Neurocognitive Functioning and Aggression in First-Graders

Maryke Haasbroek
Department of Psychology
University of Cape Town

Supervisor: Dr. Catherine L Ward

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ABSTRACT

Childhood aggression is a strong predictor of violence and offending later in life. Therefore, identifying risk factors for aggressive behaviour at an early age is useful for preventative intervention in reducing rates of violence and crime. Previous research has indicated that verbal and visuospatial deficits predict aggressive behaviour in children. Thus, the purpose of this study was to investigate the relationship between verbal and visuospatial functioning and aggression when taking conduct disorder and ADHD into account. Children aged between 6 and 8 years were assessed for verbal and visuospatial ability using the Wechsler Abbreviated Scales of Intelligence ($N = 72$). Parent and teacher ratings for 65 of these children were obtained for ADHD, conduct disorder and aggression, using the Conners' Parent and Teacher Rating Scales, a DSM-IV-based conduct disorder checklist, and the Child Behaviour Checklist, respectively. Contrary to previous findings, multiple regression analyses identified that higher visuospatial functioning was associated with aggression in boys, but not in girls, with ADHD and conduct disorder controlled for.

Keywords: children; aggression; verbal ability; visuospatial ability; life-course persistent antisocial behaviour taxonomy; ADHD, conduct disorder, socioeconomic status

Violence and aggression influence the lives of South Africans on a regular basis. Even more disconcerting is the high rate of youth involvement in violence, not only as victims, but also as perpetrators (Burton, 2007). In 2000, 27 563 deaths were caused by injuries related directly to interpersonal violence. The homicide rate in 1999 was 65 per 100 000; 7 times the global average (Norman et al., 2007). Survivors of these violent attacks are at risk for various psychological problems such as depression, post-traumatic stress disorder, and substance abuse (Norman et al., 2007). Thus, violence places a considerable burden on the health services of the country. These facts highlight why it is necessary to explore options for prevention in order to lower the rates of violent offending.

Violence and offending are frequently associated with poor cognitive functioning (Moffitt, Lynam, & Silva, 1994). Influences on neurobiology, and specifically abnormalities in the frontal lobes of the brain, increase the risk of aggression (Lou, Henriksen, & Bruhn, 1984). These abnormalities reflect in the individual's neuropsychological functioning. Corroborative data from numerous studies show that neuropsychological test scores are linked to externalising behaviour, as well as to various aspects of neurobiological functioning (Moffitt et al., 1994; Speltz, De Klyen, Calderon, Greenberg, & Fisher, 1999; Stickle, Kirkpatrick, & Brush, 2009; Tremblay, 2000; Yeudall, Fromm-Auch, & Davies, 1982). Therefore, identifying these influences and understanding how they relate to aggression may provide sites for intervention.

In order to explain the developmental pathway of violent offending, Moffitt (1993) identified a taxonomy of *adolescence-limited* and *life-course persistent antisocial behaviour*. By this taxonomy, although most people show delinquent behaviour during adolescence, a small but distinct group show delinquent behaviour throughout the life-course. *Adolescence-limited* delinquent behaviour is characterised as normative. Generally, these teenagers engage in nonviolent acts of delinquency, such as shoplifting or drug use. The small *life-course persistent* antisocial group, estimated at 5% of the population, is identified as most likely to exhibit aggressive behaviour and perpetrate violent offences (McNamara & Willoughby, 2010; Moffitt, 1993). These life-course-persistent individuals have a history of aggressive behaviour beginning as early as the age of three years, varying in levels of severity with age and environmental changes (Asendorpf, Denissen, & Van Aken, 2008; Moffitt, 1993; Moffitt, Caspi, Harrington, & Milne, 2002). Early childhood externalizing behaviour is strongly associated with life-course persistent offending (Rutter, 2003). Therefore, the identification of violent (persistent) offenders at an early age is crucial.

In general, aggressive behaviour tends to peak around the age of three years and then decrease significantly towards the early school years. This decrease in aggression is linked to the development of effortful control, which generally becomes more mature and stable by early to middle childhood (more or less 5 years of age; Tremblay, 2000; Zhou et al., 2007). On the other hand, some children with low levels of effortful control in pre-school only start showing externalising problems at around 6 or 7 years (Zhou et al., 2007). These factors suggest that the early primary school years are a critical time for intervention. In relation to these findings, one study identified a small but significant group of boys (7% of the sample, $N = 279$) who were indistinguishable from non-aggressive boys in pre-school, but who began to display aggressive behaviour during first grade and continued to do so into young adulthood (Schaeffer, Petras, Ialongo, Poduska, & Kellam, 2003). The neuropsychological functioning of pre-school children is therefore generally too underdeveloped to make good predictions about future behaviour based on results from this age group, while the early primary school age group is more suitable for this.

Neuropsychological Tests and Aggression

Cognitive deficits have been identified as one of the main risk factors for life-course persistent violent offending. These deficits often manifest in poor performance on standardised neuropsychological tests. Malnutrition, foetal alcohol syndrome, child maltreatment, traumatic brain injuries, and genetic vulnerabilities have all been associated with cognitive deficits (Bennet, Bendersky, & Lewis, 2008; Brennan, Hall, Bor, Najman, & Williams, 2003; Moffitt et al., 1994). Low scores on certain neuropsychological tests are associated with higher levels of risk-taking behaviours, even when personality, age and sex are controlled for. For example, one study found a significant correlation between risky behaviours and low scores on tests of verbal ability and impulse control (Pharo, Sim, Graham, Gross & Hayne, 2011). Others identified the neuropsychological deficits most associated with antisocial behaviour as poor executive functions,[1] verbal learning and spatial learning (Séguin, Nagin, Assaad, & Tremblay, 2004, 2009).

[1] Executive functions refer to the individual cognitive processes used to regulate goal-directed behaviour; including planning and impulse control (Miller & Cohen, 2001).

Poor Verbal Functioning and Aggression

Verbal deficits affecting reading and listening abilities, problem solving, expressive speech and writing, and memory have been identified key risk factors for antisocial behaviour (Moffitt, 1991). These deficits have also been associated with the development and stabilisation of disruptive behaviour disorders, such as conduct disorder (Smith et al., 2011; Toppleberg & Shapiro, 2000). The Cognitive Complexity and Control theory–revised (Zelazo, Müller, Frye, & Marcavitch, 2003) provides a possible explanation for the negative relationship between verbal abilities and externalising behaviours. It proposes that children regulate their behaviour through self-directed speech such as 'I must not hit others.' Poor verbal skills might interfere with this process and prompt children to react physically to social cues rather than verbally (Séguin, Parent, Tremblay, & Zelazo, 2009).

A large body of literature supports the notion that verbal deficits predict externalising behaviours. For example, Moffitt and colleagues (1994) found a significant relationship between verbal test scores, assessed at 8 years, and delinquency, measured at 13, 15 and 18 years. They found consistent results on the Wechsler Intelligence Scales for Children - Revised (WISC-R) sub-tests of vocabulary, information, arithmetic, and similarities. Similar results were found when testing these domains of verbal functioning and aggression in children aged 5 years and again at 15 years (Brennan et al., 2003), as well as with 17-year olds (Raine et al., 2005). Speech and language deficits were also found to be a key factor in externalising behaviour and underachievement in school across a wide range of measures and age groups (Hinshaw, 1992). These results indicate that poor verbal ability consistently correlates with aggression in children of all ages. There is also a relationship between verbal deficits and attention-deficit/hyperactivity disorder (ADHD; Friedman-Weieneth, Harvey, Youngwirth, & Goldstein, 2007). There is a possibility that it is this disorder, rather that the pure verbal deficits, that relates to aggression.

