, Rubens, Preddy, Raine & Pardini, 2014).

While there may be different preferences for aggression forms between boys and girls, the distinction between proactive and reactive aggression appears to remain important as it aligns to distinct motivational antecedents (Polman et al., 2007). A number of theories exist that can assist in understanding the motivational antecedents of reactive aggression. For example, the frustration-aggression hypothesis (Berkowitz, 1989; Dollard, Doob, Miller, Mowrer, & Sears, 1939) conceptualises aggression as a response to failed goal attainment, while the threatened egotism theory of aggression (Baumeister, Smart, & Boden, 1996; Bushman & Baumeister, 1998) sees aggression as a response to self-esteem threats. Both theories suggest that negative affective states may play a mediating role in the display of aggressive responses. There are fewer theoretical expositions of the motivational antecedents of proactive aggression, aside from the defining proposition that proactive aggression is motivated by (social or material) goal attainment. For example, while proactive aggression is conceptualised as 'cold-blooded', it is not clear whether affective states may mediate the motivational process in proactive aggression.

Despite appearing to have distinct motivational antecedents, recent research suggests that the distinctions between reactive and proactive aggression may not be so clear. For example, in a recent study (Smeets et al., 2017), data from 587 clinically-referred Dutch adolescents with differing levels of aggression analyzed using a variable-based approach, yielded a three-factor solution: proactive aggression; reactive aggression due to internal frustration; and reactive aggression due to external provocation. When the data were examined using a person-based approach, however, the results provided no support for a clear distinction between reactive and proactive aggression. Multi-level Latent Class Analysis identified four separate classes of individuals characterized by different levels of severity of aggressive behavior: low levels of aggression; predominantly reactive aggression/low proactive aggression; reactive and proactive aggression (higher provocation-induced aggression compared to frustration-induced aggression); and severe reactive and proactive aggression. In addition, proactive aggression was not present without reactive aggression in any classes. Although the researchers acknowledged they did not recruit a general population sample (71.6 % were male) and forms of aggression (i.e., physical or verbal) were not examined, the question remained as to whether individuals could be differentiated by predominantly proactive or reactive aggression, or whether severity is the main distinction.

Aggressive behavior represents a major educational problem: costs of educational support, limited success with suspension programs, recidivism, future incarceration (AIC, 2010). Additionally, when children are younger (e.g., in primary school), their aggressive behavior places them on a trajectory of increased risk of suspension and exclusion, educational failure and different forms of delinquent behavior and offending (e.g., Jezior, McKenzie, & Lee, 2015; Parsonage, Khan, & Saunders, 2014). Therefore, differentiating according to reactive and proactive aggression is important to the extent that it can inform effective interventions which can avoid some of the harmful sequelae of aggression (Broidy et al., 2003; Card et al., 2008; Cote et al., 2007; Cote, Vaillancourt, LeBlanc, Nagin, & Tremblay, 2006). While most of the research to date has adopted a variable-based approach to achieve this, a general limitation of this approach is that it conveys little

about how traits are combined at the person level. A number of recent researchers have examined variations in reactive and proactive aggression at the individual level, a particular strength of which is the identification of groups of individuals who are similar to each other, but distinct from individuals in other groups (Sulik, Blair, & Greenberg, 2017). Noting the results of recent studies which have found aggression severity may better distinguish individuals than aggression functions in both adolescents (Smeets et al., 2017) and adults (Brugman et al., 2017), the current study sought to examine the utility of the reactive - proactive aggression distinction at the person level in children using an alternative aggression-measurement instrument.

The aims of the current study were to determine (i) whether reactive and proactive aggression are distinct constructs in a sample of mainstream primary school children; and (ii) whether different patterns of reactive and proactive aggression within primary school-aged children at the person level are associated with different profiles of antisocial traits and emotional valence and intensity.

## **Method**

### **Participants and settings**

Participants were primary school students who participated in a program aimed at improving social and emotional regulation. Schools were invited to participate via an electronic advertisement forwarded to the principals of primary schools in Queensland (QLD) and Western Australia (WA) with behavior support teams. While principals were asked to identify primary school students who had been suspended from school or were at risk of suspension because of their antisocial behavior, they were also invited to enrol the entire class of identified students to participate in the program, subject to parental and principal consent. Eight schools enrolled 11 whole classes into the program, resulting in N = 242 primary school Grade 3 to 6 (7-12 years, Mean age = 9.7 years) students.

Nearly two-thirds of the schools (63%, N=5) were located in low to moderate socio-economic status areas with their suburb postcode being in the bottom three quintiles for socio-economic disadvantage (translating to 74% of the students, N=178). The remaining schools (3; N=

64 students) were in the top two least disadvantaged quintiles, as ranked by the Australian Bureau of Statistics (ABS) Index of Relative Socio-economic Disadvantage (IRSD) (ABS, 2011).

Approximately 64% (N= 156) of the participants were enrolled at state schools, while 35% (N= 86) were enrolled at private or independent schools.

## Measures

Three child self-report instruments that capture different forms of aggression, antisocial traits and positive and negative emotional intensity in children were administered. *Aggression* was measured using the 20-item Child and Adolescent Scale of Aggression (CASA; Tan, 2011).

Participants respond using a 4-point response option anchored with the descriptors definitely not true (scored 0) to definitely true (3) with greater scores indicative of higher levels of aggression.

The CASA has four subscales: Physical Proactive aggression (6 items; e.g., I physically hurt others to get what I want); Verbal Proactive aggression (5 items; e.g., I spread gossip and rumors about others to get what I want); Physical Reactive aggression (5 items; e.g., I physically attack others when threatened); and Verbal Reactive aggression (4 items; e.g., I swear at others when they make me angry). The scales have high levels of reliability (see Houghton et al., 2017). In the present study reliability levels for each scale respectively were:  $\alpha = .88$ ,  $\alpha = .84$ ,  $\alpha = .78$  and  $\alpha = .80$ .

The presence of *antisocial traits* was measured using the Constellation of Affective and Interpersonal Behaviours Screening Instrument (CAIBSI; Houghton, Hunter, Khan, & Tan, 2013). This instrument, specifically developed and validated for use with children and adolescents, comprises 26 items each with a 4-point scale ranging from definitely not true (scored 0) to definitely true (3). The CAIBSI is represented by four factors: impulsivity (5 items), self-centredness (6 items), callous-unemotional traits (6 items), and manipulateness (9 items). A reliability analysis in the present study showed relatively low levels of reliability for the impulsivity and callous-unemotional subscales. As such, one item was deleted from each of these scales, which improved levels of reliability:  $\alpha = .59$  (impulsivity),  $\alpha = .59$  (self-centeredness),  $\alpha = .67$  (callous-unemotional) and  $\alpha = .82$  (manipulateness).

