

**EXECUTIVE AND SOCIAL-COGNITIVE FUNCTIONING IN
REACTIVE- AND PROACTIVE-AGGRESSIVE YOUNG
BOYS**

by

Christopher P. Jones
Master of Arts, Simon Fraser University, 2002
Bachelor of Arts (Honours), University of B.C., 1998

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APPROVAL

Name: Christopher Jones

Degree: Doctor of Philosophy (Department of Psychology)

Title of Thesis: Executive and Social Cognitive Functioning in Reactive- and Proactive-Aggressive Young Boys

Chair: Dr. Ron Roesch
Professor

Examining Committee: Dr. Jeremy Carpendale
Senior Supervisor
Professor

Dr. Ray Koopman
Supervisor
Associate Professor

Dr. Marlene Moretti
Supervisor
Professor

Internal Examiner: Dr. Lucy LeMare
Associate Professor
Faculty of Education

External Examiner: Dr. Kimberly Schonert-Reichl
Associate Professor
University of British Columbia

Date Approved : November 20, 2007



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ABSTRACT

This study tests the hypotheses that: prototype descriptions of Reactive- (RA) and Proactive Aggressive (PA) syndromes will help teacher-raters to discriminate between them; that RA is uniquely associated with Attention, Internalizing and Social Problems; and that inhibitory control and social cognitive processing deficits are related to RA and its associated social problems. Principal Components Analysis of aggression ratings for 210 5- to 8-year-old boys yielded oblique RA and PA Components that were moderately correlated ($r = .64$) with the prototype items included – overlap that is consistent with prior research and that was not reduced compared with oblique components that lacked the new items ($r = .67$). Forced orthogonal RA and PA component showed unique or stronger relations for RA with the various outcome variables for a sub-sample of 80 5- to 8-year-old boys in grades K-2, though some of the correlation contrasts for RA vs. PA were not significant. As predicted, (one aspect of) social cognitive and stop task performance were negatively correlated with RA and not PA (though the contrast was not significant), and this relation strengthened with age. Though promising, conclusions are tempered by the limited variance for PA items, overlap between RA and PA components, and the substantial cross-loadings of RA and PA items, which may reflect “real” overlap (and therefore limited clinical utility for the RA/PA distinction), or persistent measurement error. Future research attending to form as well as function of aggression and using observational ratings and/or physiological assessments may evaluate these alternatives.

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TABLE OF CONTENTS

Approval	ii
Abstract	iii
Acknowledgements	iv
Table of Contents	v
List of Figures	vii
List of Tables	viii
Introduction	1
Definition and correlates of RA and PA.....	2
The problem of overlap between RA and PA.....	5
Social Learning models of RA and PA.....	7
Child factors - social cognitive ability and RA.....	7
Child factors - inhibitory control and RA.....	11
Child factors: callous-unemotionality and PA.....	13
An integrated theoretical model for RA and PA.....	14
Gender and aggression	19
Hypotheses	20
METHOD	24
Participants	24
Measures	25
Procedure	39
RESULTS	42
Descriptive Statistics.....	42
Principal Components Analysis of Aggressive Behaviour Scale items	47
Relations between RA / PA and Qualitative Variables	49
Relations between RA / PA and CBCL / TRF Variables	52
Relations between RA / PA and Peer Victimization	53
Relations between RA / PA and Social understanding	55
Relations between RA/PA and inhibitory control.....	56
Age-moderation of anticipated relations.....	57
DISCUSSION	61
RA and PA Behaviours, Items and Components:	62
Qualitative factors indicative of psychopathology:.....	62
Parent- and teacher-reported problem behaviours:	64
Victimization and related distress:.....	65

Social cognitive task performance	68
Executive function task performance:	72
Age moderation reconsidered:	73
Limitations and future directions:	76
Conclusions	78
References	80
Appendices	88
Appendix A - Aggressive Behavior Scale	89
Appendix B – Additional Parent Questions.....	91
Appendix C – Social Understanding Task Protocol.....	92
Inference task	92
Belief based emotion task	94
Ambiguous reference task:	95
Doodles Task.....	97
Appendix D – Visual Stimuli for Doodles Task	101
Appendix E – Social Cognitive Coding Manual	103
and Variable Creation.....	103
Appendix F – Victimization Measures	109
Appendix G – Administration of Victimization Self-Report Items and Victimization Variable Groupings.....	115
Appendix H – Visual Scaffold for the Self-reported Victimization Measure	116

LIST OF FIGURES

Figure 1: Model of child-environment interaction for RA syndrome	15
Figure 2: Model of child-environment interaction for PA syndrome	17

LIST OF TABLES

Table 1: Descriptive statistics for all task / child variables	42
Table 2: Zero-order (upper) and partial (lower) inter-correlations - social cognitive tasks	43
Table 3: Descriptive Statistics for teacher-rated variables	44
Table 4: Descriptive Statistics for parent-rated variables.....	45
Table 5: Descriptive Statistics for victimization variables.....	46
Table 6: Descriptive statistics for Aggressive Behaviour Scale items (n=210)	47
Table 7: Rotated Component Matrix for PCA of ABS items.....	49
Table 8: Reactive aggression scores by qualitative child factors.....	50
Table 9: Proactive aggression by qualitative child factors	51
Table 10: Correlations between RA / PA and CBCL / TRF variables	52
Table 11: Correlations between RA / PA and peer victimization variables	53
Table 12: Correlations between Self-, Parent- and Teacher-rating Components and RA/PA.....	55
Table 13: Correlations between RA/PA, verbal ability and social understanding.....	56
Table 14: Relations between RA and PA factors and Stop Task variables	56
Table 15: Correlations between RA/PA and age-moderated correlates by grade level.....	58

INTRODUCTION

Many young children who display problematic levels of aggressive behaviour will go on to display serious behavioural and mental health problems later in life (Coie & Dodge, 1998; Farrington, 1991; Brendgen, Boivin, Dionne, Vitaro & Perusse, 2006); therefore, efforts to understand, assess, and intervene appropriately are important. The functional¹ distinction between reactive aggression (RA) and proactive aggression (PA) is promising clinically because it is thought to distinguish between behaviours and syndromes with distinct causal processes and different treatment needs (e.g., see Phillips & Lochman, 2003).

The present study aims to reduce the measurement error of teacher ratings of reactive- and proactive-aggression, to replicate existing correlates of RA / PA and to demonstrate new correlates using improved measures. Specifically, I predict that social cognitive tasks will index the social understanding deficits associated with RA, and that Stop Task variables (stopping latency, stopping consistency and “wrong-button” errors) will index the deficits in inhibition and modulation that are believed to be unique to RA.

¹ Though it is argued here that a distinction on the basis of function is of primary clinical importance – as argued by Dodge and Coie (1987) and others – adequate clinical assessment, particularly for older children, may require attention to both *function* and *form* (i.e., physical vs. verbal vs. relational aggression). Consistent with this, Bjoerkqvist, Lagerspetz, and Kaukianinen (1992) have proposed a developmental model where (most) children learn to gradually replace physical aggression with more subtle strategies of attack (see also Vitaro, et al., 2006 for discussion). Little, Henrich, Jones and Hawley (2003) find that a two-by-two (i.e., reactive-proactive by overt-relational) framework fits the data very well for a fifth-through-tenth grade sample.

Definition and correlates of RA and PA

The RA construct has its roots in the frustration model of aggression (e.g., Berkowitz, 1993; Dollard, Doob, Miller, Mowrer, & Sears, 1939). It is viewed as a consequence of perceived provocation, frustration or threat. It is associated with increased arousal in the form of anger (Merk, Orbio de Castro, Koops & Matthys, 2005) and loss of control (Brendgen, Boivin, Dionne, Vitaro, & Perusse, 2006). Reactive-aggressive behaviours are “impulsive”, “defensive”, and “retaliatory”. Reactive-aggressive children are identified with items such as, “hot-headed”, “Irritable”, “quick to fly off the handle”, “When teased, strikes back”, “Blames others in fights” and “Gets mad when s/he doesn’t get his/her own way”.

PA has its roots in the Social Learning Model of aggression. It is thought to be driven by the expectation of reward (Bandura, 1973); it is “offensive” and sometimes “careful” in nature. It is operationalized by items such as “Bullies other children”, “Threatens other children”, “Uses physical force to dominate”, and “Hides aggressive acts”.

RA and PA were once viewed as competing models of aggressive behaviour before Dodge and Coie (1987) proposed an integrated model that recognized both forms. Though this is a relatively recent achievement within psychology, a longstanding similar distinction exists in many legal systems between manslaughter (which is reactive, affectively-laden, and “hot-headed”), and first-degree murder (which is pre-meditated, goal-directed and “cold”) (Kempes, Matthys, de Vries & van Engeland, 2005).

RA and PA items consistently separate as predicted² on factor analysis (Brown, Atkins, Osborne & Milnamow, 1996; Dodge & Coie, 1987; Vitiello, Behar, Hunt, Stoff & Ricciuti, 1989). The RA factor is more strongly or uniquely linked to physiological reactivity and over arousal (Scarpa & Raine, 1997), laboratory measures of impulsivity (Atkins, Stoff, Osborne & Brown, 1993), Attention Deficit Hyperactivity Disorder (Atkins & Stoff, 1993; Bierman, Smoot & Aumillier, 1993), and Emotional dysregulation / ADHD symptoms (see Card & Little, 2006 for a review). Predictably, many studies find RA to be more strongly or uniquely associated with internalizing symptoms and social problems, including anxiety and depression (Dodge, Lochman, Harnish & Bates, 1997b; Jones, 2002; Tremblay, Pihl, Vitaro & Dobkin 1994), social non-preference (Dodge, Coie, Pettit & Price, 1990; Dodge et al., 1997b; Price & Dodge, 1989), peer rejection (Bierman et al., 1993; Volling, MacKinnon & Rabiner, 1993; Waschbusch, Willoughby & Pelham, 1998), and peer victimization (Schwartz, Dodge & Coie, 1998).

PA tends to be less strongly related overall to each of these indices of psychopathology, unrelated, or negatively related, though there are exceptions. A recent meta-analysis (Card & Little, 2006) found a small zero-order correlation between PA and emotional dysregulation and Attention-Deficit Hyperactivity Disorder symptoms (ED / ADHD) that decreases with age, whereas RA has a significantly stronger relationship that increases with age. Further, the

² RA and PA items have consistently fit a two-factor solution with two factors on exploratory factor or components analysis having eigenvalues greater than one.

standardized residual for PA (controlling for RA) is not related to ED / ADHD, whereas that for RA is significant and positive (Card & Little, 2006, p. 472-473).

The standardized residuals of both RA ($sr = -.19$) and PA ($sr = -.06$) – controlling for each other – are linked to low sociometric status (summed over thirteen studies looking at social preference, peer acceptance or peer rejection); however, the link for RA is significantly stronger (Card & Little, 2006, p. 473). Both RA (small-to-moderate) and PA (small) have zero-order correlations with peer victimization; however, the standardized residual of RA is positively linked whereas that of PA is negatively linked (p. 474). Finally, Card and Little (2006, p. 470) also find that RA, but not PA, has a small but statistically reliable positive zero-order correlation with internalizing problems. The link between RA (controlling for PA) is stable, whereas the link for PA (controlling for RA) becomes increasingly negative with age.

As children high in PA appear to be relatively free of comorbid pathology, and since PA behaviours appear not to carry the same degree of negative peer social consequences, Sutton, Smith and Swettenham (1999) have suggested that proactive-aggressive children may be “skilled manipulators rather than social inadequates” (p. 118). Although PA is associated with less comorbid pathology in early childhood than is RA, it is uniquely linked to (detected) adolescent antisocial behaviour and so could be argued to be truly maladaptive and not just

socially undesirable (for a review of this debate, see Arsenio & Lemerise, 2001³). Notably, concurrent RA appears to diminish the link between PA and antisocial behaviour and predicts higher self-reported depressive symptoms at age thirteen (Vitaro, Brendgen & Tremblay, 2002). Overall, then, PA appears to be worthy of clinical attention and intervention, but for different reasons.

The problem of overlap between RA and PA

Despite divergent correlates, significant overlap between the RA and PA factors occurs for most of the studies listed above. A recent meta-analysis (Card & Little, 2006) shows a mean correlation between factors of $r = .68$ (95% C.I. = .671, .687), and it is often only residual scores – controlling for the other form – that have the divergent correlates required to support the theoretical distinction. The problem of co-occurrence appears to diminish the utility of distinguishing between forms on assessment, and precludes the possibility of tailored interventions. Critics stress the problem of “reifying residuals” (e.g., Miller & Lynam, 2006, p. 1472) and suggest that it might be time to “pull the plug” on the RA / PA distinction, since it lacks clinical utility (Bushman & Anderson, 2001).

³ Arsenio and Lemerise (2001) comment on the debate between Sutton, Smith and Swettenham (1999), who criticize the Social Information Processing model for ignoring the point that “many bullies may in fact be skilled manipulators, not social inadequates” (Sutton et al., 1999, p.118) – a position that is compatible with the present study’s position and with PA as being related to deficits in empathy and operant learning factors. Arsenio and Lemerise (2001) also present the response from Crick and Dodge (1999), who reject the implication that “competent social cognitions can result in incompetent behaviours (i.e., aggression)” (Crick & Dodge, 1999 p. 131) – an apparent value judgement unless negative consequences for “skilled” aggression are defined and demonstrated. Arsenio and Lemerise (2001) find that Sutton and colleagues appear to hold a narrow definition of social competence as success at attaining goals, whereas Crick and Dodge (1999) appear to include the (value) judgments of others – which they support. This study measures peer exclusion, which may be an effect of peers’ value judgements of RA vs. PA behaviours. Whereas there may be other issues of value that are important to an overall understanding of childhood aggression, these are believed to be unnecessary for the purposes of the present study.