Poor Visuospatial Functioning and Aggression

Visuospatial problems are also frequently reported along with aggressive behaviour. Persistent spatial cognitive problems are consistent with persistent antisocial behaviour. For instance, Moffitt and colleagues (1994) measured visuospatial abilities at 3 years and again at age 11 in a cohort of 925 participants. Children who displayed antisocial behaviour at both ages also scored poorly on all of the visuospatial tests, which included the Rey-Osterreith

Complex Figure delayed recall, the Rey-Osterreith Complex Figure copy, and the WISC-R Object Assembly and Mazes subtests.

Visuospatial deficits are related to right brain hemisphere dysfunction. Contrary to the literature focussing on verbal abilities, which is related to left hemisphere impairments, some researchers have found that *right* hemisphere neuropsychological impairments predispose individuals to serious violence (Raine et al., 2001; Yeudall et al., 1982). Right hemisphere dysfunction can contribute to social information processing deficits, which often precedes aggressive behaviour. These deficits interfere with emotion recognition and regulation (Raine, Yaralian, Reynolds, Venables, & Mednick, 2002). For example, children with right hemisphere dysfunction often have difficulties recognizing negative facial expressions such as anger or fear (Adolphs, Damasio, Tranel, & Damasio, 1996, Palmieri et al., 2010). The inability to recognize signals of negative affect (such as anger or fear) effectively during a social interaction could lead to inappropriate responses such as aggression (Raine et al., 2002). In addition, significant visuospatial impairments have been identified in the life-course persistent group of offenders at age 17 (Raine et al., 2005).

Attention-Deficit/Hyperactivity Disorder (ADHD) and Conduct Disorder

Children with symptoms of both conduct disorder and ADHD are often aggressive. These children score poorly on tests for executive functioning and frequently present with consistent and extreme externalising behaviour from early childhood through adolescence. Both ADHD and conduct disorder are disorders associated with poor executive functioning, which has, in turn, been associated with antisocial behaviour in numerous studies (e.g., Eisenberg & Morris, 2002; Morgan & Lilienfield, 2000). For example, long-term follow-up studies suggest that the combination of ADHD and childhood conduct disorder, a condition characterised by elevated levels of externalising behaviours, predicts higher rates of criminality during adulthood, particularly in children with lower IQ scores (Satterfield et al., 2007).

In general, children with ADHD struggle with the inhibition of impulses. They often act out in social settings without considering the consequences. Performance on the executive function tests of attention and concentration in the first grade is strongly associated with the life-course persistent trajectory of offending (Loeber & Stouthamer-Loeber, 1998; Moffitt, 1993; Schaeffer et al., 2003). This inhibition problem can lead to aggressive behaviour as opposed to solving problems verbally (Wagner, 2000). Conduct disorder is characterised by

behaviours in which the individual fails to adhere to societal rules and norms, for which they rarely show any guilt or remorse (Rowe, 2010).

Antisocial behaviour in children characterised by impulsivity and conduct problems usually has an early onset age, namely before 10 (Stickle et al., 2009).

Interestingly, either those who have conduct disorder or ADHD do not always show neurocognitive deficits *or* persistent externalising behaviour, suggesting that this combination only and not either one individually, serves as a risk factor for life-course persistent offending (Moffitt et al., 1994; Raine et al., 2005). There is much debate around this relationship between ADHD, conduct disorder, and aggression. Among children diagnosed with conduct disorder, the prevalence of co-morbid ADHD is estimated at 46 % (Harada et al., 2009). The cases of comorbid conduct disorder with ADHD usually present with childhood onset conduct disorder. This group also seems to have a poorer prognosis concerning adult antisocial personality disorder and offending (Holmes, Slaughter, & Kashani, 2001; Mannuzza & Klein, 2000).

On the one hand, some studies have found that only childhood ADHD, after controlling for conduct disorder, is needed to predict adult antisocial behaviour and offending (Mannuzza, Klein, Konig, & Giampino, 1989; Taylor, Chadwick, Heptinstall, & Danckaerts, 1996). Another suggestion is that a combination of neurocognitive impairment and ADHD serves as a risk factor for conduct disorder and persistent aggressive behaviour. Hyperactivity, inattention, and aggression have repeatedly been associated with poor neuropsychological test results. For instance, in an assessment of children's verbal, perceptual and quantitative skills, all scores were significantly correlated with each other, as well as with hyperactivity, inattention and aggression (Friedman-Weieneth et al., 2007; Hinshaw, 1992; Schaeffer et al., 2003). However, there is considerable confusion in the field as to where exactly these relationships between neuropsychological deficits and aggression lie. For instance, Friedman-Weieneth and colleagues (2007) found that hyperactivity and inattention correlate with aggression separately, whereas Moffitt (1991) found that only the combination of hyperactivity and inattention and correlates with aggression. For example, some suggest that the combination of ADHD and neurocognitive impairments lead to childhood onset conduct disorder, which serves as a risk factor for life-course persistent offending (Moffitt, 1993; Moffitt et al., 2002; Moffitt et al., 2008). Childhood conduct disorder is a significant predictor of adult antisocial personality disorder, which is associated with aggressive behaviour and offending (Lahey, Loeber, Burke, & Applegate, 2005).

However, even though practically all antisocial personality disorder adults report having conduct disorder as children, many children with conduct disorder do not grow up to be antisocial adults (Maughan, Pickles, Rowe, Costello, & Angold, 2000). For instance, Loeber and colleagues (2005) noted that only 20% of conduct disorder children from higher socio-economic status families grew up to have antisocial personality disorder , compared to the 65% of lower socioeconomic status children, suggesting that a supportive environment serves as a protective factor for children diagnosed with conduct disorder. These findings are supported by Zhou and colleagues (2007), who found that higher socioeconomic status was associated with better developmental paths of attention focussing and effortful control. This is extremely relevant to South Africa, where poverty and harsh, violent surroundings are widespread. Most probably, because of the limited resources of most South African schools, many children with ADHD and conduct disorder remain undiagnosed and do not receive the focussed attention and support they need (Zeegers, Rabie, Swanevelder, Edson, & Van Toorn, 2010).

Demographic Influences on Cognitive Performance and Aggression

Children with specific kinds of cognitive deficits are more vulnerable to harsh environmental circumstances such as a low socioeconomic status and violent surroundings. Parental maltreatment and violent, low-socioeconomic surroundings interact and increase the likelihood of a child developing a variety of cognitive deficits - some of which ultimately manifest in aggressive behaviour. Children born with these cognitive deficits (due to, for example, a genetic predisposition) into a context with good support are largely protected from this prognosis, but unfortunately, most of these children are born into harsh surroundings with very poor support (Moffitt, 1993; Moffitt et al., 1994).

Studies show mixed results regarding the relevance of gender and ethnicity differences when it comes to the relationship between cognitive deficits and aggression. Research has largely focussed on the relationship between cognitive functioning and aggression in boys (Raine et al., 2005; Séguin et al., 1995; Séguin et al., 2002). Studies that do look at gender interaction effects between poor cognitive functioning and aggression report significant interaction effects only for boys (Doctoroff, Greer, & Arnold, 2006) or girls (Valles & Knutson, 2008). One study found no significant interaction effect with gender at all (Brennan et al., 2003). However, they do describe a tendency for aggressive behaviour in girls to be more related to social risk factors such as socioeconomic status, where boys are more susceptible to cognitive deficits such as deficient verbal abilities (Brennan et al., 2003).