The Emotional Intensity Scale for Children (EISC; Braaten & Rosen, 2000) comprises 33 items, which measure the *valence and intensity of emotions*. Participants select one of five response options that best describe emotions related to experiences familiar to them (e.g., my mum makes my favorite meal). The EISC yields two subscales with higher scores indicating greater intensity. Eleven items measure intensity of positive emotions (e.g., happiness, playfulness) and 21 items measure intensity of negative emotions (e.g., frustration, annoyance). Emotional intensity has been found to distinguish proactive from reactive aggression. Specifically, reactive aggression is associated with heightened levels of arousal and emotion, while proactive aggression is said to involve a lack of emotional arousal (Glenn & Raine, 2009). In the present study internal reliability was sound, with  $\alpha = .82$  for intensity of positive emotions and  $\alpha = .76$  for intensity of negative emotions.

## **Procedure**

Ethics approval was obtained from the administering institutions, and the relevant educational stakeholders. Principals were invited, via an electronic advertisement, to identify students who had been suspended from school or were at risk of suspension as potential participants in a program aimed at improving social and emotional regulation, and were also invited to enrol the students' entire class in the program. Thirty-six Principals responded affirmatively and of these, eight subsequently agreed to administer the measures to the class peers of any students identified as at risk of suspension. To preserve the anonymity and confidentiality of participants, no names were recorded on any of the questionnaires. Instead, questionnaires were assigned a participant code to enable matching from pre- to post-assessment. Information letters and informed consent forms were subsequently forwarded to the schools for distribution. Written consent was obtained from the parents/guardians of all participating children. Participating students completed a range of self-report measures during regular school time. Trained research personnel administered all questionnaires using a standardised format, with administration taking 45-60 minutes to complete.



For the purposes of the current study, only students who were members of a whole class that participated in the program were included. As a result, the sample consists of 11 primary school classes from eight schools across QLD and WA. The baseline measures completed by students as part of the evaluation of the social and emotional regulation program constitute the data for this study.

### **Data analysis**

To examine the variable-based distinction between reactive and proactive aggression, an exploratory factor analysis (EFA) was undertaken. For the second stage of the analysis, children were classified as high or low on reactive and proactive aggression, and then cross-classified according to their profile across both types of aggression. Discriminant function analysis (DFA) was used to determine whether children classified into aggression groups could be distinguished by meaningful differences in antisocial traits and emotional valence and intensity measures. All analysis was undertaken using SPSS version 24.

## **Results**

### **Demographic profile of the sample and mean variable ratings**

The demographic profile of the sample, their mean rating across aggression measures and key predictor variables can be seen in Table 1. The sample comprised in total 242 primary school-aged children, with an almost even split of males and females (51.0% and 49.0%, respectively). The majority of children were in grades 4 (45.3%) and 5 (35.5%) and the mean age of the sample was 9.7 years. The functions and forms of aggression across the children had positively skewed distributions, with significant proportions of the children scoring 0 on the aggression measures: 58.1% for physical proactive aggression; 57.3% for verbal proactive aggression; 45.2% for physical reactive aggression; and 23.7% for verbal reactive aggression.

*Table 1 here*

### **Exploratory factor analysis of the CASA**

As the CASA has yet to be validated with children of primary school age, an EFA was undertaken, using principal axis factor analysis (appropriate for non-normal distributions; Costello & Osborne, 2005) with orthogonal (oblimin) rotation. This analysis indicated a two-factor structure with items falling into either a proactive aggression factor or a reactive aggression factor, indicating that aggression function better distinguished aggression patterns in this sample of primary school-age children than aggression forms (verbal or physical). The two factors (eigenvalues of 9.3 and 1.6, respectively) explained 41.5%, and 8.1% of the variance, respectively. Parallel analysis with 1,000 randomly generated matrices indicated a two-factor structure might be the best fit, as did the Velicer's Minimum Average Partial (MAP) Test, the Standardized Root Mean Square Residual (SRMR) (value of 0.03; values below 0.08 represent good fit, see Hu & Bentler, 1999), and examination of the scree plot. However, eigenvalues indicated that a four-factor solution was possible. Given the convergence of the majority of tests, alongside examination of factor loadings, it appeared that a two-factor structure aligning to a proactive aggression and a reactive aggression factor best described the structure of aggression in this sample. Factor loadings ranged from .756 to .312 for proactive aggression and from .785 to .467 for reactive aggression. Both the reactive and proactive aggression subscales had good levels of reliability (reactive aggression  $\alpha = .87$ ; proactive aggression  $\alpha = .88$ ). A bivariate Pearson's correlation revealed that reactive and proactive aggression correlated at .71 ( $p < .01$ ) in this sample.

### **Distribution of reactive and proactive aggression in primary school-aged children**

In order to examine how reactive and proactive aggression were distributed across primary school children, the reactive and proactive aggression self-report subscales of the CASA were split at the 50<sup>th</sup> percentile (the value for proactive aggression was .17, while for reactive aggression it was .65). Children were then cross-classified into a two by two matrix based on classification as high or low on reactive and proactive aggression, and placed into one of the following groups: low in both reactive and proactive aggression (LRA/LPA); high in reactive, low in proactive aggression (HRA/LPA); low in reactive, high in proactive aggression (LRA/HPA); high in both reactive and

proactive aggression (HRA/HPA). The breakdown of the groups, alongside the distribution of gender and age, can be seen in Table 2. Approximately 40% of the sample were classified in the LRA/LPA group (40.3%), while just over a third were classified in the HRA/HPA group (37.8%). A much smaller proportion of students were high in only one type of aggression, with 10.5% classified in the HRA/LPA and 11.3% classified in the LRA/HPA group. There was a significant difference in the gender distribution across the aggression types ( $\chi^2 = 21.24$ ,  $df=3$ ,  $p<.001$ ), with males dominating the group that was high in both aggression types group (68.5%) and females dominating the group that was low in both types of aggression (65.3%). The high in reactive but low in proactive aggression group had slightly more males than females (56.0%), while the high in proactive, low in reactive aggression group had an almost even split of male and female students (51.9% male). There were no significant differences in mean age across the groups.

*Table 2 here*

A series of ANOVAs were undertaken to examine univariate differences among the groups on antisocial traits and emotional valence and intensity, and the results can be seen in Table 3. There were differences between the groups on measures of impulsivity ( $F(3,230)=20.85$ ,  $p<.001$ ), self-centredness ( $F(3,230)=10.67$ ,  $p<.001$ ), callous-unemotional traits ( $F(3,230)=6.98$ ,  $p<.001$ ) and manipulateness ( $F(3,320)=28.14$ ,  $p<.001$ ). There was also a significant difference in the intensity of positive emotions experienced ( $F(3,226)=2.81$ ,  $p=.040$ ) but not the intensity of negative emotions ( $F(3,226)=.819$ ,  $p=.484$ ).