Poulin and Boivin (2000), however, have suggested that at least some of this overlap is due to the fact that teachers are limited in their ability to discriminate the two forms since they are usually both measured with overt aggressive items. Consistent with this, Little, Henrich, Jones and Hawley (2003) found no correlation between RA and PA when carefully measuring self-reported function (i.e., the purpose or motive) of aggression among children in grades 5-10 and when ensuring that the form of aggression (i.e., overt vs. relational) was controlled for⁴. Also consistent with Poulin and Boivin's (2000) argument is that Day, Bream, and Pal (1992) found increased separability – just a moderate correlation ($r = .41$) – when studying aggressive participants only – which may help teacher-raters to focus more on the nuances specific to RA and PA behaviours; that Schwartz, Dodge, Coie Hubbard, Cillessen, Lemerise and Bateman (1998) found reduced overlap when using trained observers as opposed to naïve teacher-raters; and that Price and Dodge (1989) found a negligible correlation ($r = .04$) between RA and PA when using trained observer ratings rather than teacher ratings. Taken together with findings of increasingly divergent correlates for RA and PA over time (e.g., Card & Little, 2006), these results strongly suggest that overlap thus far has resulted from rater error and

⁴ In this study, the authors administered a self-report measure of aggression to children in grades 5-10 that allowed disentangling the function (i.e. reactive vs. proactive) from the form (i.e. overt vs. relational) of aggression. The questionnaire included "pure" overt items (e.g. "I'm the type of person who often fights with others"), reactive overt items (e.g. "When I'm hurt by someone, I often fight back"), proactive overt items (e.g. "I often start fights to get what I want"), "pure" relational items (e.g. "I'm who says mean things about others"), reactive relational items (e.g. "When I'm mad at others, I often gossip or spread rumours about them"), and proactive relational items (e.g. "To get what I want, I often gossip or spread rumours about others"). Structural Equation Modelling found that the higher-order constructs RA and PA were trivially but significantly negatively correlated with each other (disattenuated $r = -.10$, $p < .05$). Further, there was a lack of positive correlation between RA and PA within the two overt and the two relational components (Little et al., 2003, p. 127).

that such error may be more likely to occur for ratings of young children's aggression. Put another way, early childhood assessment of RA and PA needs to be, and can be, improved.

Social Learning models of RA and PA

Social learning models of RA and PA accept the premise of separability and propose distinct etiological models for the two forms. RA is thought to begin with harsh, coercive and sometimes-physically abusive parent-child interactions (Dodge, Pettit & Bates, 1997a), which give rise to hostile and antisocial scripts and schemata which are "projected" (Burks, Laird, Dodge, Pettit, & Bates, 1999) in the form of "hostile attribution biases" by reactive- and not proactive-aggressive children (see Orobio de Castro, Veerman, & Koops, 2002 for a meta-analysis of this robust and consistent finding).

PA, in contrast, is thought to be rooted in modelling, positive reinforcement, and the relative absence of negative peer social consequences for use of instrumental aggression. Consistent with this, proactively-aggressive children display more favourable evaluations of aggressive responses, positive outcome expectations and self-efficacy about aggression in Social Information Processing vignette paradigms (Dodge, 1991; Dodge, Lochman, Harnish, Bates & Pettit, 1997b).

Child factors - social cognitive ability and RA

The "theory-of-mind" approach to children's developing social understanding began with the now-classic finding of Wimmer and Perner (1983)

that three-year-olds lack appreciation of the fact that beliefs can be false, and instead seem to operate with the “theory” that beliefs mirror reality. The wave of research that followed plotted other achievements in children’s growing appreciation of others’ mental states (i.e., their beliefs, goals, intentions and feelings), including the somewhat-later-arriving understanding that people can interpret the same stimulus in a variety of different ways (Carpendale & Chandler, 1996; Lalonde & Chandler, 2002) and that others’ feelings are based on their beliefs (which can, of course, be false) (Harris, Johnson, Hutton, Andrews & Cooke, 1989) – both of which are measured by the battery used in this study. Performance on “theory-of-mind” tasks is related to, but not completely explained by verbal intelligence (Watson, Painter & Bornstein, 2001), and is “helped along” by having siblings (McAlister & Peterson, 2007), mothers who are “mind-minded” (Meins & Fernyhough, 1999; Meins et al., 1998) and presumably, by other factors that increase opportunity for “triadic interaction” (Carpendale & Lewis, 2004, p. 85). Relative weaknesses in theory-of-mind has been linked with psychiatric and neurodevelopmental conditions, including schizophrenia (Doody, Gotz & Johnstone, 1998), schizotypal traits in the normal population (Pickup, 2006), and autism spectrum disorders (Happé & Frith, 1995).

I propose that both normal and abnormal variation in a child’s level of skill, relative to peers, in understanding and making “on-line” predictions about other minds within social interaction (which I will refer to as social cognitive ability) can be indexed by “theory-of-mind” type laboratory tasks, and that a battery of such tasks can be assembled that will assess a latent “social cognitive ability” (i.e.,

intelligence) factor that is correlated with, but not wholly explained by existing intelligence factors. I propose that a children's relative social cognitive ability upon school entry (be it daycare, preschool or kindergarten) has profound consequences for their social, emotional, and self-conceptual development as the first years of school unfold⁵. Simply put, children with higher levels of social cognitive ability will more quickly make sense of the busy new peer social world around them, will meet their needs with less frustration, will be perceived more favourably by peers and teachers, will have more opportunities for learning and growth and will be more likely to develop positive self- and other-representations. If this is the case, then social cognitive ability upon school entry should predict subsequent adjustment and maladjustment. Among other things, reduced social cognitive ability should be related to reactive, and not proactive, aggression. Findings thus far regarding links between social cognitive abilities and externalizing problems (i.e., undifferentiated aggression) upon school entry are mixed (e.g., Hughes, White, Sharp, & Dunn, 2000; Hughes, Cutting & Dunn, 2001). Sorting aggressive according to the reactive / proactive distinction is expected to clarify this picture.

Dodge and colleagues, however, assert that the "theory-of-mind" approach to measuring social cognitive development will have little to offer in understanding childhood aggression (Crick & Dodge, 1999). They support this *a priori* denial with just two findings – that reduced "fluency of social knowledge", or

⁵ I further propose that the negative consequences for relative delay in social cognitive development result in part from the social practice of placing children into similarly-aged groups – with peer social and adult expectations for conformity – at such a young age. More prolonged social cognitive development (i.e., greater variance at younger ages, diminishing over time) would not be such a problem under other conditions.

the number of responses that can be generated to a provocative situation, is only weakly predictive of RA (Burks et al., 1999), and that reactively aggressive children are equally accurate in comparison to other children, in correctly attributing truly hostile intentions versus unintentional provocations (Crick & Dodge, 1996; Schwartz et al., 1998).

Despite the implications of these findings, the aforementioned links between RA and EF / ADHD symptoms, peer rejection and victimization, and the social interpretive *biases* themselves certainly raise the possibility that social cognitive processing *deficits* do in fact play a role in the development of RA. It is now a well established finding that executive functioning (EF) and social cognitive ability (as measured by the false belief paradigm) are correlated in early childhood – controlling for age and intelligence (Müller, Zelazo & Imrisek, 2005). Thus, the link between RA and EF does suggest that social cognitive impairment would be entailed by a reactive-aggressive syndrome.

There is in fact already some direct evidence of a link between social cognitive deficit/delay and undifferentiated aggression, and just one author has distinguished between RA and PA. Happé and Frith (1996) found reduced teacher-rated social understanding ability in a 7- to 9-year-old sample of children with Conduct Disorder (i.e., undifferentiated RA and PA). Cohen and Strayer (1996) found reduced ability to infer appropriate emotions in a 14- to 17-year-old sample of Conduct Disordered children. Finally, Jones (2002) found a negative correlation between RA and belief understanding – controlling for PA – among a sample of 5- to 8-year-old boys. A positive correlation was also found between

teacher-ratings of proactive aggression and belief understanding and spontaneous references to mental states in the task situation – consistent with the contention that PA may be associated with increased attention and processing of social cognitive cues, though used for antisocial purposes.

Child factors - inhibitory control and RA

RA has also been linked with ratings of impulsivity, ADHD diagnosis and laboratory analogues of reactive / hostile versus proactive / instrumental-aggressive behaviours; however, no study has yet examined links between RA and a task measuring inhibitory control or other executive function. Atkins and Stoff (1993), however, were able to operationalize RA within a laboratory task, or competitive game situation. They found that children with an aggressive behaviour disorder (i.e., Oppositional Defiant Disorder or Conduct Disorder) and comorbid ADHD displayed significantly more hostile (i.e., reactive) aggression in this competitive game situation than did their aggressive peers without ADHD, and non-aggressive controls. These clinical groups used can be argued to correspond roughly to RA (for ADHD + ODD or CD) and PA (ODD or CD). Greater instrumental aggression (i.e., PA) was displayed by both aggressive clinical groups. Hostile aggression was defined as aggressive acts that inflict injury or pain without advantage to the aggressor, and operationalized as the act of sending bursts of white noise to an “opponent” during a video game. Instrumental aggression was defined as aggressive acts that provide some reward or advantage independent of the victim’s discomfort, and was operationalized as a response causing an “opponent’s” video game to “tilt” –

such that his “game would be blocked”. Neither hostile nor instrumental aggressive responses were maladaptive, as they did not impact the subject’s own game performance; however, this task does demonstrate behavioural differences in the task situation that correspond to analogous real-world differences in behaviour for the two groups.

The stop task paradigm appears to provide a good measure of inhibitory control and an analogue for impulsivity as found in a number of psychiatric conditions (Schachar & Logan, 1990), but it has not yet been used to distinguish RA from PA. The stop signal reaction time (SSRT) of the stop task (i.e., the number of milliseconds of “notice” required for the participant to successfully stop for 50% of stop trials) distinguishes children with ADHD from non-diagnosed children well, with a recent meta-analysis finding an effect size of, $d = 0.64$ (Lijffijt, Kenemans, Verbaten & van Engeland, 2005).

Another stop task variable that has been linked with ADHD and theoretically with psychiatric impulsivity more generally (Schachar & Logan, 1990) is unreliable triggering of the inhibition process – measured in this study as the Beta weight for predicting success from amount of provided “stopping notice”. Small beta weights indicate weak relationships between notice and stopping success and therefore inconsistent and unreliable triggering of the “stop process” – consistent with deficits in working memory, sustained attention, and maintenance of response set. Based on these findings, and links between RA and impulsivity, emotional dysregulation and ADHD diagnosis and symptoms, I predict long SSRT’s and lower Consistency values for RA, and not PA.

The present version of the stop task includes positive auditory feedback (i.e., a reinforcing “ding” sound) and visual feedback (a smiley face) for correct responding on “go” trials, and successful stopping on “stop” trials and negative visual feedback for wrong button and omission errors on “go” trials, and failed stops on “stop” trials. I argue that introducing contingent reinforcement and negative feedback in this manner will render the task “personally meaningful” and perhaps qualify it as a measure of “hot” as opposed to “cool” executive function (Kerr & Zelazo, 2004). Regardless, I suggest that these modifications will increase motivation and attention – particularly for younger participants, and will increase the task’s ability to index real-world inhibition and modulation under conditions of arousal, anxiety and frustration.

Child factors: callous-unemotionality and PA

Other authors have examined temperamental and physiological differences in children predisposed to proactive versus reactive aggression, and in so doing, have responded to the call for attention to individual differences in emotion processes in understanding aggression and bullying (Arsenio & Lemerise, 2001, p. 62). Though impulsivity and emotion regulation failures appear more strongly related to the RA construct (Card & Little, 2006), a “callous-unemotional trait” has been specifically related to the PA construct in children (Frick, Cornell, Barry Boden & Dane, 2003) and adults (Cornell, Warren, Hawk, Stafford, Oram & Pine, 1996) – a trait with affective (e.g., absence of guilt, constricted display of emotion), interpersonal (e.g., failure to show empathy, use of others for one’s own gain) and physiological features (i.e., under-reactivity to

emotionally distressing stimuli (Kagan & Snidman, 1991; Blair, 1999; Loney, Frick, Clements, Ellis & Kerlin, 2003). These findings suggest that child factors interact with supportive learning histories in the genesis of clinically significant proactive aggression.

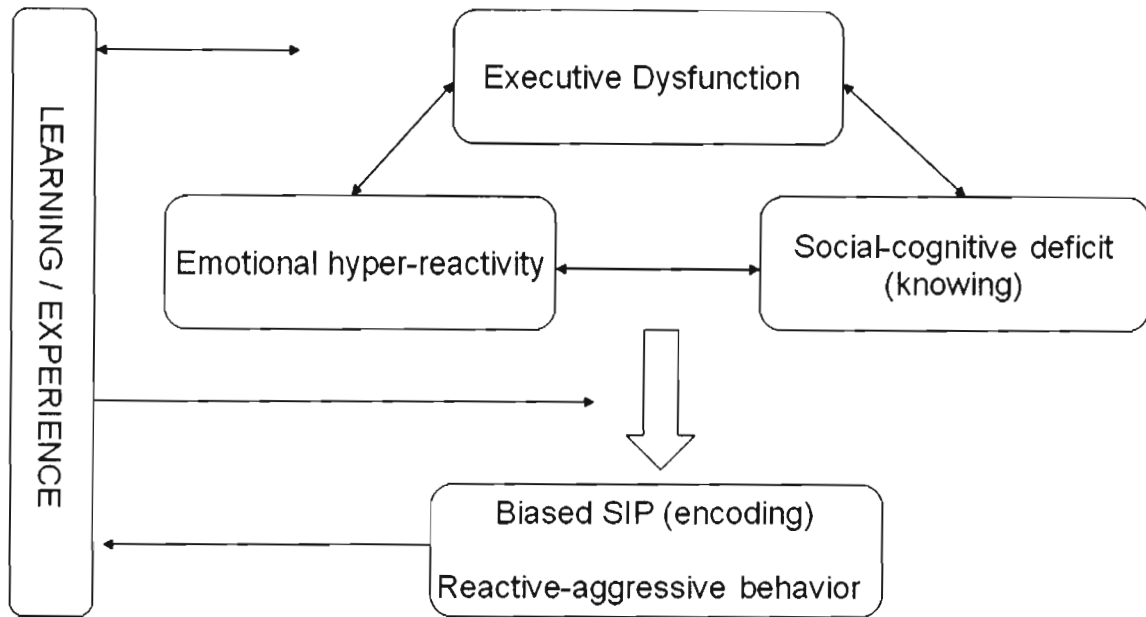
An integrated theoretical model for RA and PA

I propose that child factors (i.e., executive function and social cognitive deficits; emotional reactivity, temperamental characteristics) interact with learning factors in the genesis of both RA and PA (though the child and the learning factors are different in each case) and that the two temperamental types tend to attract the very environmental / learning factors that exacerbate the syndrome and that propel the child along the well-travelled trajectory (i.e., reactive- or proactive-aggression) in each case.