Some argue that the interaction between cognitive ability and aggression is only true for European-Americans and not for African-Americans (Donnellan, Ge, & Wenk, 2000; Le & Stockdale, 2011; Rabiner, Murray, Schmid, & Malone, 2004). On the contrary, Friedman-Weieneth and colleagues (2007) found no significant differences between these groups. These inconsistent findings suggest that other factors associated with ethnicity, such as culture and socioeconomic status, affect the outcome of these tests. For example, one study identified a higher number of life-course persistent offenders among African-Americans (61.7% of the sample) than among Caucasians (30.2%), but they did not control for socioeconomic status, even though they reported that many of the African-American participants came from poorer areas than the Caucasian participants (Le & Stockdale, 2011). Socioeconomic status is widely known to influence cognitive performance and academic achievement, particularly during childhood (Brooks-Gunn & Duncan, 1997; Hackman & Farah, 2009). Children who live in poor areas are often exposed to family and community violence, which places them at risk for psychological difficulties (Fowler, Tompsett, Braciszewski, Jacques-Tiura, & Baltes, 2009). Children from poor communities are also more likely to develop behaviour problems, such as conduct disorder (Bradshaw, Rodgers, Ghandour, & Garbarino, 2009).

Important questions surrounding ethnicity, gender, culture, and socioeconomic status need to be addressed in South Africa. With such high rates of poverty and crime, South Africa is likely to have a higher percentage of life-course persistent offenders than more developed countries. At this point, there is very little information available on the prevalence of neurocognitive deficits in early school-aged children. As most children are raised in high-risk environments, the prevalence of these deficits may be very high.

Summary and Conclusion

In sum, evidence suggests that verbal and visuospatial deficits play a role in the development of aggressive behaviour. However, few studies attempt to identify specific risk factors, or combinations of them, that are most influential. There is clearly an abundance of factors that put South African children at risk for neuropsychological problems, yet the actual prevalence of these factors in early school-aged children is unknown. Furthermore, the literature on behaviour disorders such ADHD and conduct disorder, their relationship with verbal and visuospatial ability, and ultimately aggression is inconsistent (Speltz et al., 1999; Raine et al., 2002). Knowledge of these factors, and how they relate to aggressive behaviour

in children, will greatly contribute to interventions for life-course persistent violent offending.

Specific Aims and Hypotheses

The primary objective of this study is to examine how low scores on verbal and visuospatial tests are associated with aggression when ADHD and conduct disorder are taken into account. According to previous research, the combination of ADHD, conduct disorder, verbal and visuospatial deficits is most strongly related to childhood aggression and later offending. However, numerous studies indicate that even just one of these factors alone is able to predict aggression. This study will address the questions of how these different factors interact and relate to aggression. I am specifically focusing on first-graders, as research indicates that they are at a developmental level where these traits can be identified (Schaeffer et al., 2003), but they are also young enough to intervene before their tendencies toward aggression become a burden on society.

This study will address the following hypotheses:

1. Poor verbal and visuospatial functioning separately predicts aggression when ADHD and conduct disorder are controlled for.
2. The combination of poor verbal and visuospatial functioning is a stronger predictor of aggression than each of the deficits separately.
3. The combination of conduct problems and ADHD is a stronger predictor of aggression than each of the disorders separately.
4. Gender influences the relationship between intelligence and aggression.

Method

Research Design and Setting

The design of this study is quantitative and cross-sectional. I worked as part of a larger research team to identify the factors that put first-graders at risk for aggression. The study examined prenatal development, child maltreatment, empathy, and neurocognitive deficits. My part of the study focused only on verbal and visuospatial functioning and the influence of ADHD and conduct disorder on aggression. We collected data from a school in the greater Cape Town area, rated in the fourth quintile of socioeconomic status (i.e., parents pay fees, but lower fees than parents whose children attend schools in the fifth quintile). The school is situated in a working class, historically Coloured suburb.

Participants

All fluent English-speaking first-graders at the participating school were eligible for this study. The school has 200 first graders and 115 of them are English speakers. The use of a school population excluded any potential participants with very low cognitive functioning. There were no exclusion criteria and all English speakers were invited to participate in the study.

Sample Size. An initial power analysis indicated that a sample size of 116 ($N = 104 + 8n$; Tabachnick & Fidell, 1996) is needed in order to produce sound results for this type of analysis. Invitations and consent forms to participate in this study were sent out to all parents of the 115 eligible participants. Of these, 73 parents gave consent, 16 declined and 26 did not respond. 72 children gave assent and one declined. Thus, the sample consisted of 72 child participants.

Participation. All 72 children were assessed. A further 6 parents who consented did not respond to calls from the research team and therefore were not interviewed. In addition, one parent's data was dropped from the study as the research assistant reported that she gave inaccurate answers as she had a fixed response set. The teachers filled out questionnaires for all 72 children. Ultimately, we obtained child and teacher data for all 72 participants and parent data for 65 participants.

Measures

Demographic information. The age, gender and socioeconomic status of the participants were identified, as they might have an influence on the outcome variable. The participants' birth dates were confirmed by parents and teachers and age was calculated on the date of assessment. Socioeconomic status was measured with a brief household inventory, included in the parent interviews (adapted from Booysen, 2001, and Sheppard, Norris, Pettifor, Cameron, and Griffiths, 2009; see appendix A)

Aggression. Aggression was measured with the externalising behaviour subscales of the Teacher and Parent Child Behavior Checklists (Achenbach & Rescorla, 2001). Thus, for the purpose of this study, aggression is defined as overt externalizing behaviours with the intention to harm others (Zhou et al., 2007). The checklists are designed for children between the ages of 6 and 18 years. The teachers filled out the checklists on their own time whilst the checklist was administered to the parents by trained research assistants. The checklists are

designed to measure aggression, hyperactivity, bullying, conduct problems, defiance, and violence. Test answers are based on 3-point Likert-like scales.

The reliability of the instrument has been found to be very good in studies in the USA with test-retest reliability ranging from .95 to 1.00, inter-rater reliability ranging from .93 to .96, and internal consistency ranging from .78 to .97. The criterion validity is acceptable (Achenbach & Rescorla, 2001).

The checklists are frequently used for research in the field of child development (Brennan et al., 2003; Patterson, Forgatch, Yoerger, & Stoolmiller, 1998; Raine et al., 2005; Walters, 2011; Zhou et al., 2007). They are also commonly used in South African samples (Barbarin & Richter, 2001; Wahl & Metzner, 2012).

ADHD. ADHD was measured using the ADHD Index subscale of the short versions of the Conners' Parent and Teacher Rating Scales-revised (Conners, 2001). The ADHD subscale consists of the 12 most robust items that distinguish children with ADHD from those without it, based on the diagnostic criteria of the DSM-IV (American Psychiatric Association, 2000). Consistent with the DSM-IV, ADHD is measured as a categorical trait, but a continuous score is also given. The instrument provides normative data for specific age groups, including 6 - 8-year-olds. The test has an overall correct classification rate of 96.3%. The standardisation study reported reliability coefficients ranging from .60 to .90 and internal consistency ranging between .75 and .90 (Conners, 2001).

The Conners' Rating Scales are also effective as they rely on more than one rater. Several studies have stressed the importance of multiple raters. For example, two found that clinically depressed mothers often rate their children as having more symptoms of all psychiatric syndromes (Breslau, Davis, & Prabucki, 1988; Fergusson & Horwood, 1996). Another study found that 45% of the total covariance in boys' externalising behaviour, based on reports by both parents, was accounted for by parental-specific views. They concluded that, as teachers observe the children in a different setting, they often have a more complete picture of the children's behaviour. The most accurate results are obtained when using both parent and teacher ratings, as with the Conners' Ratings Scales (Bartels et al., 2003).

The Conners' Rating Scales are frequently used in research settings in South Africa (Barbarin & Richter, 2001; Meyer, Eilertsen, Sundet, Tshifulero, & Sagvolden, 2004; Molepo, Maungandize, Mudhovozi, & Side, 2010; Wait, Stanton, & Schoeman, 2002; Zhang, Faries, Vowles, & Michelson, 2005).