Post hoc analysis using Fisher's LSD found a number of significant contrasts between the individual groups. Cohen's  $d$  is used to describe the effect size of mean differences between the groups. On impulsivity, the HRA/HPA group had the highest mean and was significantly different from the LRA/LPA group which had the lowest mean ( $d=-1.12$ ), the LRA/HPA group which had the second lowest mean ( $d=-0.83$ ), and the HRA/LPA group which had the second highest mean ( $d=-0.64$ ). The LRA/LPA group was also significantly different on impulsivity from the HRA/LPA group ( $d=-0.58$ ). On self-centredness, the HRA/HPA again had the highest mean and was

significantly different from the HRA/LPA group ( $d=-0.68$ ) which had the second lowest mean, and the LRA/LPA group which had the lowest mean on this measure ( $d=-0.84$ ). The LRA/LPA was also significantly different from the LRA/HPA group which had the second highest mean ( $d=-0.50$ ). For callous-unemotional traits, the HRA/HPA group which had the highest mean was significantly different from the LRA/LPA group which had the lowest mean ( $d=-0.62$ ), and the HRA/LPA group which had the second lowest mean ( $d=-0.58$ ). The LRA/LPA group was also significantly different from the LRA/HPA group ( $d=-0.55$ ), which had the second highest mean on callous-unemotional traits. Mean levels of manipulateness in the HRA/HPA group, which were highest across all groups, were significantly different from the LRA/LPA group which had the lowest mean ( $d=-1.18$ ) and the HRA/LPA group which had the second lowest mean ( $d=-1.32$ ). The LRA/HPA group, which had the second highest mean for manipulateness, was significantly different to the HRA/LPA group ( $d=-0.92$ ) and the LRA/LPA group ( $d=-0.84$ ). Regarding the intensity of positive emotions experienced, the LRA/LPA group had the highest mean and was significantly different from the LRA/HPA group ( $d=0.47$ ) and the HRA/HPA group ( $d=0.37$ ).

*Table 3 here*

A discriminant function analysis (DFA) was then undertaken using the four aggression types to determine whether the distribution of aggression types across primary school-aged children could be distinguished by linear combination of antisocial traits (impulsivity, self-centredness, callous-unemotional traits and manipulateness) and emotional valence and intensity (intensity of positive emotions and intensity of negative emotions). DFA produces functions that comprise linear combinations of predictor variables which maximally distinguish between the identified groups, and has been used in a number of studies to identify distinct profiles for aggression typologies (Dodge, Lochman, Harnish, Bates & Petit, 1997; Krakowski & Czobor, 2017). The overall model was significant [ $\lambda=.605$ ,  $\chi^2(18) = 111.38$ ,  $p<.001$ ], and produced two significant functions, with a third function not significant when tested alone. Function 1 had an eigenvalue of .516, accounting for 85.3% of the variance between groups, while function 2 had an eigenvalue of .076 and accounted

for 12.6% of the variance between groups. The test of equality of group means indicated significant differences across the groups on impulsivity ( $\lambda=.786$ ,  $F(3)=20.29$ ,  $p<.001$ ), self-centredness ( $\lambda=.875$ ,  $F(3)=10.67$ ,  $p<.001$ ), callous-unemotional traits ( $\lambda=.903$ ,  $F(3)=8.00$ ,  $p<.001$ ), and manipulateness ( $\lambda=.749$ ,  $F(3)=25.03$ ,  $p<.001$ ), but no significant differences on the measures of intensity of positive ( $\lambda=.968$ ,  $F(3)=2.49$ ,  $p=.061$ ) and negative emotions ( $\lambda=.983$ ,  $F(3)=1.28$ ,  $p=.283$ ). Box's M test of equality of covariance indicated that the assumption of homogeneity of covariance matrices was not violated ( $M=72.22$ ,  $p=.348$ ).

The standardized canonical discriminant function coefficients for antisocial traits and emotional valence and intensity can be seen in Table 4. The coefficients for function 1 indicate that this function is defined by a positive, high loading for manipulateness, a moderate loading for callous-unemotional traits and intensity of negative emotions, and a moderate, negative loading for intensity of positive emotions. Function 2 appears to be mostly distinguished by high loadings for impulsivity and a high, negative loading for manipulateness. In summary, function 1 appears to be defined primarily by *antisocial traits*, while function 2 appears to be primarily defined by *impulsivity*.

*Figure 1 here*

While the antisocial traits and impulsivity functions appear to distinguish the groups well, the classification results indicated that group membership for the sample was predicted correctly in only 58.8% of cases, and this overall rate masks much lower correct classification rates across the groups. The LRA/LPA group had the highest correct classification rate at 78.1%, while the HRA/HPA was correctly predicted 67.8% of the time. The HRA/LPA was only correctly predicted 8.0% of the time, and the LRA/HPA was correctly predicted 7.4% of the time. This suggests that while the functions distinguish well at the group level, there is still considerable heterogeneity in terms of the presence of antisocial traits and impulsivity within the aggression type groups. Further, it might be argued that groups classified according to aggression severity might produce higher

classification rates, given the higher correct classification rates for the LRA/LPA and HRA/HPA groups; however the higher classification rates are also likely to be partly a function of group size.

### **Discussion**

In the current study, the meaningfulness of the distinction between reactive and proactive aggression was tested in a sample of primary school-aged students using both variable-based and person-based analysis. As Brugman et al. (2017) proposed, this approach is of great importance for clinical practice because it permits assumptions to be made on the individual and group levels. The findings from the EFA analysis confirmed that reactive and proactive aggression are distinguishable at the variable level in a sample of primary school-aged children, and that aggression functions appear more distinguishable than aggression forms. This is consistent with the broader literature which has found that reactive and proactive aggression can be distinguished in children using variable-based analysis (Polman et al., 2007; Smeets et al., 2017), though it should be noted that Smeets et al. (2017) found two distinct types of reactive aggression in a clinical adolescent sample. This study extends these findings by confirming the distinction between reactive and proactive aggression using an alternative instrument for measuring aggression in children, the CASA, which has been explicitly designed to measure both forms and functions of aggression in children.

This study also sought to examine how meaningful the reactive-proactive aggression distinction was at the person level in primary school-aged children. The results of a DFA indicated that the distribution of reactive and proactive aggression in children was associated with different profiles of antisocial traits and impulsivity. An antisocial traits function, defined as having relatively high levels of manipulateness, moderate levels of callous-unemotional traits, moderate levels of intense negative emotions, low levels of impulsivity and intense positive emotions, best distinguished children who were high in both types of aggression, and those high in proactive aggression only. The reactive aggression only and low aggression groups both had negative mean ratings on this function. An impulsivity function was defined primarily by a high mean rating for impulsivity and an absence of manipulateness. This function best distinguished children high in

reactive aggression only, with children high in both reactive and proactive aggression also having a positive rating on this function, but with a mean value close to zero. Children high in proactive aggression only and children low in both types of aggression had a negative mean rating on the impulsivity function.