Below are graphic models depicting RA and PA syndromes. Figure 1 portrays the model for Reactive Aggression.

Figure 1

Model of child-environment interaction for RA syndrome



As depicted in Figure 1, it is proposed that learning and experience interact with child factors and help to shape the child as being emotionally hyper-reactive (particularly negative emotionality), and having executive dysfunction (with particular deficit in inhibitory control), and deficient social cognitive ability (i.e., a deficit in knowing about others' mental states). As noted previously, EF and social cognitive ability are strongly linked in development (Müller, Zelazo & Imrisek, 2005). Empirical links between EF and emotional hyper-reactivity in the context of RA are also well-established (Card & Little, 2005). A child with some or each of these features is cognitively *susceptible* to the development of social cognitive biases and inappropriate social behaviour. S/he is likely to behave in ways that “pull for” social experiences that lead to hostile attribution bias and

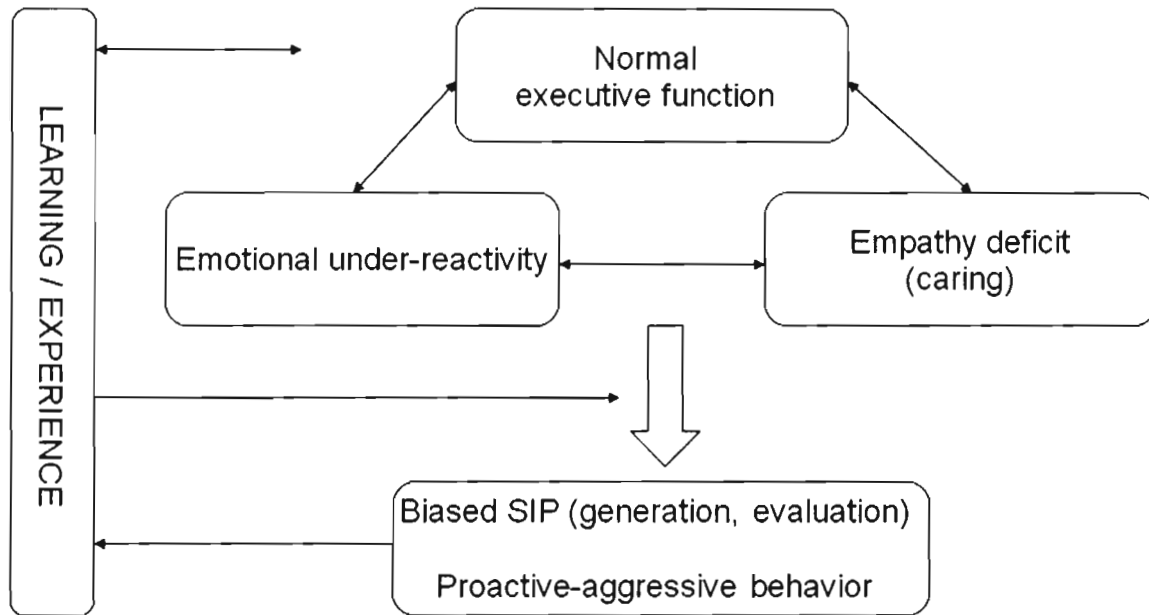
reactive aggression. Indeed, studies linking peer rejection and victimization specifically to RA appear to reflect the relative social unacceptability of public displays of anger and loss of control that are characteristic of RA (as opposed to the controlled and often “hidden” PA behaviours).

In summary, then, I propose that the child factors depicted in Figure 1 render the child likely to experience reduced positive and increased negative peer social interactions, frustration and distress in connection with those social experiences, reinforcement of SIP biases, and reinforcement of negative self- and other-representations. These environmental “responses” combine or interact to perpetuate or exacerbate the RA syndrome.

The Proactive Aggressive syndrome differs in several important ways from the RA syndrome, and is depicted in Figure 2.

Figure 2

Model of child-environment interaction for PA syndrome



As shown above, children with intact executive function and social cognition but with autonomic under-reactivity and a deficit in the affective, or “caring” component of empathy (as opposed to the cognitive / “knowing” component – see Eisenberg, Fabes & Spinrad, 2006) may be more likely to find themselves in environments that foster proactive aggression. Specifically, they may be more likely to experiment with proactive means of attaining goals, more likely to have persons around them that model and reinforce proactive aggressive behaviour, less likely to experience negative consequences for PA (perhaps by way of genetic similarity). Such a child is likely to develop SIP biases at later stages of processing – to generate more aggressive solutions to problems and to

favourably evaluate those solutions (as demonstrated by Dodge and colleagues, 1997) and to display Proactive Aggressive behaviour. Skillfully enacted PA behaviours may be rewarded with goal attainment, positive peer attention and increased social status. Successful PA behaviour provides modelling for other children starting out on this pathway and may increase shared positive attitudes toward PA behaviours in the local peer social community (in the absence of intervention or other counter-veiling forces).

The proposed positive feedback, or “snowball” effects – both within children and within local peer social communities described here would act as “sinks” (with “slippery slopes”) in the psycho-social fabric, such children who “fall in” to these processes would be expected to “fall quickly” and to constitute a relatively discrete group (as opposed to children merely at the upper end of a normally distributed spectrum). If these propositions are valid, then, we should expect to find children with discrete syndromes or disorders, rather than continuous and linear variance in RA and PA behaviours and their associated features.

This study is therefore grounded in the theory that underlying reactive and proactive syndromes have a physiological and brain basis. The reactive aggressive syndrome is characterized by autonomic over-reactivity (which can result from a multiple causes, including executive function deficit and/or ADHD) and impaired executive functioning, whereas the proactive aggressive syndrome has central characteristics of autonomic under-reactivity and the absence of executive impairment. Reactive and proactive syndromes are therefore mutually

exclusive and negatively correlated. RA and PA *behaviours*, however, do not exclusively “belong” to their underlying syndrome but are uncorrelated (based on the work of Little et al., 2003). Overlap between RA and PA that has been found in most studies reflects rater error (i.e., misclassification) which can be reduced.

Gender and aggression

Card and Little (2005) note that most studies of RA / PA correlates did not examine gender moderation and they call for more attention to this question. A recent examination of genetic and environmental effects on RA and PA found that, “...neither the magnitude of the genetic and environmental influences on proactive and reactive aggression and on physical aggression nor the pattern of overlap among the three types of aggression differed between the boys and the girls in our sample” (Brendgen et al., 2006, p. 1303). Other studies that have examined gender moderation of correlates or outcome variables have produced mixed results that are difficult to interpret on a meta-analytic level. There is reason to think that some causal processes for RA and PA may be moderated by gender. Jones (2002), for example, found that girls’ Proactive and Relational Aggression were negatively related to Social Understanding whereas RA was unrelated to Social Understanding for girls – a pattern opposite to that observed for boys. Lower rates of overt and higher rates of relational aggressive behaviours for girls (Crick, 1995, 1996) suggest that the clinical sensitivity and/or specificity of any given rating scale item may be moderated by gender. A given item or factor score may predict something quite different for a boy versus a girl. Items / factors may have a different “shift point” (i.e., from “top of normal range”

to “pathological”) for boys versus girls, and this is especially important in the case of scores that are non-linearly related to the latent pathological construct.

Whereas the general causal processes for RA and PA behaviours and syndromes may be similar across gender, this question has not yet been adequately addressed. Furthermore, some fine grained causal processes as well as measurement issues are highly likely to differ across gender. I have therefore chosen to focus the resources of this study on boys’ aggressive behaviour in their early school career – within as narrow an age range as possible.

Hypotheses

I propose that rater error can be reduced by including social status information (e.g., for PA: “Other children may not like this child, but you get the sense that he could gain their approval if he wanted to”) and peer victimization information (e.g., for RA: “Peers take pleasure in getting a rise out of this child”) in teacher ratings. I predict that these items will load upon their intended factors, and that these improved factor scores will have divergent correlates that are consistent with prior research: RA is expected to be uniquely associated with ADHD diagnosis, other mental health diagnosis, teacher and parent-identified concerns regarding emotional reactivity, teacher- and parent-rated social, attention and internalizing problems, and teacher- parent- and self-rated peer victimization (with physical, verbal and exclusion aspects).

Anticipated correlates that are unique to the present study are: teacher- and parent-identified social skills deficits, teacher- parent- and self-rated distress related to peer victimization (with physical, verbal and exclusion aspects), verbal ability (i.e., PPVT-III measured receptive pointing, which is predictive of verbal intelligence), stop task performance (including “capacity” and “consistency” of inhibitory control), and social cognitive task performance (i.e., the ability to predict others’ mental states). Poor performance and symptoms in these areas are expected to be unique to the Reactive Aggressive factor.

- 1) Higher RA factor scores will be associated with qualitative factors indicative of psychopathology and maladjustment for this normal sample:
 - a) Significantly higher RA scores will be displayed by boys with verbal ability standard score below 80, ADHD diagnosis, other mental health diagnosis, teacher- and parent-rated chief concern as social skills and/or emotional reactivity, and physical display of anxiety during the interview in comparison with children who do not display these features.
 - b) PA scores will not be significantly greater for boys with these variables.
- 2) RA will be uniquely correlated with quantitative teacher- and parent-rated indicators of psychopathology, as measured by well-established, parallel, parent- and teacher-rated measures of problem behaviours (i.e., the Child Behavioural Checklist, and the Teacher Report Form):
 - a) RA will be correlated with teacher- and parent-rated Internalizing Problems, Social Problems, and Attention problems.

- b) PA will be significantly less positively related to each of these problems than will RA.
- 3) RA will be uniquely related to self-, parent- and teacher-rated peer exclusion and victimization and related distress:
 - a) RA will be positively correlated with Verbal, Physical and Exclusion Frequency and Distress by self-, parent-, and teacher-report.
 - b) PA will be significantly less positively related to these problems than will RA.
- 4) RA will be associated with lower scores on the social cognitive tasks:
 - a) RA will be negatively correlated with interpretive and non-interpretive social cognitive tasks with and without control for verbal ability.
 - b) PA will be significantly less negatively correlated with social cognitive task performance than RA.
- 5) RA will be associated with two variables indicative of poor performance on the Stop Task – a measure of inhibitory control:
 - a) RA will be positively correlated with Stop Signal Reaction Time – a measure of the amount of “notice” required (in milliseconds) to stop the primary task response with 50% success; long SSRT’s are indicative of poor inhibitory control.
 - b) RA will be negatively correlated with Consistency – or the Beta weight that is used to predict stopping success from stop signal reaction time; low beta weights are indicative of a weak relationship between stop notice and

accuracy, and therefore of poor sustained attention and maintenance of task orientation.

6) PA will be significantly less positively or negatively related to these variables.

METHOD

Participants

The total sample consisted of 213 boys between 5.54 and 9.23 years of age ($M = 6.92$, $SD = 0.54$). Thirty-seven of these boys were recruited from newspaper advertisements, 176 were recruited through school-based and day-care based recruiting efforts – from 13 schools in the Greater Vancouver area. Seventeen of the total sample were in kindergarten, 168 were in the first grade, and 27 were in the second grade. The oldest boy (9.23 years) was repeating the second grade. Age for the total sample was slightly positively skewed (skewness = 0.787), with some degree of leptokurtosis (kurtosis = 1.753, where 0 is normal) as the majority of the sample was selected from the first grade and therefore from the middle age range (i.e., between 6.20 and 7.45 years of age).

Teacher-ratings of aggressive behaviour (i.e., the Aggressive Behaviour Scale) were collected in 2003, 2004 and 2005 for most of the total sample ($n = 210$). Social cognitive task and PPVT-III data were collected in 2003 and 2005 ($n = 112$) – and this sub-sample had a mean age of 6.70 years ($SD = 0.70$). Stop task data were collected from the 2005 sample only ($n = 84$). Teacher- and parent-ratings of psychopathology, and self-, parent- and teacher-ratings of victimization were also collected from most of the 2005 participants. All the complete data sets, therefore, were obtained in 2005 ($n = 72$); teacher-ratings of aggressive behaviour only (i.e., the ABS) were collected from the 2004

participants. Aggressive behaviour ratings and social-cognitive task data were collected in 2003.

Ethnicity data were not collected; however, nine of the 109 children who provided task data were parent-identified as speaking English as a second language. ESL status was associated with a significantly reduced score for PPVT-III – measured verbal ability ($t = 4.77$, $p = .000$, $df 110$) and with the overall social understanding Composite ($t = 2.83$, $p = .006$, $df 109$).

Measures

Behavioural ratings

Achenbach Child Behavioural Checklist For Ages 6 – 18.

This parent-rated, child behavioural assessment questionnaire is widely used in clinical practice and has excellent psychometric properties. Published internal consistency for the syndrome scales, for example (i.e., Cronbach's alpha), ranges between ($\alpha = .71$) and ($\alpha = .97$). The CBCL consists in 113 behavioural items rated on a three-point scale (i.e., 0 = "not true", 1 = somewhat true" and 2 = very true or often true"). Ratings for the 113 behavioural items are combined to yield three broad band scales: Total Problems (an overall composite); Externalizing Problems (i.e., acting out behaviour problems) and Internalizing Problems (i.e., behaviours indicative of internal distress or psychological problems) – each of which were used in the present study. Externalizing Problems is itself comprised of two narrow-band syndrome scales: Rule-Breaking Behaviour and Aggressive Behaviour – the latter of which was included in this study in order to assess divergent links for RA vs. PA. Thought

Problems, Social Problems, Attention Problems and Other Problems are the remaining variables that contribute to the Total Problems score. Social and Attention Problems are used in the present study.

Achenbach Teacher Report Form For Ages 6 – 18.

The TRF is the teacher-rated, parallel measure to the CBCL. The current study used each of the broad-band syndrome scales (Total Problems, Externalizing and Internalizing Problems) and three of the narrow-band syndrome scales (Aggressive Behaviour; Attention Problems, and Social Problems). Internal consistency values are similar with those for the CBCL.