Conduct disorder. I measured conduct disorder according to the diagnostic criteria of the DSM-IV. These criteria are frequently used to measure conduct disorder in

developmental research (Burke, Waldman, & Lahey, 2010). The DSM-IV provides a 15-item checklist of conduct disorder symptoms (Searight, Rittnek, & Abby, 2001; see Appendix B). In accordance with the DSM-IV guidelines, participants were identified as meeting the criteria for conduct disorder if he/she presented with three of the criteria during the past year, with at least one of the behaviours occurring in the past 6 months. The checklists were administered to the parents and teachers. Continuous scores of these conduct problems were used for the statistical analyses.

Verbal and visuospatial ability. Verbal abilities were tested with the Vocabulary and Similarities subtests of the Wechsler Abbreviated Intelligence Scales (WASI). These scores were combined and calculated into a verbal IQ scores. Visuospatial abilities were measured with the Block Design and Matrix Reasoning subscales of the WASI, which were calculated into performance IQ scores. Both subtest are widely accepted as sound measures of visuospatial ability (White, Campbell, Echeverria, Knox, & Janulewicz, 2009; Goldstein & McNeil, 2004). Full IQ scores were also calculated for descriptive purposes.

Description of the WASI. The WASI is a brief intelligence test taking about 30 minutes to complete. It provides a very good estimate of intelligence in a short space of time, which is ideal for research and experimental purposes (Psychological Corporation, 1999). It is also an effective screening tool for identifying whether a participant falls within the normal range of intellectual functioning, according to the Wechsler norms. The test battery consists of verbal and nonverbal subtests. The test is suitable for participants aged 6 - 89 years and provides normative data for different age groups. These norms were developed for USA citizens. The instructions provide age-appropriate start and stop points for each subtest. Participants achieve raw scores, which are converted into age-adjusted *t*-scores. These scores are then converted into Verbal IQ, Performance IQ and Full Scale IQ scores ($M = 100$, $SD = 15$; Psychological Corporation, 1999).

Verbal measure: Vocabulary. The Vocabulary subtest consists of words that the examiner presents to the participant. The participant has to define the meaning of each word.

For the 6-8-years group, the first four items are presented visually and the participant has to identify the object.

Verbal measure: Similarities. The Similarities subtest measures abstract verbal reasoning ability as well as general intelligence. For the first four items, participants are shown a set of three pictures of objects that belong to a certain category (such as fruit) and another set of pictures, from which they have to identify the one that belongs to the first set. For the remaining part of the test, participants have to explain why two items belong together (e.g., a dog and a horse are both animals). The concepts become more abstract as the test progresses.

Visuospatial measure: Block Design. The Block Design subtest measures the participant's ability to visually perceive and analyse abstract figures and to construct something from the component parts. Specifically, it measures visuospatial organisation, nonverbal reasoning, and general fluid intelligence. The participant has to replicate a set of two-dimensional geometric designs using red and white cubes within a specific time limit.

Visuospatial measure: Matrix Reasoning. The Matrix Reasoning subtest measures visuospatial organisation, abstract reasoning, and general fluid intelligence. The participant is provided with a series of geometric patterns on grids, each missing a segment. The participant has to identify the missing part from a selection of five alternatives.

Validity and reliability. The WASI standardisation study (Psychological Corporation, 1999) demonstrated poorer performance on all subtests in children and adolescents with mild and moderate mental retardation, reading disability, reading and math disability combined, and traumatic brain injury. The scale is also successful in identifying cognitive giftedness (Psychological Corporation, 1999). Concerning internal consistency, reliability coefficients ranged from 0.92 to 0.98 for Verbal IQ and 0.94 to 0.97 for Performance IQ. The reliability coefficients for Full Scale IQ scores ranged from 0.96 to 0.98. The WASI maintains the content validity of the full Wechsler Adult Intelligence Scale-III. A correlation study between the WASI and the WAIS-III revealed that the WASI subtests have good convergent validity with the counterparts in the WAIS-III (0.76 - 0.88). The WASI full-scale IQ scores correlated strongly with the full-scale WAIS-III IQ scores (0.92; Psychological Corporation, 1999).

Use of the WASI in South African samples. Previous use of the Wechsler scales has persistently yielded lower average scores for South African samples on all subtests (Shuttleworth-Edwards, Kemp, Rust, Muirhead, & Heartman, 2004). The largest influences on scores across groups are age, level and quality of education, and socioeconomic status (Psychological Corporation, 1999; Shuttleworth et al., 2004; Skuy, Schutte, Fridjhon, &

O'Carroll, 2001). The Wechsler scales provide norms for age groups, but not for educational levels. A study of high school learners in Soweto stressed the important role that level of education plays in Wechsler test performance (Skuy et al., 2001). They found statistically significant differences in the participants' scores on Similarities and Block Design as a function of education level. They also found an overall significant difference in all Wechsler tests scores between the South African sample and the North American norms, which they largely attributed to socioeconomic status and cultural differences in test taking attitudes.

An important limitation is that these results are based on the Wechsler Adult Intelligence Scales III (WAIS III) and not the WASI. Nevertheless, the WASI is still a very useful tool to get a good estimate of verbal and visuospatial ability, as the tests are very similar to those used in the WAIS III. However, as the participants are in the same age group and educational level, and fall roughly under similar socioeconomic circumstances, their results are comparable within the sample. Even though South African samples in general score lower, they do so consistently, which implies that the instrument is still capable of detecting variation in the samples. The instrument still provides a good estimate of intelligence, even if the American norms are not applicable. For the purpose of this study, I am not looking for cut-off scores to predict aggression, but whether scoring lower on the two sections of the WASI predicts higher rates of externalising behaviour. Therefore, the WASI is useful as it indicated which participants fall far below or above the norm of their peers on test results for the purpose of describing the sample. However, continuous scores were used in the statistical models.

Procedure

The children were tested in single 30 minute sessions, administered by me and trained research assistants. Each participant was alone in the room with the research assistant and minimal distractions. The assent form was read to them and signed by both parties beginning assessment. They received a small toy and a snack as incentive. The teachers were provided with questionnaires for each child to fill in during their own time. Our research team made home visits to most of the parents to administer the questionnaires to ensure that the answers were not influenced by poor reading/writing skills or poor understanding of the language. Special arrangements were made with some parents to accommodate them, such as meeting then in a private room at the school or their workplace. The assessments and interviews took place over a period of four weeks.

Ethical Considerations

This study followed the ethical guidelines for research with human subjects outlined by the Health Professions Council of South Africa and the University of Cape Town Codes for Research. I obtained permission to conduct this research from the principal of the school, as well as the Western Cape Education Department. The study was also approved by the ethics committee of the psychology department of the University of Cape Town. All the participating teachers and parents signed consent form before data collection started (see Appendices C and D, respectively). The child participants gave assent before their assessments (see appendix E).

Debriefing. Soon after data collection, my supervisor hosted a workshop on problem solving as a method for behaviour management at the school. She also contacted the school and relevant parents about the children who achieved problematic scores on any of the instruments that were used. They were encouraged to send these children for professional assessments. Lastly, the school and the Western Cape Education Department will be provided with a copy of this research report.

Statistical Analysis

SPSS Version 20.0 (SPSS Inc., 2011) was used to inspect and analyse the data. As the teacher responses had some missing data, parent information was used for the Child Behaviour Checklist, Conners' ADHD index, and the conduct disorder checklist. Goodness-of-fit calculated with Cronbach's alpha co-efficients for the externalising behaviour subscale of the parent Child Behaviour Checklist (α =.870), the Conners' Parent Rating Scale (α =.860) and the conduct disorder checklist (α = .695).