The findings of the current study support research which has identified distinct behavioral, neurocognitive and treatment profiles for reactive and proactive aggression (Merk et al., 2005; Fite, Raine, Stouthamer-Loeber, Loeber & Pardini, 2009b; Hubbard, McAuliffe, Morrow, & Romano, 2010), with proactive-only aggression in children being associated with high levels of antisocial traits, and reactive-only aggression associated with high levels of impulsivity. There does also appear to be an additive effect when children exhibit both types of aggression – pervasive aggressors as they have been previously referred to (Dodge et al., 1997) - such that they have the highest mean on the antisocial traits function and a positive mean on the impulsivity function. While this might provide an argument that severity is a better distinguishing feature of aggression in children, the differential distribution of antisocial traits and impulsivity across the groups suggest potentially important differences in etiology, maintenance factors and future risk profiles for children with different types of aggression.

It has been contended that reactive aggression is due to a failure of emotional regulation and a compromised information-processing system, which leads children to attribute hostile intentions to ambiguous social cues and to have a paucity of non-aggressive responses to draw on when dealing with social problems (Dodge & Coie, 1987; Frey, Newman, & Onyewuenyi, 2014; Hubbard et al., 2010). The high ratings on the impulsivity function for the reactive aggression only children, along with negative ratings on the antisocial traits function, appear to support the argument that reactive aggression is a function of poorly regulated behavioral responses. It has also been suggested that proactive aggression is likely to follow on from reactive aggression with the latter having an earlier age on onset (Dodge et al., 1997; Kempes et al., 2005). It is certainly plausible that children who exhibit reactive aggression and who also have moderate to high levels of antisocial

traits may learn to use their aggression more instrumentally, and begin to develop into pervasive aggressors.

Somewhat surprisingly, emotional valence and intensity was a greater feature of the antisocial traits function than the impulsivity function, in particular the presence of high intensity of negative emotions and an absence of high intensity positive emotions. Aligned to this finding, both the proactive-only aggression and the high in both types of aggression groups had significantly lower ratings of intensity of positive emotions than the low aggression group. These findings contrast with research which has suggested that children with reactive aggression are more likely to experience higher negative emotionality, such as anxiety and depressive symptomology (Fite et al., 2009b; Raine et al., 2006). It also indicates a potential mediating role for negative affect (or an absence of positive emotion) in proactive aggression, and suggests that the role of different emotional states warrants further examination as it relates to both direct antecedents and consequences of aggressive behavior (Hubbard et al., 2010).

Smeets et al. (2017) argued that reactive and proactive aggression lacked clinical utility, primarily because they found differences in severity rather than aggression functions amongst adolescents. The results of the current study contradict those findings, with proactive-only and reactive-only children having distinct behavioral profiles, though consistent with the study by Smeets et al. (2017), children high in both types of aggression had in general higher levels of antisocial traits indicating greater clinical significance. However, these findings may be in part due to the use of different samples, with the study by Smeets et al. (2017) drawing on a clinical sample and the current study using a mainstream school sample. With children exhibiting both types of aggression having a more serious presentation in terms of the breadth of their aggressive behavior and higher levels of antisocial traits, they may be more likely to be subject to a clinical referral for aggression. Proactive-only children, however, may be better at hiding their aggressive behavior, using it in a more calculated manner to maximize rewards and avoid sanctions, and hence may less commonly come to the attention of teachers and school support staff and warrant a clinical referral.



The use of a mainstream school sample in this study means that the sample of children is normally distributed for gender. Notably, the proactive-only group is the most evenly split for gender across all the aggression type groups, which might account for the inability to detect a proactive-only aggression group found in the study by Smeets et al. (2017), which drew on a predominantly male sample. There do appear to be important gender differences in the prevalence of aggression functions in the mainstream sample of children examined in this study. While previous research has noted differences in the display of forms of aggression across boys and girls (Card et al., 2008; Fite et al., 2014), this study suggests that in terms of aggression functions, reactive-only or reactive combined with proactive aggression is less common in girls than boys. On the other hand, proactive-only aggression is almost equally prevalent across boys and girls. It may be that girls' tendency to use non-physical or indirect forms of aggression makes their propensity for proactive aggression harder to detect, and this warrants further exploration.

It has been suggested that due to the low prevalence of proactive-only aggression, aggression interventions for children should focus primarily on reactive aggression, with sub-components included to address the drivers of proactive aggression (Merk et al., 2005). However, in the current study, the prevalence of reactive-only and proactive-only aggression were nearly equivalent (approximately 1 in 10 children), while just over a third of the sample exhibited both reactive and proactive aggression. There is a danger that proactive-only aggression may be under-treated in school settings if these children are more skilled at concealing aggressive behavior from surveillance efforts of teachers or staff. Research has indicated that the presence of proactive aggression is associated with higher risks of bullying behavior (Kempes et al., 2005; Fossati et al., 2009), adolescent delinquency (Brendgen, Vitaro, Tremblay, & Lavoie, 2001; Merk et al., 2005), and persistent antisocial behavior, violent offending or psychopathy in adulthood (Fite et al., 2009b; Raine et al., 2006). Thus, intervening early with proactively aggression children is likely to generate a range of substantial benefits for the child, for the school, and for society in general, even if the prevalence of this group is low. A recent evaluation of a school-based intervention targeting

children displaying antisocial behavior which focused on improving social and emotional regulation and increasing empathy, found that the program led to significant reductions in self-reported verbal proactive aggression, physical proactive aggression, verbal reactive aggression, and in teacher ratings of callous-unemotional traits (Carroll et al., 2017). Programs of this nature may have the potential to reduce negative outcomes for both proactive and reactive aggressively children, but further longitudinal research is required to determine whether the benefits are experienced equivalently across groups.

There are a number of limitations of the current study. The measure used in this study, the CASA, is a child self-report measure of aggression, and it is possible that children may not be able to reliably discern between aggression functions (Hubbard et al., 2010). Polman et al. (2007) found survey measures less effective at distinguishing reactive and proactive aggression in children compared to observational methods. However, it has been argued that self-report ratings may be preferred for measuring aggression functions in children, as children are better able to identify the motivations for their aggressive behavior than external observers (Little et al., 2003b; Raine et al., 2006). Additionally, this study drew on only a modest sample of primary school-aged children, and the findings of this paper warrant replication with a larger sample of children in this age group. The classification rate for the DFA should also be re-tested with a larger sample of children, to enhance the size of the low prevalence aggression groups.