Aggressive Behaviour Scale.

This measure, presented in Appendix A, consists in six reactive and six proactive behavioural items rated on a five-point Likert scale (ranging from 1 = “Doesn’t apply” to 5 = “Certainly / always applies”) followed by narrative descriptions of each syndrome – intended to capture the overall “flavour” of the hypothetical syndromes – also rated on a five-point Likert scale. Both behavioural and narrative description items were subjected to Principal Components Analysis in order to test hypotheses concerning their loadings and in order to obtain component scores for each child.

Victimization measure.

No existing measures of victimization could be identified that collected information about each of verbal threats and teasing, direct physical victimization, and exclusion, that utilized each source of information (i.e., parent, teacher and child), and that assessed both frequency and distress aspects (i.e., 3 x 3 x 2

variables). Ladd and Kochenderfer-Ladd (2002), however, did clearly demonstrate that a multi-informant measure yielded better estimates of relational adjustment than any single-informant measure. Therefore a new measure was developed that combined child, parent and teacher ratings of verbal threats and rumours, direct physical aggression and peer exclusion and that assessed both frequency and estimated (or self-rated) associated distress for a total of 18 variables. Item content (but not phrasing) and the notion of using parallel self-, teacher-, and parent-rated forms were borrowed from Ladd and Kochenderfer-Ladd (2002). Appendix F presents the parent, teacher and child rating forms; Appendix G presents the items used to form each of the variables.

Parent and teacher-data were collected using rating forms with Likert scales from 1 to 5. Child-rated items were administered orally during the interview using a three-point Likert Scale (“never”, “sometimes” and “often” for frequency; “don’t care”, “bothers me” and “bothers me a lot” for distress) with a visual “scaffold” for their ratings – that graphically depicted the three choices (see Appendix H). Self ratings were obtained from eighty-three children – eighty of whom had teacher ratings of RA and PA.

In order to obtain accurate information, parents and teachers were given the option of choosing an “I don’t know” response if they were unfamiliar with a child’s victimization experiences. This gave rise to missing cells for certain items, such that multi-item variables were sometimes based on less than a full compliment of items. This method filled many but not all of the empty cells such that number of cases varies across the eighteen victimization variables (see

Table 3.4 for number of cases for each variable). Correlations between these eighteen variables and RA / PA were first computed and examined before further steps were taken to fill missing cells and reduce the 18 variables.

Reducing the 18 variables required filling missing data cells for parent and teacher-rated “I don’t know” responses. This was accomplished by inserting “frequency” values of the same item into empty “distress” cells (i.e., parent-rated, verbal frequency was used to estimate parent-rated verbal distress if the parent didn’t rate distress). Next, missing frequency values for variables were filled with the mean of the other frequency variables (e.g., teacher-rated exclusion frequency was estimated from teacher-rated physical and verbal victimization frequency), and filling their corresponding distress values with the same value if necessary.

Qualitative teacher and parent-reported items

The TRF included questions pertaining to presence of learning assistance and other intervention, and their responses were coded accordingly. The TRF also asked open questions about the teacher’s “chief concerns” about the child, and the presence of any reference to social skills or emotional reactivity was coded for the respective variable.

Parent-forms contained similar questions pertaining to chief concerns; references to social skills and/or emotional reactivity were coded accordingly. On a separate form, parents were also asked to indicate if their child had ever received a mental health diagnosis (and to specify what it was), and about the ESL status of their child, and to indicate (as a validity check) if they had any

problems reading or understanding any of the forms (no parent indicated that they had such difficulty).

Finally, the experimenter recorded signs of shyness / anxiety during the child interview, including averted eye contact and behavioural inhibition and used this to code the interview as anxious interview “present” or “absent”. These codes were not subjected to inter-rater reliability analysis.

Receptive vocabulary / verbal ability

The Peabody Picture Vocabulary Test – Third Edition.

This measure was chosen for its strong correlation ($r = .88$) with WISC-III Verbal Comprehension Index and ($r = .82$) with WISC-III Full Scale IQ (Hodapp & Gerken, 1999). For each item, children are given a word and shown a pictorial array of four choices – one of which corresponds to the word. Children are asked to “Point to (example)” or “Show me (example)”. The task has rules for selecting starting item according to age, reversing to earlier items upon failure of a certain number of items in the first set, and ceiling item / point of discontinuation. Total correct raw scores are then converted to standard scores (with a mean of 100; SD of 15).

Social-cognitive ability

Four tasks were chosen to measure social-cognitive ability in order to create composite variables – thereby reducing error variance as recommended by Hughes, Adlam, Happé, Jackson, Taylor and Caspi (2000). These authors obtained internal consistency values ranging between ($\alpha = .60$) and ($\alpha = .82$) for their social cognitive composite. Another study using multi-variable, multi-task

approach to social cognitive assessment obtained values of ($\alpha = .67$) and ($\alpha = .69$) (Bosacki & Astington, 1999).

Two of the tasks chosen for the present study were “Interpretive” social understanding tasks which require appreciating that two people can interpret the same stimulus differently – a relatively “late” developmental achievement. Two of the four tasks were “Non-interpretive” social understanding tasks, which require only understanding of the more direct connection between thoughts / feelings and perceptions that story characters might experience. The Non-interpretive tasks measure the understanding that knowledge depends on perception, but do not require an appreciation of idiosyncratic, or personal, interpretation (i.e., that two people can interpret the same stimulus differently). Two tasks for each facet were selected and standard scores (i.e., z-scores) for each were combined to form Interpretive and Non-Interpretive variables. All tasks were combined to form the Social Cognitive Composite score.

Belief-based emotion attribution.

This non-interpretive task was originally developed by Harris, Johnson, Hutton, Andrews and Cooke (1989). Hughes, Adlam, Happe, Jackson, Taylor and Caspi (2000) demonstrated good test-retest reliability with their version, which was adopted for the present study. The story involves a “mean surprise”, where a character falsely expects a treat that was consumed by his “friend” when he wasn’t looking. Children are privy to the treat being consumed by the “trickster” character (i.e., the nasty surprise) before being asked to predict the “victim” character’s belief about the treat and the emotional state that is

congruent with this naïve belief (see Appendix C). Children were awarded points for: guessing what the “trick” would be, spontaneously providing the character’s emotion (based on his false belief), responding correctly to the question about the character’s emotion (with “part marks” for the correct valence), explaining the character’s emotion (with “full marks” requiring a reference to his false belief), and stating the character’s false belief (see Appendix E for more details). Points were summed to form a total score for this task.

Inference task.

This non-interpretive task is based on the work of Varouxaki, Freeman, Peters and Lewis (1999), and measures children’s understanding of own and others’ knowledge acquired through inference. For the present study, children interact with a puppet, rather than another child as in Varouxaki et al. (1999). The child and the puppet receive an opaque box before the examiner introduces two miniature cars (a blue one and a yellow one). The child and the puppet are asked not to look while the experimenter hides a car in each box. It is made clear to the child (and puppet) that there are just two colours of car but it is not explicitly stated that an inference can be made. There are four conditions which vary who gets to peek in their OWN box after the cars are hidden by the experimenter: (1) Both Peek (2) Puppet Peeks (3) Child Peeks; and (4) Nobody Peeks conditions. At this point, the child is asked to provide their own current knowledge (or lack of knowledge) of the contents of the puppet’s box, and the puppet’s knowledge of the contents of their own box. In conditions where the child has not peeked in his own box, and could not therefore make an inference

about puppet's box (i.e., Nobody Peeks and Puppet Peeks conditions) the child is next asked to state what he WILL know once he has looked in his own box and what the puppet will know about the child's box once the puppet has looked in his OWN box. Note that knowledge in both cases depends on an understanding of inference (i.e., "I know that I have blue and I know there are just two colours, so the puppet must have yellow"; or, "The puppet knows he has blue and since there are just two colours, he must know I have yellow!").

Children were awarded points in the Both Peek condition for: correctly stating that they know what the puppet has in his box (i.e., attributing an inference to self), explaining this inference (i.e., "...I know because I have looked in my box, and I know there are just two kinds"), correctly stating that the puppet knows what is in their box (i.e., correctly attributing an inference to the puppet) and explaining how the puppet can make that inference with reference to his having seen his own box and knowing that there are just two kinds. In the Puppet Peeks condition, children were awarded points for denying the possibility of inference (i.e., stating that they did not know what was in the puppet's box), being able to predict their own inference (i.e., state that they will know what is in the puppet's box once they have looked in their box), being able to explain their future inference (i.e., "because I will know what's in my box, and will know that there are just two kinds..."), being able to attribute an inference to the puppet (i.e., state that the puppet knows what's in their box and to explain that inference as well. Similar points were awarded for correct attribution and explanation of

own and puppet's inference in the Testee Looks and the Nobody Looks conditions (see Appendix E for more details).

Doodles Task.

This Interpretive task was developed by Lalonde and Chandler (2002). Performance reflects children's: understanding of the limits on knowledge that arise from limits on perception (i.e., that the puppet doesn't know what the child knows); understanding of the limits on OWN knowledge that arose from the limits on one's own perception (i.e., that there was a time when the child did not have full knowledge of the picture); appreciation of interpretive differences between persons (i.e., that the two puppets can and likely will have different interpretations of the same stimulus). This task presents children with two simple line drawings, termed "Doodles", which were popularised by the cartoonist Roger Price (1953). The first Doodle depicts "A ship arriving too late to save a drowning witch" (see Figure 1 of Appendix D). The picture is reviewed with the child and then covered so that only a partial, or restricted, view of the picture remains. Two puppet characters (Larry the Lion and Charlie the Crocodile) are then individually introduced to the restricted view in separate trials. For each trial, the child is asked (1) "What will Larry say this is a picture of?" and then (2) "What will Charlie say this is a picture of?" Children who generate an appropriate guess (i.e., not attributing knowledge of the full view) that is the same for Larry and Charlie are then asked: "Now you've said Larry and Charlie think this is an (child's response) –is there anything else Larry could think it is?" A second condition utilizing a Doodle of "An elephant smelling a grapefruit," is

administered in a similar fashion (see Figure 2 of Appendix D). This trial differs in that children are first presented with the restricted view – as are the puppets – and also asked to provide two guesses (i.e., interpretations) before being shown the full view. At the end, children are asked to remember and provide these initial interpretations (i.e., “Do you remember what you thought it was when I first showed you this picture?”).

Children are awarded points for correctly attributing what puppets will say about the Doodles in the restricted viewing condition (with “part marks” for transitional responses, and responses that “lapse” into “privileged” information), for acknowledging that different interpretations across puppets are possible, and for correct recall of their own prior interpretations before having full view / knowledge (see Appendix E for more details).

Ambiguous referential communication.

This Interpretive task is borrowed from Carpendale (1995) and the original version was based on a hiding game introduced by Sodian (1990). In the current version, a sticker (rather than a penny) is hidden under one of three cards which are distinctively marked by either a large red block, a large blue block, or a small red block. Participants are introduced to two miniature dolls that stand up on the table – Maxi and Mary and told they are going to play a game with them. The dolls are placed under the table and the child participant is asked to “look away” while the experimenter hides the sticker under the large red block card. The child and the dolls are then told the ambiguous message: “The sticker is hidden under the card with the BIG BLOCK”. The dolls are asked one-at-a-time (while

the other doll is under the table) to indicate where they think the sticker is hidden, which they do. The “Mary” doll endorses one of the two equally reasonable interpretations of the ambiguous message while Maxi endorses the other interpretation. The experimenter ensures that the child understands both interpretations before restating the problem and asking the following questions: “I told them that the sticker was hidden under the BIG block. Why does Mary think the sticker is under the card with the big red block and at the same time Maxi thinks the sticker is under the card with the big blue block?” followed by “Is it silly for Mary to say one thing and Maxi to say something else?” and finally, “Why is it okay for Mary to say one thing and Maxi to say something else?” Following these questions, children must predict what a third character would say about the location of the sticker upon hearing the ambiguous “clue”. If the subject takes a decisive position, the experimenter asks: “How can you tell what they will think?” and “How sure are you that they will think that?” If the subject says “I don’t know” then the experimenter asks: “Why is it hard to tell what they will think?” Finally, the child’s overall comprehension of the events of the task is checked by asking, “Suppose Larry chose the small red block – would that be silly or not silly?” Children were awarded points for correctly explaining the differing interpretations with reference to the ambiguity (with “part marks” for transitional responses in which they tried to explain the differences with reference to the character’s idiosyncrasies), for saying that it was “not silly” for interpretations to differ, and for correctly denying the possibility of knowing with certainty the third character’s

interpretation of the message (though it may be possible to guess) (See Appendix E for more details).

Inhibitory control

Stop Task.

The present version of the Stop Task was designed and administered within the E-Prime environment (Schneider, Eschman, & Zuccolotto, 2002) and modelled closely after three versions of the paradigm described by Nigg (1999), Logan Schachar and Tannock (1997) and Rubia, Oosterlaan, Sergeant, Brandis and Leeuwen (1998). The paradigm consists in a two-choice discrimination task as a primary task, and a stop signal on a certain percentage of trials where the child must inhibit responding to the primary “go” stimulus. Stop signals can be visual or auditory but the primary task, including the “go” stimulus is always visual. The task measures reaction time to the primary task stimulus (i.e., the child’s “go” process) and the amount of “stop notice” required to inhibit their response to the primary task stimulus (i.e., the child’s “stop” process). Authors of these versions have had difficulty obtaining task motivation and attention from children younger than six (Nigg, personal communication). No previous version has used positive reinforcement contingent on correct responses to “go” and “stop” trials.