All variables used in the analyses were first inspected to ensure that the assumptions for parametric tests were upheld. Performance IQ was the only variable that did not meet the assumption of normality, however it was not too skew to cause considerable concern and the regression analyses that were done are robust against this type of violation (Tabachnick & Fidell, 1996). The main data analysis consisted of hierarchical regression analyses, which were used to determine the predictive strength of each of the independent variables (verbal IQ, performance IQ, ADHD and conduct disorder) with the outcome variable (aggression). A further univariate analysis of variance was done in order to understand the relationship of gender to verbal and performance IQ and aggression.

Results

Demographic Information

The sample consisted of 30 males (42%) and 42 females (58%). Age ranged from 6 years 0 months to 8 years 0 months (M = 6 years 7 months, SD = 5.16 months). As the participants were all from the same school and area, there was relatively little variation in the SES measure. Scores on the household inventory ranged from 9 to 15 out of a maximum of 15 (M = 12.28, SD = 1.85). Parents classified all of the participants as "Coloured".

Descriptive Statistics

Aggression. Parent and teacher ratings on the externalising subscale of the Child Behavior Checklist differed significantly (p <.001). The mean parent score for aggression was 12.80 (SD = 7.85), compared to the teacher score of 2.58 (SD = 5.38). With regards to parent ratings, females (M = 13.08, SD = 6.97) scored slightly higher in aggression than males (M = 12.41, SD = 9.07), however the difference was not statistically significant. It was clear that parents gave more thought to their responses where some of the teachers tended to have a response set for the majority of the children. It appeared that they gave children they identified as not problematic the same scores for everything. As the teacher ratings also contained some missing data, parent ratings were used for statistical analyses. Table 1 illustrates how parents rated the sample according to the Child Behavior Checklist (CBCL) norms.

Table 1. *Performance According to CBCL Norms (Parent Ratings)*

	Sample (N = 65)	Male (n = 27)	Female (n = 38)
Normal	30 (46%)	12 (44%)	18 (47%)
Borderline	13 (20%)	7 (26%)	6 (16%)
Clinical	22 (34%)	8(30%)	14 (37%)

Verbal and visuospatial ability. The sample obtained a mean full IQ score of 86.07 (SD = 9.1). Mean verbal and performance IQ scores were 82.72 (SD = 10.19) and 92.72 (SD = 9.17), respectively. According to the WASI norms, these full IQ and verbal IQ scores fall

Table 2. *Performance on WASI Sub-tests*

	Vocabulary	Similarities	Matrix Reasoning	Block Design
N	72	72	72	72
Mean	34.43	41.58	45.90	44.89
Std. Deviation	8.70	9.38	7.91	7.50
Minimum	20	28	33	32
Maximum	56	70	71	71

into the category "low average" (80 - 89), while performance IQ falls in the category "average" (90 - 109; Psychological Corporation, 1999). According to the *t*-scores obtained for the four subscales, participants performed best in Matrix Reasoning, followed by Block Design then Similarities and the worst scores were obtained for Vocabulary (see Table 2).

According to the WASI norms for full IQ scores, 18 (25%) of the sample can be described as "borderline" (70 - 79), 33 (46%) as "low average" (80 - 89), and 21 (29%) as "average" (90 - 99). The WASI guidelines state that 60% of the sample should fall within one standard deviation of the mean and 95% should fall within 2 standard deviations. According to the WASI standardised mean (100, *SD* = 15), 55.5 % of the sample falls within one standard deviation and 100% falls within two standard deviations. According to the sample mean (86.07, *SD* = 9.1), 70 % fall within one standard deviation, 97% fall within two and 100% fall within 3 standard deviations. Therefore, the data are not as widely dispersed as with the American norms. However, this could also be due to the small sample size and the fact that the participants were from only one school, and is therefore relatively homogeneous.

ADHD. There was a significant difference between the Conners' Rating Scales t-scores of the parents and teachers for each subscale (see Table 3). The average total problem scores from parent ratings were 237.71 (*SD* = 42.32), compared to 202.46 (*SD* = 25.84) for teacher ratings. These scores are the four t-scores of the different subscales added together. However, only the ADHD Index scores were used for the analyses, as this subscale specifically measures ADHD traits rather than general problem behaviours.

Table 3. *t-test Results Comparing Parent and Teacher Ratings on Conners' Scales*

	Parent Ratings ($N = 65$)					Teacher ratings ($N = 72$)				
	Mean	*SD*	df	*t*	Sig. (2-tailed)	Mean	*SD*	df	t	Sig. (2-tailed)
Oppositional	56.60	12.77	64	35.73	.000	47.94	6.33	71	64.26	.000
Cognitive Problems	57.38	12.93	64	35.78	.000	55.50	11.81	71	39.88	.000
Hyperactivity	64.43	13.05	64	39.79	.000	48.24	5.82	71	70.30	.000
ADHD Index	59.29	11.32	64	42.22	.000	50.78	8.74	71	49.29	.000

Criteria for ADHD. The t-scores obtained for the different subscales were coded into categorical variables based on the guidelines from the Conner's manual (Conners, 2001). Scores between 0 and 65 are "no concern", scores between 66 and 70 are "at risk" and scores above 71 are "clinical". Table 4 shows how the sample performed according to the parent and teacher ratings for the ADHD Index scale.

Table 4. *ADHD Index Performance According to Conners' Norms*

	Parent Ratings			Teacher Ratings		
	Sample ($N = 65$)	Male ($n = 27$)	Female ($n = 38$)	Sample ($N = 72$)	Male ($n = 30$)	Female ($n = 42$)
No Concern	49 (75%)	22 (82%)	27 (71%)	66 (92%)	28 (93%)	38 (91%)
At Risk	7 (11%)	2 (7%)	5 (13%)	3 (4%)	2 (7%)	1 (2%)
Clinical	9 (14%)	3 (11%)	6 (16%)	3 (4%)	0 (0%)	3 (7%)

Conduct disorder. There was also a significant difference between the mean scores of the Conduct Disorder Checklist for parents (*M* =. 86, *SD* = 1.32) and teachers (*M* =.03, *SD* = .24; $p < .001$). Parents identified 9 children (13%) that meet the criteria for conduct disorder (See Table 5) where teachers did not identify any.

Table 5. *Performance According to Conduct Disorder Criteria (Parent Ratings)*

	Sample (N = 65)	Male (n = 27)	Female (n = 38)
Normal	55 (85%)	22 (82%)	33 (87%)
Conduct Disorder	10 (15%)	5 (18%)	5 (13%)

Co-morbid ADHD and conduct disorder. Of the 10 children meeting the criteria for conduct disorder, 4 (40%) were identified as "at risk" for ADHD and 2 (20%) were identified as in the "clinical" range.

Statistical Analyses

Hypotheses 1 and 2: Cognitive ability and aggression. Neither verbal ability nor visuospatial ability, or the two combined, proved to be a significant predictor of aggression when controlling for age, gender, socioeconomic status, ADHD and conduct disorder. As these results are insignificant, Hypothesis 2, which states that the combination of verbal and visuospatial ability is a stronger predictor than each one separately, is no longer relevant.

Hypothesis 3: ADHD, conduct disorder and aggression. Hierarchical regressions indicated that ADHD and conduct disorder were both significant predictors of aggression when controlling for age, gender and socioeconomic status (See Tables 6 and 7, respectively). The model explained 60% of the variance ($F(5, 58) = 18.354$, $p < .001$; see Table 8).