In conclusion, the present study adds to our understanding of the distribution of reactive and proactive aggression in primary school aged children. The findings support the distinction between reactive and proactive aggression both at the variable and person level in primary school-aged children, confirmed through the use of an alternative measure of aggression. In contrast to recent research, this study suggests that children displaying proactive aggression only are meaningfully different from children with other patterns of aggression. Further, there may be value in the delivery of targeted early interventions for these children in mainstream school settings, given their higher lifetime risks of delinquency and offending behavior. Given the preponderance of child referrals to

mental health clinicians and the associated increased costs for treating these children and their victims across the lifespan, research that differentiates between reactive and proactive aggression has great merit for the provision and evaluation of treatment options.

#### References

- Australian Bureau of Statistics (ABS). (2011). *Census of Population and Housing: Socio-Economic Indexes for Areas (SEIFA), Australia, 2011*. Cat. No. 2033.0.55.001.
- Australian Institute of Criminology. (2010). *Australian crime: Facts and figures 2009*. Canberra: Author.
- Baumeister, R.F., Smart, L., & Boden, J.M. (1996). Relation of threatened egotism to violence and aggression: The dark side of high self-esteem. *Psychological Review*, *103*, 5-33.  
<https://dx.doi.org/10.1037/0033-295X.103.1.5>
- Berkowitz, L. (1989). Frustration-aggression hypothesis: Examination and reformulation. *Psychological Bulletin*, *106*, 59-73. <https://dx.doi.org/10.1037/0033-2909.106.1.59>
- Blair, R.J.R., Peschardt, K.S., Budhani, S., Mitchell, D.G.V., & Pine, D.S. (2006). The development of psychopathy. *Journal of Child Psychology and Psychiatry*, *47*, 262-275.  
<http://dx.doi.org/10.1111/j.1469-7610.2006.01596.x>
- Blair, R.J.R. (2013). Commentary: Disregard for others: empathic dysfunction or emotional volatility? The relationship with future antisocial behavior – reflections on Rhee et al. (2013). *Journal of Child Psychology and Psychiatry*, *54*, 167-168.  
<http://dx.doi.org/10.1111/jcpp.12026>
- Braaten, E.B., & Rosen, L.A. (2000). Self-regulation of affect in attention deficit-hyperactivity disorder (ADHD) and non-ADHD boys: Differences in empathetic responding. *Journal of Consulting and Clinical Psychology*, *68*, 313-321. <http://dx.doi.org/10.1037/0022-006X.68.2.313>

- Brendgen, M., Vitaro, F., Tremblay, R.E., & Lavoie, F. (2001). Reactive and proactive aggression: Predictions to physical violence in different contexts and moderating effects of parental monitoring and caregiving behavior. *Journal of Abnormal Child Psychology*, *29*, 293-304.  
<http://dx.doi.org/10.1023/A:1010305828208>
- Briody, L., Nagin, D.S., Tremblay, R.E., Bates, J.E., Brame, B., Dodge, K.A., ... Pettit, G.S. (2003). Developmental trajectories of childhood disruptive behaviors and adolescent delinquency: A six-site, cross-national study. *Developmental Psychology*, *39*, 222-245.  
<http://dx.doi.org/10.1037/0012-1649.39.2.222>
- Brugman, S., Cornet, L. J., Smeijers, D., Smeets, K., Oostermeijer, S., Buitelaar, J. K., ... Jansen, L. (2017). Examining the reactive proactive questionnaire in adults in forensic and non-forensic settings: A variable- and person-based approach. *Aggressive Behavior*, *43*, 155-162.  
<http://dx.doi.org/10.1002/ab.21671>
- Bushman, B.J. & Baumeister, R.F. (1998). Threatened egotism, narcissism, self-esteem, and direct and displaced aggression: Does self-love or self-hate lead to violence? *Journal of Personality and Social Psychology*, *75*, 219-229. <http://dx.doi.org/10.1037/0022-3514.75.1.219>
- Card, N.A., & Little, T.D. (2006). Proactive and reactive aggression in childhood and adolescence: A meta-analysis of differential relations with psychosocial adjustment. *International Journal of Behavioral Development*, *30*, 466-480. <https://doi.org/10.1177/0165025406071904>
- Card, N.A., Stucky, B.D., Sawalani, G.M., & Little, T.D. (2008). Direct and indirect aggression during childhood and adolescence: A meta-analytic review of gender differences, intercorrelations, and relations to maladjustment. *Child Development*, *79*, 1185-1229.  
<http://doi.org/10.1111/j.1467-8624.2008.01184.x>
- Carroll, A., Sanders O'Conner, E., Houghton, S.J., Hattie, J.A., Donovan, C., & Lynn, S. (2017). A preliminary empirical evaluation of KooLKIDS: A school-based program to reduce early

onset antisocial behavior in children. *Journal of Intellectual & Developmental Disability*, 42, 22-35. <https://doi.org/10.3109/13668250.2016.1190004>

Costello, A.B., & Osborne, J.W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation*, 10 (7). Available online: <http://pareonline.net/pdf/v10n7.pdf>

Cote, S.M., Vaillancourt, T., Barker, E.D., Nagin, D., & Tremblay, R.E. (2007). The joint development of physical and indirect aggression: Predictors of continuity and change during childhood. *Development and Psychopathology*, 19, 37-55.  
<https://doi.org/10.1017/S0954579407070034>

Cote, S.M., Vaillancourt, T., LeBlanc, J.C., Nagin, D.S., & Tremblay, R.E. (2006). The development of physical aggression from toddlerhood to pre-adolescence: A nationwide longitudinal study of Canadian children. *Journal of Abnormal Child Psychology*, 34, 68-82.  
<https://doi.org/10.1007/s10802-005-9001-z>

Cima, M., & Raine, A. (2009). Distinct characteristics of psychopathy relate to different subtypes of aggression. *Personality and Individual Differences*, 47, 835–840.  
<https://doi.org/10.1016/j.paid.2009.06.031>

Dodge, K.A., & Coie, J.D. (1987). Social-information-processing factors in reactive and proactive aggression in children's peer groups. *Journal of Personality and Social Psychology*, 53, 1146-1158. <https://doi.org/10.1037/0022-3514.53.6.1146>

Dodge, K.A., Lochman, J.E., Harnish, J.D., Bates, J.E., & Petit, G.S. (1997). Reactive and proactive aggression in school children and psychiatrically impaired chronically assaultive youth. *Journal of Abnormal Psychology*, 106, 37-51. <https://doi.org/10.1037/0021-843X.106.1.37>

Dollard, J., Doob, L., Miller, N., Mowrer, O.H., & Sears, R.R. (1939). *Frustration and aggression*. New Haven: Yale University Press.