In the present version, children were asked to land red or blue planes by pushing the corresponding red or blue button on a response box. Thirty percent (i.e., sixty-four of 240 total trials) were “stop trials” where a (visual) stop sign was presented after a certain delay relative to the onset of the airplane image and

children were asked to withhold responding on such trials. Fixation bars were presented for 300ms followed immediately by a centred red or blue “cartoon” image of an airplane for 1200ms. Red planes pointed to the left whereas blue planes faced right. The stimuli were presented on a laptop computer with a 17” screen. Children responded using a response box that had just two prominent buttons (i.e., 2” in diameter) – one red on the left and one blue on the right – matching the direction of travel of the planes. On stop trials, an image of a stop sign “joined” the airplane on the screen after a certain period of delay. Delay was set initially at 250 ms. such that the stop sign image “joined” the plane image on the screen 250 ms. after the onset of the plane image. When children successfully withheld their response on a stop trial, the stop delay was lengthened by 50 ms. (making it harder to stop on the next trial). When children did not withhold their response to a stop trial, the stop delay for the next stop trials was shortened by 50 ms. – thereby making it easier to stop. This procedure resulted in the probability of stopping being maintained at approximately 50% as designed and recommended by Logan et al. (1997). The plane and stop sign images were terminated immediately upon receiving the child’s response – unless the child withheld responding (correctly or not) – in which case the plane image (and stop sign image if it was a stop trial) remained on the screen for the remainder of the 1200 ms. Feedback followed the child’s response, or the termination of the 1200 ms. trial. Feedback to correct responses (whether they be either correct discriminations on “go trials” or correct non-responses to stop trials) consisted in a (rewarding) “ding” sound, a

(rewarding) three-inch diameter happy face centred near the top the screen, and (rewarding) 24 point blue text stating: “Correct!” (for 1000 ms.) with the child’s reaction time in milliseconds to the trial (unless it was a stop trial where no RT was presented) and the child’s percent responses correct thus far (tracked separately for stop and no-stop trials).

Feedback to incorrect responses (which were either errors of omission or “wrong button errors” on go trials or errors of commission on stop trials) received no auditory feedback, a three-inch diameter sad face, and 24 point red text on the screen stating “Incorrect” with the child’s current percentage of responses correct thus far below. Before commencing the Stop Task, children were told:

“This is a task that measures how fast you can land some planes – like an air traffic controller. Do you know what an air traffic controller is? [Experimenter explains as necessary]. So, when you see a red plane, please land it on the red runway (motion to push the red button). When you see a blue plane, please land it on the blue runway (motion to the blue button). Please land the planes as fast as you can – that’s what we’re going to see, is how fast you can land the plane. One more thing – when you see a stop sign, don’t land the plane – it’s not safe. When you see the stop sign – don’t push any buttons. Do you understand?”

Four blocks of 60 trials were presented with one or two minutes of break between blocks. Each block contained forty-two “go” trials and eighteen “stop” trials. Post-block feedback consisted in a blue screen with black and white 24-point text stating the number of planes landed on “go” trials (which ranged from zero to forty-two) and the words “You are a fast and safe air traffic controller”.

Since trials were 2500 ms. in total (i.e., 300 ms of fixation, 1200 ms of target stimuli and 1000 ms. of feedback), total task duration ranged between thirteen and sixteen minutes.

The following variables were computed from the child's task performance: mean reaction time to "go" trials; standard deviation of reaction time to go trials; Stop Signal Reaction Time (SSRT), or the amount of "notice" in milliseconds required to stop on 50% of trials, "Beta", or the beta weight for predicting stopping accuracy from stopping notice (i.e., the strength of the relationship between notice and accuracy) and errors of pressing the wrong button on go trials – a measure that has face validity as an index of behavioural modulation errors under high motivation and arousal. As in previous versions of the Stop Signal paradigm, SSRT's were relativized to children's Go RT's such that Go RT and SSRT are independent and unconfounded. In effect, "notice" reflects the amount of time (in MS) between the onset of the stop signal, and the completion of the child's "go process" (i.e., when the child "would have" pressed a button, had they not stopped).

Procedure

Fifteen schools from the Vancouver School District were approached in 2003 and four chose to participate. Participating grade 1 classrooms were provided with informed consent forms for each male student. Teachers sent these forms home with students and then completed behavioural ratings for each male student who returned an affirmative consent form. The research team

returned to the school at a later date to obtain teacher-ratings and to administer tasks (for another research project) for thirty-five children in total.

First grade teachers at forty-three schools in the Vancouver, British Columbia school district were approached by mail in 2004, and eleven teachers from six schools chose to participate. These teachers completed anonymous behavioural ratings for each male student in their classroom and returned these forms to the researcher by mail.

Data in 2005 were collected from three private schools and through newspaper advertisements aimed directly at parents with a monetary incentive. Parents responding to the newspaper advertisement were mailed informed consent and behavioural rating forms for parent and teacher. Parents obtained teacher-rated data for their child; however, in some cases the experimenter needed to follow up with teachers in order to obtain their data. Task performance data was collected during a one-hour appointment in the home; tasks were administered in the same fixed order as for the school-based participants. Parents provided their completed behavioural rating forms at the appointment; teacher-forms were returned by mail directly to the researcher or collected by the researcher. Eighty of eighty-five teachers' forms were collected. Eighty-two of eighty-five parent forms were collected. No participants were missing both teacher and parent forms. Teachers of school-based participants sent home study information and consent packets with students. Sons of consenting parents were taken from classroom activities and tested alone in a quiet room within the school. Parent-recruited children were tested in their homes or at the

laboratory and rating forms were collected from parents and teachers. Informed consent was explained verbally to child participants and they were given the opportunity at the outset to discontinue testing at any time; however, none declined. Participants were given stickers after each task component to induce motivation and attention. Tasks were given in fixed order – beginning with the social understanding tasks (Inference task, belief-based emotion task, ambiguous reference task, Doodles task) followed by two tasks for another research project, followed by the PPVT-III, self-report victimization measure, and the Stop Task. Task administration time was between fifty and seventy minutes per child.

RESULTS

Descriptive Statistics

Mean and variability were calculated for each of the task variables. Note that sample sizes vary as not all children completed all measures. Table 1 presents sample size, mean and SD for each of the task variables.

Table 1

Descriptive statistics for all task / child variables

Variable	N	Mean (SD)
PPVT – III raw score	112	97.30 (19.17)
PPVT – III verbal ability	112	99.36 (14.05)
Age (of the social-cognitive task sample)	112	6.99 (0.70)
Overall Social Cognitive Composite – proportion correct	110	0.51 (0.13)
kindergarten – proportion correct	17	0.38 (0.15)
grade 1 – proportion correct	65	0.51 (0.13)
grade 2 – proportion correct	28	0.58 (0.08)
Non-Interpretive Composite – proportion correct	112	0.72 (0.18)
Inference task – proportion correct	112	0.81 (0.21)
Belief-based emotion task – proportion correct	112	0.64 (0.26)
Interpretive Composite – proportion correct	110	0.30 (0.11)
Ambiguous reference task – proportion correct	110	0.15 (0.09)
Doodles task – proportion correct	110	0.44 (0.16)
Stop Task		
Age (of the Stop-task sample)	84	7.03 (0.78)
Mean reaction time to "go" trials	84	756.08 (76.61)
standard deviation RT	84	178.44 (27.40)
Stop Signal Reaction Time (SSRT)	84	383.42 (122.32)
Beta (beta weight for predicting stopping from SSRT)	84	.00798 (.00424)
No. wrong button errors	84	8.65 (8.47)

Table 1 shows variability for task variables that was deemed sufficient for hypothesis testing. Internal consistency (i.e., Cronbach's alpha values) for the Social Cognitive composite ($\alpha = .88$), Non-interpretive composite ($\alpha = .87$), and Interpretive composite ($\alpha = .79$), were found to be satisfactory. Alpha values for

the individual tasks ranged from ($\alpha = .66$) for the six Belief-based emotion items to ($\alpha = .89$) for the nineteen items of the Inference task. Inter-correlations between these tasks were calculated and are presented below in Table 2.

Table 2

Zero-order (upper) and partial (lower) inter-correlations - social cognitive tasks

Variable	Belief-based emotion	Inference	Ambiguous reference	Doodles
Belief-based emotion df	-	.19** ^a 112	.38*** ^a 110	.44*** ^a 111
Inference task df	.13 ^b 107	-	.36*** ^a 110	.42*** ^a 111
Ambiguous reference df	.35*** ^b 107	.33*** ^b 107	-	.44*** ^a 110
Doodles df	.39*** ^b 107	.37*** ^b 107	.41*** ^b 107	-

*** $p \leq .001$ ** $p \leq .01$ * $p \leq .05$ † $p \leq .10$ two-tailed

^azero-order correlation

^bpartial correlation – controlling for PPVT-III raw score (i.e., absolute verbal ability)

Table 2 shows significant zero-order and partial inter-task correlations controlling for verbal ability standard scores. The correlation between the Inference task and the Belief-based emotion task was not significant when controlling for PPVT-III scores; however, the internal consistency ($\alpha = .87$) of the Non-interpretive composite was felt to justify its use.

Turning to the teacher- and parent-rated problem behavioural assessments, Table 3 presents means and standard deviations for the teacher-rated variables. Also presented are T-score equivalents for raw scores on the TRF, which are normed against the TRF standardization sample. Note that T-scores have a mean of 50 and a standard deviation of 10. Sum scores for Reactive- and Proactive-Aggressive scales are also presented – both for the overall sample and the sub-sample of boys who were administered the tasks –

though note that sum scores were not used for hypothesis testing. Note that sum scores can range between seven (i.e., all 7 items rated as “1”, or “not at all”) and thirty-five (i.e., all 7 items rated as “5”, or “certainly applies”). TRF variables are shown in hierarchical format – indicating the narrow-band subscales that comprise the broad band scales.

Table 3

Descriptive Statistics for teacher-rated variables

Variable	N	Raw Score Mean (SD)	TRF T-score Mean (SD)
RA sum of items – PCA sample*	210	12.52 (6.47)	-
Kindergarten	17	11.12 (5.71)	-
Grade 1	166	12.46 (6.17)	-
Grade 2	27	13.78 (8.43)	-
PA sum for PCA sample*	210	9.05 (3.87)	-
Kindergarten	17	9.47 (3.71)	-
Grade 1	166	8.89 (3.83)	-
Grade 2	27	9.70 (4.29)	-
RA sum for task sample	82	13.15 (7.41)	-
PA sum for task sample	82	9.73 (4.79)	-
TRF – Total Problems	80	32.16 (29.33)	56
TRF – Internalizing Problems	80	5.09 (5.67)	55
TRF – Externalizing Problems	80	7.99 (10.70)	58
TRF – Aggressive Behaviour	80	6.04 (8.33)	59
TRF – Attention Problems	80	14.84 (12.72)	54
TRF – Social Problems	80	2.26 (3.05)	56

* possible range is from 7 (i.e., all items rated as “doesn’t apply”) to 35 (i.e., all items rated “certainly applies”)

Table 3 shows that mean teacher ratings of RA were higher for RA than for PA, with the average PA sum of scores just two points above the lower limit of seven (i.e., where all 7 items are rated as “1” doesn’t apply”). It can be seen that mean raw scores on TRF variables were mildly elevated when using TRF norms, but within the Normal range (i.e., T-score below 65). Notably, the average TRF Aggression raw score corresponds to a T-score of 59, and a percentile of 82.

TRF variables had observed alpha values were consistent with expected (i.e., published) values (which range between .71 and .97): Total Problems ($\alpha = .97$); Internalizing Problems ($\alpha = .86$); Externalizing Problems ($\alpha = .95$); Aggressive Behaviour ($\alpha = .95$); Social Problems ($\alpha = .79$); and Attention Problems ($\alpha = .95$).

Turning now to the parent-rated (i.e., CBCL) variables, Table 4 presents those descriptive statistics and T-score equivalents for raw CBCL scores.

Table 4

Descriptive Statistics for parent-rated variables

Variable	N	Raw Score Mean (SD)	CBCL T-score Mean
CBCL – Total Problems	82	27.18 (19.02)	53
CBCL – Internalizing Problems	82	6.20 (5.16)	56
CBCL – Externalizing Problems	82	9.61 (7.74)	57
CBCL – Aggressive Behaviour	82	7.17 (5.76)	59
CBCL – Social Problems	82	3.54 (3.21)	56
CBCL – Attention Problems	82	5.21 (4.04)	55

Table 4 shows mean raw scores that are mildly elevated according to CBCL norms, T-scores that are consistent with those obtained for teacher-ratings, and also within the Normal range according to CBCL descriptors (i.e., below 65). Notably, the mean Aggressive Behaviour score corresponds to a T-score of 59 and a percentile rank of 82 when using CBCL norms for boys aged 6 to 11.

Internal consistency for the CBCL variables was, again, consistent with expected values, ranging from ($\alpha = .75$) for Social Problems to ($\alpha = .94$) for Total Problems.

Next, descriptive statistics were calculated for the peer victimization measure. Total scores for these multi-item variables were divided by the number of items to yield “per item” mean scores and standard deviations for each. Variables that were missing item responses (due to parents or teachers reporting “I don’t know”) were filled with the mean of the items that were completed. Table 5 presents means and standard deviations for the eighteen victimization variables.

Table 5

Descriptive Statistics for victimization variables

Victimization variable	Self-ratings		Parent-ratings		Teacher-ratings	
	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)
Verbal threats and teasing / 5*	83	2.28 (1.02)	78	1.64 (0.64)	75	1.33 (0.52)
Verbal victimization distress	83	2.16 (1.11)	76	2.00 (1.02)	75	1.53 (0.89)
Physical victimization	83	2.43 (0.94)	76	1.48 (0.58)	80	1.24 (0.42)
Physical victimization distress	83	2.35 (1.08)	75	1.94 (0.28)	80	1.49 (0.84)
Peer exclusion / rejection	83	2.55 (0.91)	74	1.94 (0.94)	76	1.61 (0.99)
Peer exclusion distress	83	2.06 (1.04)	72	2.58 (1.54)	75	1.91 (1.42)

*NB: a 3-point scale – converted to 5-point – was used for children’s self-report

Table 5 shows that mean and variability statistics were higher overall for self- than for parent- and certainly for teacher-ratings; however, this may result from the conversion of children’s self-ratings from a 3-point to a 5-point scale. Note, however, that self-ratings were somewhat higher for frequency than for distress ratings for each type of victimization, whereas parent- and teacher-ratings showed the opposite pattern: distress was always rated higher than frequency. This feature was not tested for statistical significance. Cronbach’s alpha was calculated for Self- ($\alpha = .90$), Parent- ($\alpha = .94$) and Teacher-ratings ($\alpha = .93$) – collapsed across type of aggression, frequency and related distress.