Variable	B	β	*t*	Sig. (*p*)
(constant)	-12.808		-1.000	.321
Gender	-.897	-.057	-.591	.557
SES	.317	.075	-.777	.440
Age	.339	.209	2.226	.030
Conduct Disorder	3.703	.623	6.609	.000

Step 1: Gender, Socioeconomic Status, Age. ($R^2 = .105$)

Step 2: Gender, Socioeconomic Status, Age, Conduct Disorder. ($R^2 = .482$)

Note. SES = socioeconomic status

Table 8. *Multiple Regression Results for ADHD, Conduct Disorder and Aggression (N = 65)*

Variable	B	β	*t*	Sig. (*p*)
(constant)	-37.139		-2.888	.005
Gender	-.531	-.034	-.396	.694
SES	.113	.027	.305	.761
Age	.371	.229	2.708	.009
Conduct Disorder	2.577	.440	4.674	.000
ADHD	.293	.425	4.389	.000

Step 1: Gender, Socioeconomic Status, Age. ($R^2 = .085$)

Step 2: Gender, Socioeconomic Status, Age, Conduct Disorder, ADHD. ($R^2 = .602$)

Note. SES = socioeconomic status

Hypothesis 4: Gender, cognitive ability and aggression. A univariate analysis of variance indicated a significant interaction effect between gender and visuospatial ability with aggression ($F(1, 65) = 5.387$, $p = .024$) with ADHD and conduct disorder controlled for (see Table 9; refer to Appendix F for all correlations).

Figure 1 describes this interaction. It is clear that visuospatial ability has no effect on aggression in females ($R^2 = 0.002$), but males with higher visuospatial scores tend to be more aggressive ($R^2 = 0.106$).

Table 9. *Significant Correlations between Independent Variables and Aggression*

Variable	B	Std. Error	*t*	Sig. (*p*)
ADHD	.244	.066	3.698	.000***
Conduct Disorder	2.988	.535	5.588	.000***
Gender*PIQ	-.367	.158	-2.321	.024*

*$p < .05$, ** $p < .01$, *** $p < .001$

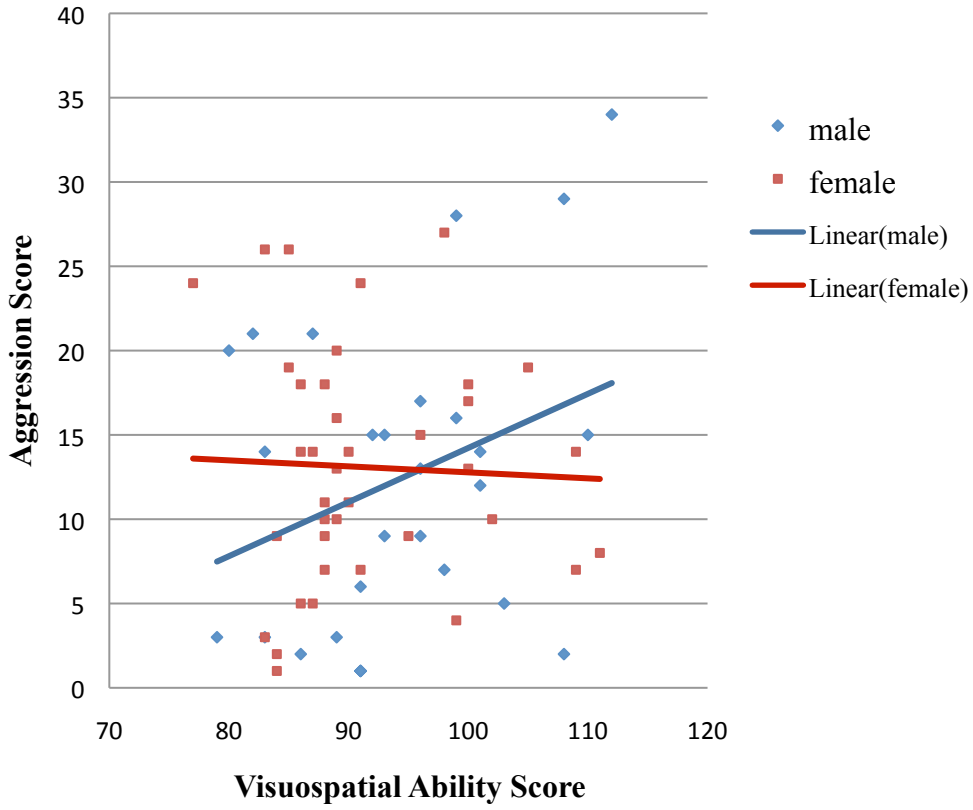

Figure 1. Interaction Between Gender and Visuospatial Ability with Aggression

Discussion

The present study investigated the relationships between verbal and visuospatial ability, ADHD, conduct disorder and aggression in a sample of first-graders. Contrary to what the first and second hypotheses predicted, verbal and visuospatial ability were not significantly associated with aggression in this group of first-graders when taking age, gender and socioeconomic status into account. However, both ADHD and conduct disorder were strongly associated with aggression, each on their own and combined. Lastly, gender interacted with visuospatial ability to correlate with aggression for boys, but not for girls. Surprisingly, this effect was the opposite of what was expected: Boys with higher visuospatial scores appeared to be more aggressive than those with lower scores.

Several factors could account for the non-significant results of the relationship between verbal and visuospatial ability and aggression. Firstly, parents rated their children's levels of aggression very highly compared to the teacher ratings. In fact, just over half of the sample fell into the borderline or clinical ranges for aggression. The mean aggression score of the sample is also considerably high in comparison to other samples. One study used the Child Behavior Checklist in various African countries and developed a norm of 3.2 (*SD* = 3.3) for the externalising behaviour subscale (Bangirana et al., 2009). This sample in this study obtained a mean score that is therefore roughly three times higher than this African norm. This implies either that aggression is a major problem in this population, or that the parent raters were not very reliable. It is likely a combination of the two.

Teacher ratings were excluded from the statistical analyses for two reasons: Firstly, the amount of missing data resulted in aggression scores that were not as valid as the parent ratings. Secondly, it appeared as if some teachers gave fixed sets of answers for the majority of the children in their class and scores only varied for the most problematic children. Therefore, the data were also too unreliable for descriptive and statistical purposes. As these teachers each have 40 first-graders in their classes, they have a great amount of work to deal with. It is understandable that they were unable to give as much thought to each child, or know as much about them, as the parents did. However, teacher scores can be very valuable and accurate as they are able to compare children's behaviour across a wide range of children and often have a realistic idea of what "problem behaviour" consists of for a particular age group. The fact that I was unable to use the teacher data for statistical analyses provides a limitation for this study. A possible solution for this would be to conduct this kind of research

over a wide range of schools so that teachers have fewer children to report on and are therefore able to give greater attention to those participants.

A surprising finding was that females were rated as slightly more aggressive than males. This contradicts most of the literature, which states that males are much more aggressive than females (Asendorpf et al., 2008; Bartels et al., 2003). A possible explanation could be the violent environment in which these children grow up. During the interviews, the majority of the parents expressed their concern of their children's safety and development due to the high rates of violent crime in the area. This could imply either that parents of boys see their aggression as normative and thus do not rate it highly, or that girls are simply more aggressive due to their circumstances. The fact that parents gave significantly higher ratings than the teachers on all the problem scales also suggest that these parents might be overwhelmed by the burdens that their circumstances place on them. The majority of the parents work full time and live in poor and violent areas. These factors can contribute greatly to the stress of raising children, which in turn could result in an over-estimation of their children's problems. Many of the parents also mentioned that their neighbourhoods are too unsafe to let their children play outdoors. They expressed their frustration at having to keep their first-graders inside all day in small apartments or homes with no space to release their energy. This could also contribute to the children's elevated levels of activity and aggression at home.