- Fite, P.J., Stoppelbein, L., & Greening, L. (2009a). Proactive and reactive aggression in a child psychiatric inpatient population. *Journal of Clinical Child & Adolescent Psychology*, 38, 199-205. <https://dx.doi.org/10.1080/15374410802698461>
- Fite, P.J., Raine, A., Stouthamer-Loeber, M., Loeber, R., Pardini, D.A. (2009b). Reactive and proactive aggression in adolescent males: Examining differential outcomes 10 years later in early adulthood. *Criminal Justice and Behavior*, 37, 141-157. <https://doi.org/10.1177/0093854809353051>
- Fossati, A., Raine, A., Borroni, S., Bizzozero, A., Volpi, E., Santalucia, I., Mafferi, C. (2009). A cross-cultural study of psychometric properties of the Reactive-Proactive Aggression Questionnaire among Italian nonclinical adolescents. *Psychological Assessment*, 21, 131-135. <https://doi.org/10.1037/a0014743>
- Fite, P. J., Rubens, S. L., Preddy, T. M., Raine, A., & Pardini, D. A. (2014). Reactive/proactive aggression and the development of internalizing problems in males: the moderating effect of parent and peer relationships. *Aggressive Behavior*, 40, 69–78. <https://doi.org/10.1002/ab.21498>
- Frey, K.S., Newman, J.B., & Onyewuenyi, A.C. (2014). Aggressive forms and functions on school playgrounds: Profile variations in interaction styles, bystander actions, and victimization. *The Journal of Early Adolescence*, 34, 285-310. <https://doi.org/10.1177/0272431613496638>
- Glenn, A.L., & Raine, A. (2009) Psychopathy and instrumental aggression: Evolutionary, neurobiological, and legal perspectives. *International Journal of Law and Psychiatry*, 32, 253–258. <https://doi.org/10.1016/j.ijlp.2009.04.002>
- Houghton, S., Carroll, A., Zadow, C., Sanders O'Connor, E., Hattie, J., & Lynn, S. (2017). Treating Children with Early Onset Conduct Problems and Callous Unemotional Traits: An Empirical Evaluation of KooLKIDS. *Emotional and Behavioural Difficulties*, 4, 350-364. <https://doi.org/10.1080/13632752.2017.1301646>

- Houghton, S., Hunter, S.C., Khan, U., & Tan, C. (2013). Interpersonal and affective dimensions of psychopathic traits adolescents: Development and validation of a self-report instrument. *Child Psychiatry & Human Development, 44*, 51-69. <https://doi.org/10.1007/s10578-012-0311-4>
- Hu, L. & Bentler, P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structure Equation Modeling: A Multidisciplinary Journal, 6*(2), 1-55. <https://doi.org/10.1080/10705519909540118>
- Hubbard, J.A., McAuliffe, M.D., Morrow, M.T., & Romano, L.J. (2010). Reactive and proactive aggression in childhood and adolescence: Precursors, outcomes, processes, experiences and measurement. *Journal of Personality, 78*, 95-118. <https://doi.org/10.1111/j.1467-6494.2009.00610.x>
- Jeziar, K.L., McKenzie, M. E., & Lee, S. S. (2016). Narcissism and callous-unemotional traits prospectively predict child conduct problems. *Journal of Clinical Child and Adolescent Psychology, 45*, 579-590. <https://doi.org/10.1080/15374416.2014.982280>
- Kempes, M., Matthys, W., De Vries, H., van Engeland, H. (2005). Reactive and proactive aggression in children. A review of theory, findings and the relevance for child and adolescent psychiatry. *European Journal of Child and Adolescent Psychiatry, 14*, 11-19. <https://doi.org/10.1007/s00787-005-0432-4>
- Krakowski, M., & Czobor, P. (2017). Proneness to aggression and its inhibition in Schizophrenia: Interconnections between personality traits, cognitive functions and emotional processing. *Schizophrenia Research, 184*, 82-87. <https://doi.org/10.1016/j.schres.2016.11.038>
- Little, T.D., Brauner, J., Jones, S.M., Nock, M.K., & Hawley, P.H. (2003a). Rethinking Aggression: A Typological Examination of the Functions of Aggression. *Merrill-Palmer Quarterly, 49*, 343-369. <https://doi.org/10.1353/mpq.2003.0014>

- Little, T.D., Jones, S.M., Henrich, C.C., & Hawley, P.H. (2003b). Disentangling the “whys” from the “whats” of aggressive behavior. *International Journal of Behavioral Development*, 27, 122-133. <https://doi.org/10.1080/0165025024400128>
- Merk, W., Orobio de Castro, B., Koops, W., & Matthys, W. (2005). The distinction between reactive and proactive aggression: Utility for theory, diagnosis and treatment? *European Journal of Developmental Psychology*, 2, 197-220. <https://doi.org/10.1080/17405620444000300>
- Parsonage, M., Khan, L., & Saunders, A. (2014). *Building a better future: The lifetime costs of childhood behavioural problems and the benefits of early intervention*. London: Centre for Mental Health.
- Polman, H., Orobio de Castro, B., Koops, W., van Boxtel, H.W., & Merk, W.W. (2007). A meta-analysis of the distinction between reactive and proactive aggression in children and adolescents. *Journal of Abnormal Child Psychology*, 35, 522-535. <https://doi.org/10.1007/s10802-007-9109-4>
- Poulin, F., & Boivin, M. (2000). Reactive and proactive aggression: Evidence of a two-factor model. *Psychological Assessment*, 12, 115-122. <https://doi.org/10.1037//1040-3590.12.1.115>
- Raine, A., Dodge, K., Loeber, R., Gatzke-Kopp, L., Lynam, D., Reynolds, C., Stouthamer-Loeber, M., & Liu, L. (2006). The Reactive–Proactive Aggression Questionnaire: Differential Correlates of Reactive and Proactive Aggression in Adolescent Boys. *Aggressive Behavior*, 32, 159–171. <https://doi.org/10.1002/ab.20115>
- Rutter, M., Bishop, D.V., Pine, D.S., Scott, S., Stevenson, J., Taylor, E., & Thapar, A. (2009). *Rutter’s Child and Adolescent Psychiatry, Fifth Edition*. Maldon, MA: Blackwell Publishing Ltd.