Principal Components Analysis of Aggressive Behaviour Scale items

In order to demonstrate that the RA and PA items formed empirically separable factors, and that qualitative descriptions loaded as predicted, items were subjected to Principal Components Analysis. First, means and standard deviations were calculated for each item and these are presented below in Table 6. Note that the possible range for all items was 1-5, but ratings were sometimes observed to range from 1-4.

Table 6

Descriptive statistics for Aggressive Behaviour Scale items (n=210)

Aggressive Behaviour Scale Item	Observed Range	Mean (SD)
RA 1 Gets angry easily and strikes back	1 – 5	2.21 (1.30)
RA 2 Claims that others are to blame/started trouble	1 – 5	2.40 (1.34)
RA 3 Gets angry when corrected	1 – 5	1.72 (1.04)
RA 4 Irritable - quick to "fly off the handle"	1 – 5	1.62 (1.01)
RA 5 Gets mad when not get his/her own way	1 – 5	1.72 (1.06)
RA 6 Exposes self to harm when aggressive	1 – 4	1.25 (0.66)
RA 7 Reactive description	1 – 5	1.60 (1.16)
PA 1 Bullies other children	1 – 5	1.38 (0.74)
PA 2 Threatens other children	1 – 5	1.38 (0.74)
PA 3 Uses force to dominate other children	1 – 5	1.28 (0.67)
PA 4 Hides aggressive acts	1 – 5	1.45 (0.89)
PA 5 Plays mean tricks on other children	1 – 4	1.27 (0.63)
PA 6 This child picks on smaller kids	1 – 5	1.16 (0.49)
PA 7 Proactive description	1 – 5	1.25 (0.65)

Table 6 shows that means and standard deviations varied across the ABS items. In general, Proactive Aggression items received lower ratings, and had less variability than did Reactive Aggression items. The RA items "Gets angry easily and strikes back" and "Claims that others are to blame..." received highest mean ratings of the ABS items; however, the significance of this was not tested. No significant age effects were found for any of the items, with the exception of (RA

3) "Gets angry when corrected", which showed a positive correlation with age ($r = .22, p = 0.45$).

Internal consistency (i.e., Cronbach's alpha) was found to be high ($\alpha = .94$) for the ABS overall, as well as for the RA ($\alpha = .93$) and PA ($\alpha = .92$) item sets. It was expected that the ABS items, including the RA and PA prototype description items, would load strongly on their intended components. It was also expected that the prototype description items would help to reduce the correlation between components. In order to examine this, Principal Components Analysis with Oblimin rotation and Kaiser normalization was performed on the ABS items. Unfortunately, the inter-correlation between oblique components was negligibly smaller with the description items in ($r = .637$) versus out ($r = .674$).

Due to the overlap between Components, and in order to obtain estimates of the unique variance accounted for in outcome variables by RA and PA, Principal Components Analysis was repeated using Varimax rotation (i.e., forced orthogonal rotation). This was also thought to yield truer estimates of children's scores on underlying RA and PA behavioural dimensions that are hypothesized to be uncorrelated when measured without misclassification due to rater error. Table 7 presents the item loadings for the Varimax rotation.

Table 7***Rotated Component Matrix for PCA of ABS items***

Aggressive Behavior Scale Item	Component	
	1	2
RA 1 Gets angry easily when teased / threatened – strikes back	.828	.326
RA 2 Blames others in fights	.744	.336
RA 3 Gets angry when corrected	.797	.350
RA 4 Irritable, quick to “fly off the handle”	.874	.327
RA 5 Gets mad when s/he doesn’t get his/her own way	.845	.253
RA 6 Exposes self to harm (e.g., from stronger children) when aggressive	.515	.446
RA 7 Reactive Aggressive Prototypical description	.816	.276
PA 1 This child bullies other children	.422	.769
PA 2 This child threatens other children	.390	.786
PA 3 This child uses force to dominate other children	.394	.779
PA 4 This child hides aggressive acts	.431	.716
PA 5 This child plays mean tricks on other children	.356	.686
PA 6 This child picks on smaller kids	.257	.742
PA 7 Proactive-Aggressive qualitative description	.088	.699

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Rotation converged in 3 iterations.

Table 7 shows that items loaded on their intended components, with cross-loadings that were smaller than intended loadings in all cases. Notably, the qualitative description items loaded very strongly on their intended components, with the RA item showing some loading on the PA factor, and the PA item showing a negligible loading on the RA factor. Of all the RA items, the RA prototype description had the second-smallest loading on the PA factor whereas the PA description had the smallest loading on the RA factor. These findings are consistent with validity of the description items.

Relations between RA / PA and Qualitative Variables

Hypothesis 1 predicted that the RA factor score would be significantly higher for the qualitative factors (e.g., ADHD diagnosis). In order to test this

hypothesis, the z-scores for RA and PA components were compared using t-tests for children with versus without these factors. Table 8 presents these mean differences and corresponding t-values. Note that positive t-test values indicate that the RA score was higher when the factor was present whereas negative t-test values indicate that the RA score was lower when the factor was present.

Table 8

Reactive aggression scores by qualitative child factors

Qualitative factor	Factor absent		Factor present		<i>r</i>
	N	RA z-score M (SD)	n	RA z-score M (SD)	
ESL	100	-0.02 (1.09)	9	0.11 (0.89)	0.363
ADHD diagnosis	74	-0.06 (1.09)	8	1.35 (1.01)	3.52***
LD / Learning Assist.	65	-0.01 (1.09)	17	0.40 (1.36)	1.31
Behaviour intervention	71	0.03 (1.18)	11	0.36 (0.97)	0.90
Other M.H. diagnosis	75	-0.01 (1.11)	7	1.03 (1.25)	2.36*
(P) Emotional reactivity	68	-0.06 (1.05)	14	0.70 (1.43)	2.31*
(T) Emotional reactivity	75	-0.04 (1.06)	7	1.25 (1.50)	2.95**
(Both) Emotional reactivity	79	-0.02 (1.06)	3	2.42 (1.05)	3.90***
(P) Soc.skills concern	71	0.01 (1.15)	11	0.46 (1.16)	1.20
(T) Soc.skills concern	65	0.04 (1.21)	17	0.19 (0.92)	0.48
(Both) Soc.skills concern	74	0.06 (1.17)	8	0.24 (1.08)	0.42
VIQ < 80	75	0.02 (1.17)	7	0.68 (0.76)	1.48
Anxious interview	74	0.15 (1.19)	8	-0.64 (0.30)	-1.87 †

*** $p \leq .001$ ** $p \leq .01$ * $p \leq .05$ † $p \leq .10$

Table 8 shows that, consistent with predictions, children identified as having ADHD, another mental health diagnosis, parent- or teacher-reported concern about emotional reactivity had significantly higher RA scores than did children without these features. Children with both parent and teacher-rated concerns about emotional reactivity had significantly higher RA scores than did other children.

Contrary to predictions, teacher- and parent-reported concerns regarding social skills were not associated with increased RA scores. Also, children with an anxious interview had marginally significantly lower RA scores than children who did not.

Hypotheses 1b predicted that the Proactive Aggression factor would not be associated with any of the qualitative factors, or would be negatively related. Table 9 shows mean differences in PA factor scores for children with and without these qualitative factors.

Table 9

Proactive aggression by qualitative child factors

Qualitative factor	Factor Absent		Factor Present		t
	N	PA z-score M (SD)	n	PA z-score M (SD)	
ESL	100	0.06 (1.09)	9	0.49 (1.50)	1.097
ADHD diagnosis	74	0.18 (1.11)	8	-0.28 (1.06)	-1.12
LD / Learning Assist.	65	0.16 (1.11)	17	0.05 (1.16)	-0.34
Behaviour intervention	71	0.11 (1.13)	11	0.28 (0.98)	0.46
Other M.H. diagnosis	75	0.08 (1.05)	7	0.73 (1.62)	1.49
(P) Emotional reactivity	68	0.18 (1.22)	14	-0.08 (1.06)	-0.81
(T) Emotional reactivity	72	0.09 (1.03)	10	0.64 (1.80)	1.26
(Both) Emotional reactivity	79	0.14 (1.11)	3	-0.06 (1.43)	-0.31
(P) Soc.skills concern	71	0.13 (1.08)	11	0.19 (1.36)	0.18
(T) Soc.skills concern	65	0.04 (1.00)	17	0.50 (1.44)	1.53
(Both) Soc.skills concern	74	0.11 (1.07)	8	0.33 (1.51)	0.53
PPVT VIQ < 80	75	0.07 (0.95)	7	0.88 (2.18)	1.88 †
Anxious interview	74	0.18 (1.16)	8	-0.25 (0.15)	-1.02

*** p ≤ .001 ** p ≤ .01 * p ≤ .05 † p ≤ .10

Table 9 shows that PA was not significantly associated with ADHD, other mental health diagnosis, learning assistance, behavioural intervention, parent and teacher-reported concern regarding emotional reactivity. Contrary to expectation, however, PA scores were slightly, though non-significantly, higher

for boys with teacher-reported concern about emotional reactivity. Another non-significant trend was found for boys with verbal ability standard score below eighty.

Relations between RA / PA and CBCL / TRF Variables

Hypothesis 2 predicted that RA would show unique correlations with teacher and parent-rated Internalizing, Social Problems and Attention Problems. Table 10 presents these correlations.

Table 10

Correlations between RA / PA and CBCL / TRF variables

Variable		RA	PA	t-statistic PA vs. RA
Total Problems	Parent (<i>n</i> = 79)	.42***	.04	2.428*
	Teacher (<i>n</i> = 80)	.71***	.36***	2.356*
Externalizing Problems	Parent	.39***	.11	1.858†
	Teacher	.71***	.52***	1.211
Aggressive Behaviour	Parent	.39***	.12	1.758†
	Teacher	.72***	.49***	1.502
Internalizing Problems	Parent	.21†	-.08	1.905†
	Teacher	.32**	-.15	3.268**
Social Problems	Parent	.35**	.02	2.116*
	Teacher	.71**	.27*	3.049 **
Attention Problems	Parent	.46**	.12	2.178*
	Teacher	.58***	.31**	1.818†

*** $p \leq .001$ ** $p \leq .01$ * $p \leq .05$ † $p \leq .10$

Table 10 shows that for both teacher-ratings of Aggression and Externalizing Problems, correlations with RA and PA were not significantly different. The same parent-rated variables were marginally more strongly related to RA than PA. Hypothesis 2a was supported: RA was related to each of the CBCL / TRF indicators of pathology. Hypothesis 2b was not supported: PA was related to teacher-rated (but not parent-rated) Attention Problems and teacher-rated (but

not parent-rated) Social Problems. It is noteworthy that all parent rated indices of pathology were correlated with RA only. Teacher-rated problems were also strongly correlated with RA; most were correlated with PA, though less strongly in many cases.

Relations between RA / PA and Peer Victimization

Hypothesis 3 predicted unique relations between RA and victimization.

Table 11 presents correlations between RA / PA and the victimization variables.

Table 11

Correlations between RA / PA and peer victimization variables

Variable			RA factor	PA factor	t-statistic RA vs. PA
Verbal	Self	Frequency (<i>n</i> = 83)	.11	.25*	-.903
		Distress (<i>n</i> = 83)	.09	.14	-.321
	Parent	Frequency (<i>n</i> = 76)	.26*	-.22 †	3.140**
		Distress (<i>n</i> = 74)	.25*	-.11	2.340*
	Teacher	Frequency (<i>n</i> = 73)	.60***	.39***	1.364
		Distress (<i>n</i> = 73)	.65***	.36***	1.906 †
Physical	Self	Frequency (<i>n</i> = 83)	-.02	.20 †	-1.430
		Distress (<i>n</i> = 83)	-.09	.05	-.903
	Parent	Frequency (<i>n</i> = 74)	.33**	-.04	2.316*
		Distress (<i>n</i> = 73)	.30**	-.05	2.249*
	Teacher	Frequency (<i>n</i> = 78)	.43***	.46***	-.191
		Distress (<i>n</i> = 78)	.49***	.30**	1.221
Exclusion	Self	Frequency (<i>n</i> = 83)	-.11	.19	-1.971 †
		Distress (<i>n</i> = 83)	-.04	.20	-1.564
	Parent	Frequency (<i>n</i> = 72)	.39***	-.06	2.791**
		Distress (<i>n</i> = 70)	.42***	.07	2.195*
	Teacher	Frequency (<i>n</i> = 74)	.56***	.31**	1.538
		Distress (<i>n</i> = 73)	.60***	.17	2.710**

*** $p \leq .001$ ** $p \leq .01$ * $p \leq .05$ † $p \leq .10$

Table 11 shows that the correlates for RA and PA diverged across raters, with self-ratings of victimization frequency and distress unexpectedly (marginally) negatively related to RA and positively related to PA – contrary to Hypothesis 3.

Parent ratings were most consistent with Hypothesis 3 in that RA was associated with all aspects of victimization and significantly more so than was PA in every case. Teacher ratings agreed in that RA was strongly related to all aspects, but not always significantly more so than was PA. Teacher-ratings of verbal victimization distress and exclusion distress were significantly stronger for RA than for PA.

Notably, the relations between victimization aspects and RA/PA differed *between* raters, but were largely consistent *within* raters across verbal, physical and exclusion aspects, and across frequency and distress aspects of victimization. Thus, it seemed appropriate to complete missing parent- and teacher-rated data cells with values taken from the same rater (see Methods for more details) and to reduce the 18 variables (as it turned out, to three variables – one each for self-, parent-, and teacher-ratings).

Following this filling in of missing data, the seventy-four complete victimization datasets were subjected to exploratory Principal Components Analysis with oblique rotation⁶. The solution gave rise to three components with eigenvalues greater than one, accounting for 73% of the variance in the items. These components corresponded to self, teacher and parent ratings, with all items loading on their own factors, with cross loadings as high as (0.211) and inter-correlations of ($r = .07$ between teacher-rated and the parent-rated component) and ($r = 0.01$) between teacher- and self-rated component, and ($r = -$

⁶ It should be noted that the coherence of self-, parent-, and teacher-rated factors was helped somewhat by the procedure for missing data, since values for missing cells were taken from other values provided by the same rater.