As predicted, participants scored lower on the WASI scales than the norms suggest they should (Shuttleworth-Edwards et al., 2004). The mean verbal IQ and full-scale IQ scores fell into the "low average" category while performance IQ falls in the bottom of the "average" category. The WASI norms indicate that the sample mean should fall into the "average" category. The fact that the sample scored closer to the WASI norm for performance IQ than verbal IQ suggests that performance IQ may be a more culture-free measure of intelligence than verbal IQ (Walker, Batchelor, & Shores, 2009). If this is the case, performance IQ may be more effective in detecting a relationship with aggression than verbal IQ, simply because it is a more accurate measure of intelligence for this sample. Also of note is that the standard deviations for scores on all three of these IQ scales are markedly lower than the standard deviation of the WASI norms. This means that the instrument was not able to detect as much variance in the sample as it does in other samples. This could be a reason as to why no relationship with these scales and aggression was detected. However, the small and relatively homogenous sample could also have accounted for this.

In accordance with the cited literature, ADHD and conduct disorders were both strongly related to aggression. These results appear to answer the question whether the combination of these two behavioural problems are needed to predict aggression. Each of them was associated with aggression, but the combination of the two correlated much higher with aggression than each on their own. These findings stress the importance of detecting behavioural problems at a young age. If these results are viewed in the light of *the life-course persistent antisocial behaviour* taxonomy (Moffitt, 1993), children with co-morbid ADHD and conduct disorder are more likely to become antisocial adults than their peers. Despite the fact that the sample of children meeting the criteria for conduct disorder was so small (n = 10), the prevalence of co-morbidity with ADHD, or at least "at risk" for ADHD was relatively similar to what previous research has found (Harada et al., 2009). As more than half of the participants that met the criteria for conduct disorder were classified as "at risk" or "clinical" for ADHD, it is clear that these are important factors to consider when identifying children who are at risk for adult antisocial behaviour. This group is known to have a poor prognosis with regards to adult violence and offending (Holmes et al., 2001) Therefore, these children that met the criteria for conduct disorder, and who were rated as "at risk" or "clinical" for ADHD, may need early intervention to prevent this.

Similar to aggression, the prevalence of ADHD and conduct disorder are associated with socioeconomic status. Higher socioeconomic status is associated with better developmental paths of attention focussing and effortful control. These are executive functions associated with ADHD and conduct disorder (Zhou et al., 2007). As mentioned before, these behavioural disorders often go undetected in South African communities where mental health resources are limited (Zeegers et al., 2010). This study found a similar phenomenon where none of the children who met the criteria for either of the behavioural disorders had ever been assessed for such disorders.

Perhaps the most surprising finding is the interaction between gender and visuospatial ability and aggression, and that it is at odds with the existing literature. In this sample, the boys with higher visuospatial scores were rated as more aggressive than their male peers. This interaction was not present for females. Besides the possible contributing factors already mentioned, this interaction may be explained by evolutionary theories of behaviour (Archer, 2009). From this perspective, aggression can serve as a protective factor in violent surroundings. It can also hold a social advantage for males, as females and other males regard them as able to look after the safety of themselves and others (Archer, 2009). Therefore, higher visuospatial ability might well be contributing to effective social

functioning, in the sense that aggression in particular contexts may be regarded as more effective social functioning.

Another explanation is provided by social learning theory. From this point of view, children reflect the violent behaviour they see in their surroundings. This continuous exposure to violence results in children internalising beliefs about violence as a normative and acceptable strategy to respond to social situations. In fact, in communities submerged in gang violence, such as the sample in this study, aggression is often an adaptive response (Anooshian, 2005). Some argue that aggression can be a successful strategy, associated with social acceptance, in situations where aggression is common in the community (Stormshak et al., 1999). As visuospatial ability is a right hemisphere function, which is associated with social information processing, (Raine et al., 2002) it is possible that better visuospatial ability is associated with aggression in situations where it is socially adaptive. However, is does not mean that aggression should be condoned. Even if it is adaptive in certain circumstances, children can still benefit from alternative social strategies where personal success is not gained at the cost of harming others (Anooshian, 2005).

It should also be noted that, as one can see form the scattered data points in Figure 1, there is a lot of variability in this relationship between visuospatial ability and aggression. This indicates that there are most likely other factors that also contribute to this relationship. Future research should examine this relationship in order to determine the other contributing factors that account for this variability.

The findings of this study provide insight into the limitations of some of the previous research regarding cognitive functioning and aggression. The relationship between them may not be as simple in that poor cognitive functioning is necessarily always associated with aggression. Most of these studies were conducted in developed countries (Moffitt et al., 1994; Tremblay, 2000) were violence rates are markedly lower (Norman et al., 2007). Future research could investigate this relationship between the function of aggressive behaviour and different environments, with special attention to levels of violence. In addition, researchers should pay attention to the gender differences in aggressive behaviour in children from different social surroundings. Although I have speculated about the effects of violent surroundings on this sample's behaviour, no measure of the participants' actual exposure to different kinds of violence was taken. The inclusion of such measures in future studies could possibly validate these speculations.

As mentioned before, a power analysis indicated that a sample size of $N = 115$ would have been necessary to detect an effect. However, a relatively large non-response rate

ultimately yielded a much smaller sample with regards to completed sets of data with $n = 65$. This provides a limitation when interpreting the results of this study. The large non-response rate of potential participants suggests that future studies should aim to reach a much larger population than needed in order so to end up with a suitable sample size.

Conclusion

This study investigated the relationship between verbal and visuospatial ability and aggression in first-graders. As previous research indicated them to be important contributing factors to this relationship, ADHD, conduct disorder, age, gender and socioeconomic status were also taken into account. The rationale for this investigation was based on the *life-course persistent antisocial behaviour* taxonomy (Moffitt, 1993), which identifies childhood aggression as strong predictor for adult antisocial behaviour and offending. As violence and crime are prominent problems in South Africa (Norman et al., 2007) information that could lead to early intervention for individuals at risk for these kinds of antisocial behaviours is essential. Therefore, the purpose of this study was to identify whether poor verbal and visuospatial ability serves as a potential risk factor for aggressive behaviour in this particular sample of first-graders.

Although this study did not find a significant relationship between verbal and visuospatial ability and aggression, it revealed some important findings. Both ADHD and conduct disorder were identified as significantly correlated with aggression. Furthermore, the interaction between gender and visuospatial ability was significantly related to aggression where males with higher visuospatial ability were more aggressive than their male peers. This provides some insight into the function of aggressive behaviour in more violent contexts, where acting aggressively may be socially adaptive.

However, aggressive behaviour in childhood remains a risk factor for adult antisocial behaviour and offending - regardless of whether it is adaptive or not. Violence and crime are clearly great problems in this country. Therefore, it is essential that further research is done to identify and explain the various and complex risk factors that put South African children at risk to become violent adults.

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Appendix A

HOUSEHOLD INVENTORY How many of the following do you have in your household at this time? (please tick the box if you have at least one in your home)			
Running water inside the house	☐	Electricity inside the house	☐
Flushing toilet inside the house	☐	Radio/Hi-fi	☐
Car	☐	Television	☐
Fridge	☐	Video machine/DVD	☐
Microwave Oven	☐	DSTV/ Satellite	☐
Washing machine	☐	Computer	☐
Landline telephone	☐	Internet	☐
Cell phone	☐		

Apart from your immediate family, how many other people live in your household?

_____

Of the additional members of your household, how are they related to your 1st Grade child?

_____

_____

Appendix B

Behaviour Checklist **Please tick the appropriate box. Leave it open if the behaviour did not occur or you do not know**		
Has this child shown the following behaviour:	**In the Past Year?**	**In the Past Six Months?**
1. Often bullies, threatens or intimidates others.		
2. Often initiates physical fights		
3. Has used a weapon that can cause serious physical harm to others (e.g., a bat, brick, broken bottle, knife, gun).		
4. Has been physically cruel to people.		
5. Has been physically cruel to animals		
6. Has stolen while confronting a victim (e.g., mugging, purse snatching, extortion, armed robbery).		
7. Has forced someone into sexual activity		
8. Has deliberately engaged in fire setting with the intention of causing serious damage.		