- Smeets, K.C., Oostermeijer, S., Lappenschaar, M., Cohn, M., van der Meer, J.M.J, Popma, A., & Buitelaar, J.K. (2017). Are proactive and reactive aggression meaningful distinctions in adolescents? A variable- and person-based approach. *Journal of Abnormal Child Psychiatry*, 45, 1-14. <https://doi.org/10.1007/s10802-016-0149-5>
- Sulik, M., Blair, C., & Greenberg, M. (2017). Child conduct problems across home and school contexts: A person-centered approach. *Journal of Psychopathology and Behavioral Assessment*, 39, 46-57. <https://doi.org/10.1007/s10862-016-9564-8>
- Tan, S. C. (2011). *Delinquency, reputational orientations, psychopathic like traits, and aggression: Extending Reputation Enhancement Theory to adolescent loners* (Unpublished doctoral thesis). University of Western Australia, Perth, Western Australia.
- Vitaro, F., Brendgen, M., & Barker, E.D. (2006). Subtypes of aggressive behaviors: A developmental perspective. *International Journal of Behavioral Development*, 30, 12–19. <https://doi.org/10.1177/0165025406059968>

Table 1 Demographic characteristics of the sample and mean ratings in aggression types, antisocial traits and emotional valence and intensity

Demographic characteristics	N	%	Min	Max	Mean	SD
Age	242		7	12	9.73	.87
School grade						
Grade 3	24	9.8				
Grade 4	111	45.3				
Grade 5	87	35.5				
Grade 6	23	9.4				
Gender						
Male	124	51.0				
Female	119	49.0				

*Aggression<sup>a</sup>*

Physical proactive aggression	238	.00	2.33	.26	.45
Verbal proactive aggression	238	.00	2.60	.27	.45
Physical reactive aggression	238	.00	3.00	.48	.65
Verbal reactive aggression	238	.00	3.00	.65	.65

*Antisocial traits<sup>a</sup>*

Impulsivity	236	.00	3.00	1.24	.67
Self-centredness	236	.00	3.00	1.63	.64
Callous-unemotional traits	236	.00	2.50	.72	.56
Manipulativeness	236	.00	3.00	1.08	.70

*Emotional valence and intensity<sup>b</sup>*

Intensity of positive emotions	230	11.00	55.00	43.15	8.22
Intensity of negative emotions	230	21.00	101.00	69.34	13.94

<sup>a</sup>All of the aggression and antisocial traits measures had a possible range of 0-3

<sup>b</sup>The emotional valence and intensity scores can range from 33 to 145

Table 2:

*Breakdown of aggression types and associated demographics*

	LRA/LPA	HRA/LPA	LRA/HPA	HRA/HPA	P*
% (N)	40.3 (96)	10.5 (25)	11.3 (27)	37.8 (90)	
Gender, male	34.7	56.0	51.9	68.5	<.001
%					
Age, M (SD)	9.69 (.78)	9.96 (.88)	9.93 (.96)	9.63 (.84)	.191

\*Between group differences were tested using chi square analysis and t-tests

Note: LRA/LPA = Low proactive aggression, low reactive aggression; HRA/LPA = Low proactive aggression, high reactive aggression; LRA/HPA = High proactive aggression, low reactive aggression; HRA/HPA = High proactive aggression, high reactive aggression.

Table 3:

*Univariate differences across aggression group on antisocial traits and emotional intensity*

	LRA/LPA	HRA/LPA	LRA/HPA	HRA/HPA	P*
Impulsivity	.92 <sub>bd</sub>	1.24 <sub>ad</sub>	1.12 <sub>d</sub>	1.61 <sub>abc</sub>	<.001
Self-centredness	1.40 <sub>cd</sub>	1.51 <sub>d</sub>	1.71 <sub>a</sub>	1.90 <sub>ab</sub>	<.001
Callous-unemotional	.56 <sub>cd</sub>	.58 <sub>d</sub>	.83 <sub>a</sub>	.89 <sub>ab</sub>	<.001

Manipulativeness	.73 <sub>cd</sub>	.75 <sub>cd</sub>	1.24 <sub>ab</sub>	1.47 <sub>ab</sub>	<.001
Intensity of positive emotions	44.82 <sub>cd</sub>	43.58	40.73 <sub>a</sub>	41.89 <sub>a</sub>	.040
Intensity of negative emotions	67.85	70.29	68.73	71.01	.484

\*Between group differences tested with ANOVA

Note: LRA/LPA = Low proactive aggression, low reactive aggression; HRA/LPA = Low proactive aggression, high reactive aggression; LRA/HPA = High proactive aggression, low reactive aggression; HRA/HPA = High proactive aggression, high reactive aggression. Means with different subscripts indicate significant differences between means in post-hoc analysis using Fisher's LSD. Significant differences with LRA/LPA group are identified with a subscript of a, differences with HRA/LPA group are identified with a subscript of b, and differences with LRA/HPA means are identified with a subscript of c, and differences with HRA/HPA group is identified with a subscript of d.

Table 4:

*Standardized canonical discriminant function coefficients for aggression types*

Measures	Functions	
	Function 1	Function 2
Impulsivity	0.243	1.180
Self-centredness	0.171	-0.27
Callous-unemotional traits	0.370	-.270
Manipulativeness	0.527	-.852
Intensity of positive emotions	-0.346	.102
Intensity of negative emotions	0.490	-.166

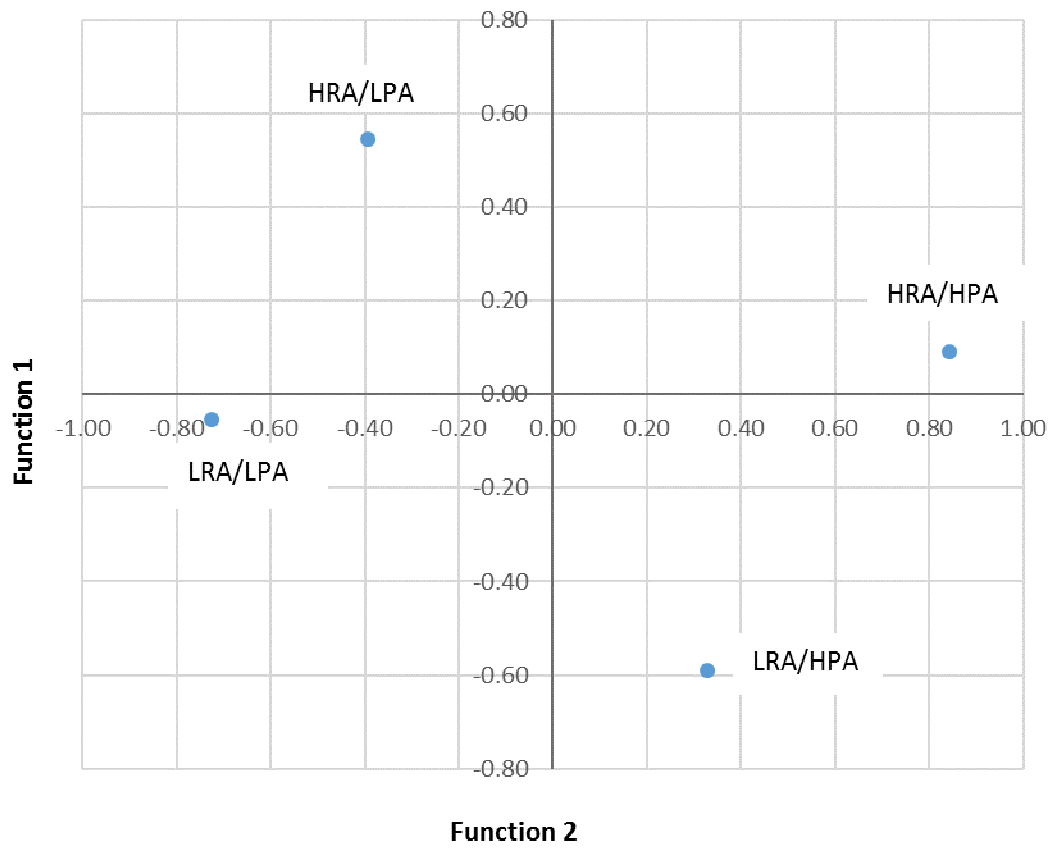
Table 5:

*Functions at aggression group centroids*

Aggression groups	Functions	
	Function 1 (antisocial traits)	Function 2 (impulsivity)
Low in both types (LRA/LPA)	-.726	-.055
High in reactive, low in proactive (HRA/LPA)	-.394	.544
Low in reactive, high in proactive (LRA/HPA)	.328	-.589
High in both types (HRA/HPA)	.842	.091

Figure 1:

*Mean values for canonical functions in each group*



Note: LRA/LPA = Low proactive aggression, low reactive aggression; HRA/LPA = Low proactive aggression, high reactive aggression; LRA/HPA = High proactive aggression, low reactive aggression; HRA/HPA = High proactive aggression, high reactive aggression.

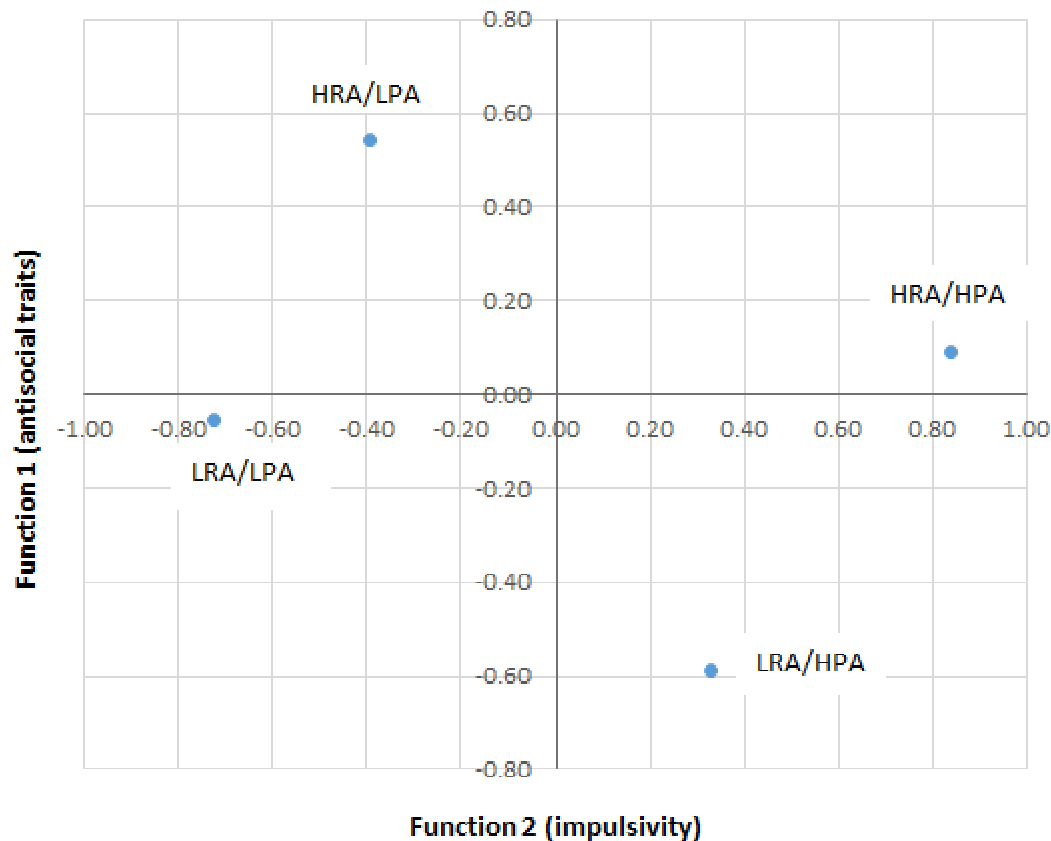


Figure 1 Mean values for canonical functions in each group 300 dpi .

*Table 4 here*

Table 5 displays the mean values for the functions across the aggression groups. Children in the LRA/LPA group had a high, negative mean on the antisocial traits function (function 1), and a negative, close to zero mean on the impulsivity function (function 2). The HRA/LPA group had a moderate, negative mean on antisocial traits function and a high mean rating on the impulsivity function. Those classified as LRA/HPA had a moderate mean rating on the antisocial traits function, and high, negative mean on the impulsivity function. The HRA/HPA group had a high, positive mean rating on the antisocial traits function, and a very low, positive mean rating on the impulsivity function. Figure 1 demonstrates how the functions discriminate between the groups. The HRA/HPA group is discriminated by having the highest loading on the antisocial traits function, while the LRA/HPA group has the second highest loading on the antisocial traits function. The HRA/LPA group and the LRA/LPA group both have negative means on the antisocial traits function. The HRA/LPA group has the highest mean on the impulsivity function, while the HRA/HPA has the

next highest mean on this function, though the mean is close to zero. The LRA/LPA and the LRA/HPA groups both have negative means on the impulsivity function though the LRA/LPA group's mean is close to zero.

*Table 5 here*

Author Manuscript



Minerva Access is the Institutional Repository of The University of Melbourne

**Author/s:**

Carroll, A; McCarthy, M; Houghton, S; O'Connor, ES; Zadow, C

**Title:**

Reactive and proactive aggression as meaningful distinctions at the variable and person level in primary school-aged children

**Date:**

2018-09-01

**Citation:**

Carroll, A., McCarthy, M., Houghton, S., O'Connor, E. S. & Zadow, C. (2018). Reactive and proactive aggression as meaningful distinctions at the variable and person level in primary school-aged children. *AGGRESSIVE BEHAVIOR*, 44 (5), pp.431-441.

<https://doi.org/10.1002/ab.21763>.

**Persistent Link:**

<http://hdl.handle.net/11343/285186>

**File Description:**

Accepted version