.30) between the teacher- and the parent-rated component. Correlations between the Self-, Parent- and Teacher-rating components and RA / PA were computed and presented in Table 12:

Table 12

Correlations between Self-, Parent- and Teacher-rating Components and RA/PA

Variable (n = 72)	RA component	PA component	t-statistic RA vs. PA
Self-rating component	-.07	.22 †	-.906
Parent-rating component	.37**	-.17	3.519**
Teacher-rating component	.63***	.28*	2.172*

*** p ≤ .001 ** p ≤ .01 * p ≤ .05 † p ≤ .10

Table 12 shows a pattern that agrees with that observed for the individual victimization variables. Hypothesis 3 was not supported in the case of self-ratings of victimization, which were marginally-significantly related to PA and unrelated to teacher-rated RA. Hypothesis 3 was supported by both parent- and teacher-ratings, which were significantly more strongly related to RA than PA. Teachers seemed not to discriminate between RA and PA in their victimization ratings as well as parents did; however, the significance of this apparent contrast was not tested.

Relations between RA / PA and Social understanding

Hypothesis 4 predicted that RA, and not PA, would be negatively and uniquely correlated with social understanding ability – with and without control for verbal ability. Table 13 presents the relevant correlations.

Table 13**Correlations between RA/PA, verbal ability and social understanding**

Variable	Df	RA factor	PA factor	t-statistic RA vs. PA
PPVT-III standard score	109	-.12	-.09	-.427
Overall Social Cognitive – Zero order	108	-.13	-.07	-.427
Partial – controlling for PPVT-III	105	-.11	-.06	-.354
Non-Interpretive – Zero order	109	-.03	-.02	.073
Partial – controlling for PPVT-III	105	-.01	-.05	.283
Interpretive – Zero order	108	-.19*	-.06	-.427
Partial – controlling for PPVT-III	105	-.17 †	-.06	-.780

*** $p \leq .001$ ** $p \leq .01$ * $p \leq .05$ † $p \leq .10$

Table 13 shows that hypothesis 4 was not supported. RA was significantly correlated only with the Interpretive Composite, and not with the overall and non-Interpretive Composite. RA was only marginally significantly related to reduced Interpretive scores when controlling for PPVT standard scores. PA was less strongly negatively related to social cognitive task performance, but not significantly less so in any case.

Relations between RA/PA and inhibitory control

Hypothesis 5 predicted that RA would be uniquely correlated with performance variables on the Stop Task. Table 14 presents these correlations.

Table 14**Relations between RA and PA factors and Stop Task variables**

Variable (n = 81)	RA factor	PA factor	t-statistic RA vs. PA
Go trial – Mean reaction time	-.24*	.03	1.773 †
Go trials – SD RT	.16	.16	.006
Stop Signal Reaction Time	.34**	.06	1.827 †
Beta weight (success, notice)	-.25*	.00	-1.571
Wrong button errors	.23*	.23*	.038

*** $p \leq .001$ ** $p \leq .01$ * $p \leq .05$ † $p \leq .10$

Table 14 shows that Hypotheses 5a was supported: a small but significant correlation emerged between RA and longer SSRT's (i.e., more stop notice was required) and weaker Beta weights for predicting stop success from stop notice (i.e., RA was associated with less consistency in stopping for a given amount of notice). Hypothesis 5b was not strongly supported as PA was just marginally significantly less correlated with SSRT than was RA and did not significantly differ from RA in its relations with Beta weight magnitude. Notably, RA and not PA were correlated with faster Go trial reaction times. Also, RA and PA were equally correlated with wrong button errors.

Age-moderation of anticipated relations

Age moderation for the variables of interest was tested with linear regression, with RA or PA as the dependent variable, and with age, one of the various outcome variables (e.g., TRF, CBCL or task variables) and the interaction term entered simultaneously. This analysis yielded marginally significant or significant age moderation of the link between RA and TRF Social Problems (i.e., for the [variable] x age interaction term, $t = 1.77$, $p = .08$), CBCL Social Problems ($t = 2.06$, $p = .043$), CBCL Attention Problems ($t = 1.73$, $p = .09$), the overall social cognitive Composite ($t = -2.302$, $p = 0.023$), the non-Interpretive social cognitive Composite ($t = -2.58$, $p = .011$), and the Interpretive social-cognitive Composite ($t = -1.674$, $p = .097$). Age moderation of the links between PA and these variables was not significant in any case. The links between RA and PA and the victimization components were not moderated in any case.

Grade was used as a proxy for age in order to survey the extent to which the variables moderated by age displayed changing relations with RA and/or PA across Kindergarten, first and second grade age groups. Within these subsamples, significance of differential relations was not tested due to power limitations, however the meaningfulness of differences can be inferred from the t-values contrasting links with RA / PA for the whole sample and the significance of age moderation analyses. Though the links between RA and Stop Task variables were not significantly moderated by age, some moderation appeared to be occurring; these correlations are also presented in Table 15.

Table 15

Correlations between RA/PA and age-moderated correlates by grade level

Variable	Correlation with RA / PA by Grade						Age moderation trend	
	K n = 17		Grade 1 n = variable		Grade 2 n = 26		RA	PA
	RA	PA	RA	PA	RA	PA		
CBCL – Attention Problems	.22	-.14	.47** df=36	.08 df=36	.47* df=36	.27	<i>Increasingly positive</i> †	<i>Increasingly positive</i> NS
CBCL – Social Problems	-.16	-.42 †	.48*** df=36	.07 df=36	.41* df=36	.17	<i>Increasingly positive</i> *	<i>Decreasingly negative</i> NS
TRF – Social Problems	.56**	.24	.70*** df=36	.44** df=36	.79*** df=36	.07	<i>Increasingly positive</i> †	<i>Variable</i> NS
Social cognitive Composite	-.08	-.25	-.22 df=64	-.04 df=64	-.50* df=64	.06	<i>Increasingly negative</i> *	<i>Increasingly positive</i> NS
Non-Interpretive social-cognitive	-.01	-.07	-.03 df=65	.04 df=65	-.36† df=65	-.13	<i>Increasingly negative</i> †	<i>No relation</i> NS
Interpretive social-cognitive	-.13	-.39	-.32* df=64	-.05 df=64	-.44* df=64	.21	<i>Increasingly negative</i> *	<i>Increasingly positive</i> NS
Stop Task – SSRT	-.05	-.26	.58*** df=37	.07 df=37	.34† df=37	.17	<i>Increasingly positive</i> NS	<i>Increasingly positive</i> NS
Stop Task – Beta	.24	.44†	-.29† df=37	.01 df=37	-.50*** df=37	-.04	<i>Increasingly negative</i> NS	<i>Decreasingly positive</i> NS

*** p ≤ .001 ** p ≤ .01 * p ≤ .05 † p ≤ .10 NS indicates age moderation was not significant

Table 15 shows that the anticipated links for RA increased in magnitude in nearly every case, with the exceptions that the link with Social Problems was not larger

in the second than the first grade, and the negative link with performance on the non-Interpretive social cognitive Composite was near-zero in kindergarten and in the first grade with a moderate negative correlation observed in the second grade.

Age moderation was not significant for PA for any of these variables; however, apparently-declining links are observed in some cases, unchanging non-relations in others, and age moderation running counter to that observed for RA in the cases of teacher-rated Social problems and Interpretive social cognitive task performance in the second grade. As with RA, the link between PA and Attention Problems appeared to increase with age.

The correlation between Social Cognitive ability and RA observed for second-grade boys did not change and was still significant when controlling for verbal ability (partial $r = -.49$, $p = .012$) or parent-rated attention problems (partial $r = -.41$, $p = .042$). It did drop to marginal significance, however (partial $r = -.33$, $p = .097$), when controlling for teacher-rated Attention problems (which were strongly associated with RA).

Though not significantly moderated by age, correlations between RA and PA and Stop Task variables behaved similarly to the social cognitive task variables and seemed also worthy of presentation in Table 15. Over the three grade/age groups, RA appears to become increasingly linked with poor performance – in terms of both SSRT and Beta. The same pattern was observed between PA and SSRT, though to an apparently lesser extent (not tested for significant difference from RA). The relationship between PA and Beta appears

as an apparently-decreasing link – beginning with PA predicting good performance in kindergarten, and ending with a near-zero correlation in the second grade.

DISCUSSION

This investigation found some support for the claim that reactive and proactive aggression are separable and have divergent correlates across several aspects of childhood functioning. This divergence was revealed through use of orthogonalized RA and PA factor scores which provides stronger evidence of true divergence in comparison with the partialling approach that is commonly used. Hypothesis testing was perhaps helped by the fact that the sample was quite aggressive overall – in the 82nd percentile on TRF and CBCL Aggressive Behaviour. If these values can be trusted, and observed correlations with RA and PA are valid, then the sample was clearly elevated in terms of RA, whereas rates of PA for this sample in comparison with the normal population remain unknown.

Several of the divergent correlates for RA and PA found here appear to be moderated by age, indicating need for further and longitudinal research. Reduced variance for PA items compared with RA items and the failure to reduce overlap between RA and PA components indicates that conclusions should be tempered somewhat. Predictions that were not supported suggest the need to alter theory, improve measurement, or both.

RA and PA Behaviours, Items and Components:

RA and PA items behaved as predicted on the basis of previous research – with two factors emerging having eigenvalues greater than one. Cross loadings well in excess of 0.30 were observed, and oblique Components were found to be moderately correlated – consistent with previous findings (Card & Little, 2006). Oblique components were slightly less correlated when the descriptive items unique to this study were included versus not included. Forced orthogonal components were found to have many of the predicted divergent correlates, although conclusions must be tempered in light of the reduced variance of PA items relative to RA items.

The finding of reduced mean scores and variance for PA is significant in itself and consistent with prior research (e.g. Card & Little, 2006).

Qualitative factors indicative of psychopathology:

Predictions of higher RA component scores for children with ADHD diagnosis, other mental health diagnosis, teacher- and parent-reported chief-concern-as-emotional-reactivity were supported. The ADHD finding replicates previous findings of such a relationship (Card & Little, 2006), whereas the finding of a link between RA and having a mental health diagnosis is new, but consistent with documented links between ADHD / executive dysfunction and increased risk of other mental health diagnoses (Miller, Nigg & Faraone, 2007). These findings support the claim that RA is uniquely associated with poor self-regulation and general psychopathology, though it is noted that teachers were likely aware of

boys' diagnoses and that this knowledge may have influenced their ratings of RA / PA.

That RA scores were significantly higher for children with parent- and teacher-reported emotional reactivity is not surprising given the centrality of emotional reactivity to the Reactive-Aggressive construct. Certainly teachers who endorsed emotional reactivity as a chief concern were expected to also endorse RA items which pertain strongly to such reactivity. That parent-identified emotionally-reactive children had higher RA and not higher PA scores, lends strong support to the validity of the teacher-rated RA and PA items and the separability of the constructs.

The finding that teacher- and parent-reported concerns regarding social skills were not associated with higher RA scores was unexpected given links between RA and social information processing encoding errors (i.e., hostile attribution bias) (Dodge et al., 1997) and low socio-metric status (Card & Little, 2006). It is possible that there is no relationship between RA and teacher- and parent-reported social skills deficits, and that the low sociometric status that authors have linked to RA (Card & Little, 2006) occurs in spite of normal variation in social skills. Children with RA may be prone to encoding errors and attribution biases at times, but at the same time display normal social skills otherwise such that they are not viewed or rated as challenged in this domain. Alternatively, there may be some relationship between social skills deficits and RA that was not detected by looking at chief concerns. There may be other conditions that do not include reactive aggression that are more likely to give rise to a chief concern of

social skills, and conversely, there may be other features of RA that are more concerning than social skills deficits, such as emotional reactivity. Asking more pointed questions about parents' and teachers' perceptions of social skills would provide a more sensitive test of this relationship. The large and moderate correlations observed between RA and teacher and parent-rated Social Problems is consistent with, but doesn't necessarily support this interpretation.

Parent- and teacher-reported problem behaviours:

Relating the Aggressive Behaviour Scale to the CBCL and TRF

Aggression scales was important in order to assess the extent to which RA and PA correspond to commonly-used clinical assessment tools, and to demonstrate the need to distinguish between RA and PA if CBCL and/or the TRF do not. Parent ratings of Aggressive Behaviour and Externalizing Problems were only marginally significantly more strongly correlated with teacher-rated RA than PA; links between teacher-ratings of Aggressive Behaviour and Externalizing Problems were more evenly related to RA and PA. Since teachers provided both RA/PA and TRF Aggression ratings, this shows that the TRF did not distinguish between RA and PA – both forms were detected as TRF Aggressive/ Externalizing Problems. The CBCL, in contrast, did appear to distinguish between teacher-rated RA and PA: teacher-rated RA was detected as CBCL Aggression by parents, whereas teacher-rated PA was not. Taken together, these findings suggest that there are important differences between RA and PA in terms of parent-detected / home behaviour; that these differences would likely be missed if relying upon TRF Aggression and Externalizing scores alone; and

that PA behaviours would be missed altogether if relying on CBCL parent-ratings of Aggression alone.

Predictions regarding Total Problems and Social Problems were fully supported: RA was significantly more strongly linked to these indices of dysfunction than was PA by both parent and teacher-report. Partial support was obtained for Internalizing Problems and Attention Problems – where parent- or teacher-ratings were either significantly or marginally more strongly linked to RA. Overall, these findings support the claim that RA is uniquely or more strongly linked with these forms of psychopathology than is PA.

Regression analysis of age moderation for this K-2 sample revealed correlations between RA and CBCL Attention Problems, CBCL Social and TRF Social Problems that increased in magnitude with age. Weaker overall links for PA were not significantly moderated by age and the apparent pattern was one of unchanging near-zero correlations, negative correlations in kindergarten becoming less negative for older children, or increasingly negative correlations (i.e., predictive of reduced problems/better scores). Overall, these data reflect increasing separability of RA and PA in terms of CBCL/TRF problem behaviours during this period, and this is consistent with the meta-analytic findings of Card and Little (2006).

Victimization and related distress:

Moderate links for parent-ratings and large correlations between teacher-ratings of victimization and RA were consistent with predictions and previous

research. Also consistent was the finding that RA was significantly more strongly related than was PA to all most aspects of victimization, including the reduced variables. These data are in agreement with that of Card and Little (2006), who find a significant negative link between the standardized residual for PA and victimization (which matches the pattern for parent-ratings of the current study), and a small positive link for the zero-order correlation between PA and victimization (a pattern that matches that observed for teacher-ratings in the present study).