9. Has deliberately destroyed other's property (other than by fire setting).		
10. Has broken into someone else's house, building or car.		
11. Often lies to obtain goods or favors or to avoid obligations (i.e. "cons" others).		
12. Has stolen items of nontrivial value without confronting the victim (e.g., shoplifting, but without breaking and entering; forgery)		
13. Often stays out at night despite parental prohibitions, beginning before age 13 years.		
14. Has run away from home overnight at least twice while living in a parental or parental surrogate home (or once without returning for a lengthy period).		
15. Is often truant from school, beginning from before age 13 years.		

Appendix C

Consent Form
University of Cape Town
Consent to participate in a research study:
Risk Factors for Poor Development in First-graders

Dear Parent,

Study purpose

You and your first-grade child are being invited to participate in a research study being conducted by researchers from the Department of Psychology at the University of Cape Town. The purpose of this study is to map the prevalence of certain factors that place children at risk for poor development.

Study procedures

If you decide to participate in this study, you will be interviewed for approximately 60 minutes, either at home or at the school – this is your choice. The interview will include questions about your parenting history as well as your child's behaviour. Your child will be assessed at school. The assessment will include tests of ability to do academic work and to get along with others. Their height and weight will also be measured. They will be assessed over two 60 minute sessions and breaks can be taken whenever they need them. We will also be discreetly observing your child in the classroom and during breaks. In addition, we will also be asking your child's teacher to provide us with information about his/her academic performance and behaviour at school.

Possible risks and benefits

There are no real risks involved in this study. Your child may become tired during the assessments, but he/she will be encouraged to take breaks whenever needed. Your child will be provided with refreshments during the assessment as well as a small toy upon completion. You will be offered a R50 cell phone or supermarket voucher to thank you for your time. One very real benefit is that this study will provide your child with a developmental assessment which he/she would not likely get otherwise. You can be assured that, in the event

that we should find your child to be at risk for any problems, we will notify you and refer you to the appropriate resources.

Alternatives

You may choose not to participate in this study. Your decision will not affect your or your child's relationship with the school in any way.

Voluntary participation

Participation in this study is completely voluntary. You are free to refuse to answer any question. You are free to change your mind and discontinue participation at any time without any effect on your relationship with the school.

Confidentiality

Information about you and your child for this study will be kept confidential. You and your child's consent form and other identifying information will be kept in locked filing cabinets. The information obtained will not be disclosed to anybody else but the researchers involved. Any reports or publications about this study will not identify you or any other study participant. The computers used to type up the data will be password protected.

Questions

Any study-related questions or problems should be directed to the following researchers:
Dr. Catherine Ward 021 650 3422
Dr. Susan Malcolm-Smith 021 650 4605
Questions about your rights as a study participant, comments or complaints about the study may also be presented to Ms. Rosalind Adams (021 650 3417).

*To be filled out and sent back to Portavue primary school by **MAY 31st**

I have read the consent form and am satisfied with my understanding of the study, its possible risks, benefits and alternatives. I hereby voluntarily consent to the participation of me and my child in the research study as described.

---------- ----------

Signature of participant (parent) Date

---------- ----------

Name of participant (printed) Witness

Please tick the options that are most convenient for you

- € I prefer that the researchers interview me at home

  Preferred interview time at home:

  - € Morning (8am - 12pm)
  - € Afternoon (13pm-17pm)
  - € Evening (17pm-20pm)

- € I prefer to come to Portavue primary school for my interview

  Preferred interview time at Portavue Primary:

  - € Morning (8am - 12pm)
  - € Afternoon (13pm-17pm)

My home telephone number:

My home address:

Appendix D

Consent Form
University of Cape Town
Consent to participate in a research study:
Risk Factors for Poor Development in First-graders

Dear Educator,

Study purpose

You are being invited to participate in a research study being conducted by researchers from the Department of Psychology at the University of Cape Town. The purpose of this study is to map the prevalence of certain factors that place children at risk for poor development.

Study procedures

If you decide to participate in this study, you will be asked to provide us with the names of English-speaking learners in your class, and to fill in a short questionnaire about each of those learners. The questionnaire will cover the child's academic performance and behaviour at school.

Possible risks and benefits

There are no real risks involved in this study, except that each questionnaire is likely to take at least 10 minutes to complete. We will offer you a R200 Woolworths gift voucher to thank you for your time. In addition, Dr Ward, one of the principal investigators, has offered to conduct a workshop for the staff at Portavue Primary in "problem-solving as a method of handling difficult behaviour". We will also donate some books to the school library.
One very real benefit is that this study will provide your learners with a developmental assessment which he/she would not likely get otherwise. You can be assured that, in the event that we should find a child to be at risk for any problems, we will notify their parents and the school (as appropriate), and suggest options for referral.

Alternatives

You may choose not to participate in this study. Your decision will not affect your relationship with the school in any way.

Voluntary participation

Participation in this study is completely voluntary. You are free to refuse to answer any question. You are free to change your mind and discontinue participation at any time without any effect on your relationship with the school.

Confidentiality

Information that you provide for this study will be kept confidential. Your consent form and other identifying information will be kept in locked filing cabinets. The information obtained will not be disclosed to anybody else but the researchers involved. Any reports or publications about this study will not identify you or any other study participant. The computers used to type up the data will be password protected.

Questions

Any study-related questions or problems should be directed to the following researchers:
Dr. Catherine Ward 021 650 3422
Dr. Susan Malcolm-Smith 021 650 4605
Questions about your rights as a study participant, comments or complaints about the study may also be presented to Ms. Rosalind Adams (021 650 3417).

Please fill out the last page and return it to us. You are welcome to keep the first two pages.

*To be filled out and sent back to Portavue primary school by **MAY 31st**

I have read the consent form and am satisfied with my understanding of the study, its possible risks, benefits and alternatives. I hereby voluntarily consent to the participation of me and my child in the research study as described.

---------- ----------

Signature of participant (parent) Date

---------- ----------

Name of participant (printed) Witness

Appendix E

UNIVERSITY OF CAPE TOWN

DEPARTMENT OF PSYCHOLOGY

Assent Form

(To be read to the child participant before testing begins)

Hello! We want to tell you about a research study we are doing. A research study is a way to learn more about something.

If you agree to join this study, you will be asked to do some tasks like drawing pictures, telling me about the meaning of some words, and building puzzles with blocks. We will also measure your height, arm and head with a measuring tape. Then we will measure your weight on a scale.

There will be two sessions, both about an hour long. If you get tired, we can take a break at any time. When you are finished with the tasks, you will get a small toy and something to eat and drink.

You do not have to join this study. It is up to you. No one will be mad at you if you don't want to be in the study or if you join the study and change your mind later and stop.

Any questions?

If you sign your name below, it means that you agree to take part in this research study.

---------- ----------

Date (MM/DD/YEAR) Signature of Child Participant

Signature of Test Administrator

Appendix F

Table 7. *Correlations between Independent Variables and Aggression*

Variable	B	Std. Error	*t*	Sig. (*p*)
Verbal IQ	-.145	.102	-1.411	.164
Performance IQ	.272	.112	2.425	.068
ADHD	.244	.066	3.698	.000***
Conduct Disorder	2.988	.535	5.588	.000***
Gender*PIQ	-.367	.158	-2.321	.024*
Gender*VIQ	.212	.135	1.565	.123

Note: Controls are age, SES and gender (omitted from the table).

*$p < .05$, ** $p < .01$, *** $p < .001$