When the lack of relations between RA and victimization on self-report are taken together with the strong agreement between parents and teachers in linking RA to all aspects of victimization and distress, it does seem likely that reactive-aggression was associated with denial of such victimization (whereas PA apparently was not, or was less so). If this finding can be replicated, it fits well with the increased neuroticism that has been theoretically and empirically linked with RA (Little, Brauner, Jones, Nock & Hawley, 2003; Miller & Lynam, 2006) and adds another specific and clinically useful example of such neuroticism.

The suggestion that RA might be associated with denial is more interesting in light of the finding that self-reported victimization was marginally associated with PA. The validity of these small correlations for self-ratings was bolstered by agreement of the teacher-ratings of victimization, which were significantly correlated with PA. The data suggest that some proactively aggressive children are experiencing verbal, physical and exclusion victimization

and distress related to verbal teasing and exclusion and – unlike their reactively-aggressive peers – are not denying these experiences as much, or at all on self-report – perhaps because problems are less frequent, severe, and/or proactively aggressive children are less distressed by them. Consistent with this, the victimization experiences of proactively aggressive children are not being detected by their parents, suggesting reduced severity and visible distress in comparison with RA. The parent-reported victimization data are in agreement with the CBCL data: again, parents are reporting problems that correlated with teacher-identified RA and that are not correlated with teacher-identified PA, and pointing to important differences that would be missed if relying on teacher-report alone.

The existence of a subgroup of proactively-aggressive boys who are “dishing out” as well as “taking” victimization experiences fits with the “mixed aggressive” subgroup whom some have argued should be qualitatively separated from “pure bullies” and “pure victims” – contra the current quantitative, and additive approach⁷. Unnever (2005), for example, argues for qualitative grouping based on his and others’ findings that “aggressive victims” use more proactive aggression than “pure victims”, more reactive and physical aggression than “pure

⁷ Pending evidence-based revision, I favour looking to physiology for fundamental classification (i.e., one can be reactive or callous-unemotional) and the simplest model for classifying children who give as well as receive bullying experiences. There is so far no convincing evidence to contradict a default (i.e., default by Occam's razor) model where these are considered as separate problems which can occur together and which combine additively, rather than forming a qualitatively different group. As argued earlier, I believe that “mixed aggressive” children are fundamentally reactive or proactive on the basis of physiology and other differences that have yet to be identified. Their behavior may be misinterpreted, and/or they may actually display behavior that appears to reflect the “other” syndrome, but for different reasons. If these views regarding overlap between bullying and victimization, and between RA and PA are found wanting, there are several alternatives to choose from in addition to the model proposed by Unnever (2005).

bullies”, and less proactive and subtle (i.e., verbal and social) aggression than “pure bullies” (Schwartz et al., 1997, 1998).⁸ Further research is needed to determine if there are qualitative differences between pure proactive, pure reactive and mixed aggressive children, or between children who bully and are bullied versus children who bully or are bullied alone, and if there is a need to abandon the quantitative approach to assessment that is taken in this study.

Social cognitive task performance

The link between social-cognitive task performance and RA for the sample as a whole was small and significant only for the Interpretive Composite. Age moderation of the effect size was, in hindsight, consistent with general findings of increasing separability of RA and PA over time in terms of EF / ADHD symptoms (Card & Little, 2006), which are related to social-cognitive performance⁹. Though social cognitive scores varied less with age, this reduced variance among this study’s older children was nevertheless more indicative of RA. Indeed, the link for the second-grade participants was such that one quarter of the variance in RA was accounted for by variance in social cognitive task performance and vice versa – a link that did not change when controlling for verbal ability, teacher or parent-rated attention problems or inhibitory control.

⁸ Unnever (2005) also notes that the “aggressive victim” group tended to be older and that “pure types” were more prevalent in the younger grades (p. 166). These features are consistent with this group being truly “reactive” in nature, but gradually acquiring, or *pretending* to acquire the proactive methods of the dominant and truly-proactive-aggressive children. This possibility could be tested by assessing the predictive validity of a scoring procedure based on it.

⁹ Robust and reliable correlations have been demonstrated between ADHD and measures of executive functioning (Shallice et al., 2002) and between executive functioning and social-cognitive task performance (Müller, Zelazo & Imrisek, 2005).

These data do not fit well with the claims of Crick and Dodge (1999): that this approach has little to offer by way of understanding RA and PA; that general processing deficits may have little to do with RA; and the social cognitive processing errors of reactive-aggressive boys are specific to provocation situations that trigger these schemata (Schwartz et al., 1999). Though similar links have been demonstrated in previous research (Happé & Frith, 1996; Jones, 2002; Strayer & Cohen, 1996) no prior findings can be found that demonstrate a social cognitive deficit that is unique to RA when controlling for verbal ability and inhibitory control.

If the social-cognitive tasks used in this study index RA to the same extent and in the same way that the hostile attribution bias (HAB) paradigm appears, to then interpretation of age moderation observed here may be aided by the age moderation findings of a meta-analysis of studies linking *general aggression* with HAB (Orobio de Castro, Veerman, & Koops, 2002). Coping with wide variance in age across studies, these authors found a “wave-like” pattern for age-moderation: effect sizes were lower for studies sampling from six to twelve years of age in comparison with studies that sampled from four to six, and eight to twelve, leaving an apparent “trough” (i.e., of reduced effect sizes) for children aged six to eight. This “trough” corresponds closely to the present whole sample (i.e., all but seven of the current overall sample $n=210$ were between 5.99 and 8.47, five of them were aged 5.54 to 5.88); however, the thirteen eldest children (all of whom were in the second grade sub-sample) were aged 8.00 to 9.23. Further research is needed to establish if this age moderation pattern can be

replicated, if it applies to social cognitive performance as well as the hostile attribution task paradigm, and if it is something about the tasks or the nature of reactive aggression itself that can explain it.

If this finding is valid, and withstands replication, then it may be that social cognitive understanding is simply more variable in the younger grades and may become increasingly correlated with reactive aggression (and other indices of maladjustment) only in the older grades when the majority of peers are reliably using those skills and there is a peer social expectation to have and use them.

Alternatively, age-appropriate social understanding may be important at each of the age groups assessed, but the task items that were used in this study may have been “calibrated” to detect delayed development only in the second-grade children. Further item analytic research will be needed to assess these and other interpretations.

Alternatively, or in addition to some extent, social cognitive deficit may be a consequence and not a cause of reactive aggression, and may be caused by other – possibly important – factors in the kindergarten and first grade age ranges. Thus, items may have detected (or it may be possible, with better items, to detect) “true delay” across each age grade, but only in the second grade were tasks able to detect delay that is associated with RA. Longitudinal research is needed to address this question and the current findings suggest that such research will be fruitful.

The notion that RA might be either a cause or effect (or both) of reduced social cognitive ability introduces a debate regarding the way that social

understanding and social knowledge, or social-interpretive constructions should be conceptualized (see Carpendale & Lewis, 2004). Though not necessarily incompatible with other dominant positions, the current findings for the social-cognitive tasks seem most consistent with a social constructionist view where social cognitive understanding (as measured by these kinds of tasks) develops as a result of social interaction –and not the other way around as in the dominant “information processing” view. Thus, it is not just opportunity for social (e.g., sibling) interactions that may facilitate social cognitive development, but the nature of those social relationships that is important (Carpendale & Lewis, 2004 p. 79). In line with this thinking, I speculate that peers' negative responses to reactive aggression lead to reduced development-promoting peer social interactions (e.g., cooperative play), as well as increased development-inhibiting peer social interaction (e.g., victimization and hostility), such that social cognitive ability in relation to peers may lag further behind over time. Indeed, Dodge (1991) has already provided evidence that reactive aggression perpetuates itself in a similar way (though the mechanism is framed in terms of biases, rather than social-cognitive ability). Thus, the increasing separability of RA from PA and from non-aggressive children in terms of problem behavior, peer rejection, and social-cognitive ability may be the result of “positive feedback” – whereby peer social consequences of the behaviors become causal forces that increase emotional problems, limit development in social cognitive and/or self-regulatory domains, and increase the probability of more reactive-aggressive behavior.

Executive function task performance:

As predicted, RA was significantly related to inhibitory control variables – SSRT (i.e., “capacity”, or the amount of notice required for 50% stopping success), and Beta (i.e., “consistency”, or the strength of the relationship between stop notice and stopping success). Whereas links between PA and these variables were near zero, the prediction for a significantly less positive link was not supported. This finding is consistent with previous findings of a link between RA and ratings of emotional dysregulation and ADHD symptoms (Card & Little, 2006) but stands as the first demonstration of an apparently unique link between RA and task-measured inhibitory control.

Age moderation of the links between SSRT / Beta and RA / PA was not significant, but appeared to be occurring. If there is age moderation, the apparent pattern is consistent with Card and Little's (2006) findings for ED/ADHD symptoms in some respects and not others. In the present study, RA became increasingly related to poor performance and PA became less related to good performance, such that RA and PA remained similarly discrepant over time. In contrast, Card and Little found a small positive zero-order correlation between PA and ratings of EF / ADHD that decreased over the five-to-fifteen-year age range, such that the differential relations for RA and PA grew significantly over the same period. This difference may lie in error variance and low power of the present study to detect the true slope of age moderation for RA and PA, non-linear variation in age-moderation effects over the five-to-fifteen-year age range (assuming some truth to the apparent slope in the current findings), or important

differences between task measures and ratings of EF / ADHD symptoms (assuming truth to current and previous findings).

Though findings for inhibitory control are informative and signal a need for further research, age moderation was not significant, and the overall effect size for the sample as a whole was disappointingly small. Further research with the power to detect and accurately determine the slope of apparent age moderation will be required before a routine clinical assessment of inhibitory control for some aggressive children (i.e., within a certain age range) can be indicated and interpreted.

Age moderation reconsidered:

Though possible interpretations of age moderation have been discussed for each of the correlates of interest, one interpretation of the overall pattern, and that observed in Card and Little (2006) (i.e., increasing impairment associated with RA but not PA) is that RA (and to a lesser extent PA) items are detecting different sorts of children over time, with a marked shift occurring between the kindergarten and first grade sub-samples, since kindergarten effects were markedly smaller and/or running counter to the direction observed for the whole sample.

One variant of this hypothesis is that many reactive-aggressive children are desisting in their aggression in large numbers between kindergarten and the first grade. These children may be “normal” (since reactive aggression is more normative in younger children) and may be clouding the data for RA and PA

correlates in the kindergarten sub-sample. This hypothesis can be informed by a recent large study using semi-parametric group-based modelling (SPGB) based on mothers' CBCL ratings of physical aggression for children aged two to nine (NICHD, 2004). The authors found a general pattern of desistence over this period, with all five trajectory groups showing some decrease in their CBCL Aggression scores over time. Group-based modelling identified two groups that I interpret as problem groups – a small group with high scores and a stable trajectory (3% of the sample), and a group with moderate CBCL Aggression scores and a slightly declining trajectory (15% of the sample). The groups that I interpret as non-problem groups included a group with moderate scores and a sharply-declining trajectory (12% of the sample), and two other groups that showed low and slightly-declining trajectories (comprising 70% of the sample). The problem with explaining the current findings with reference to desistence of the “moderate sharp-decliners” is that most of the decline for this group occurred just before, rather than just after, kindergarten. Thus it is possible, but somewhat inconsistent with this study, that such children are reducing the effect sizes for RA in kindergarten because they are mistaken for children on moderate and high trajectories (18% of children)¹⁰.

Another variant of the hypothesis that items worked differently across the age/grade groups is that children displaying reactive aggressive behaviour in kindergarten are displaying behaviour that is rated as proactive-aggressive in the

¹⁰ Notable features of the NICHD (2004) study that differ from the current study are that it relied exclusively upon parent (CBCL) ratings and that it included girls as well as boys. In the current study, CBCL ratings of Aggression detected RA only, and did not detect PA that was detected by TRF ratings.

first and second grades. Vitaro, Brendgen, and Barker (2006) cite evidence that RA in one year is predictive of subsequent PA in the next year, whereas PA does not predict subsequent RA (Lansford, Dodge, Petit, & Bates, 2002). They go on to speculate that this may indicate, "...that RA developmentally precedes PA...[and that] an increase in self-regulatory capacity with age and a parallel increase in social pressure to inhibit tantrums may foster a general decline in RA...though PA may be stable or even increase...such that RA and PA become increasingly differentiated" (p. 16). I would only add what Vitaro et al. (2006) seem to imply, which is that only the most impaired children would persist in RA such that increasing divergence in correlates would be expected for all variables (though that was not exactly the case for Internalizing).

Finally, kindergarten teachers' perceptions of aggressive behaviour and/or ABS items may differ in important ways from teachers of the first and higher grades. Kindergarten teachers may, for example, be more forgiving of some and not other forms of aggressive behaviour – viewing reactive behaviours as temporary adjustment reactions to the transition to school life, but maintaining a deviant view of more callous and proactive-aggressive behaviours. The net effect could be one whereby RA items would detect PA to a greater extent than in older grades. Other rater biases may operate due to the qualitative differences in the experiences of kindergarten teachers and those of other grades. Future studies that utilize both observational methods and teacher-ratings to identify RA and PA could test such hypotheses.

Limitations and future directions:

The most problematic limitation of this study and others attempting to study RA / PA with community samples, is the limited variance of PA behaviours in comparison with RA. Indeed, the base rate for problematic PA is low and/or more difficult to detect using teacher ratings. Thus divergent correlates may be an artefact of this problem rather than true divergence. This problem can be addressed with larger samples and more sensitive measurement (assuming detection failure is part of the problem).

The unexpected moderation of correlates by age signals a need for more subjects in the youngest and oldest groups – a need that was not recognized at the outset of this study. The fact that there were so few children in these groups is clearly a limitation in hindsight as it limited power to detect age moderation that was not anticipated. The Stop Task variables seem to provide a clear example of age moderation that apparently occurred, but was not statistically significant due to low numbers at the extreme ends of the regression line.

The need to improve teacher ratings – to reduce misclassification that was thought to be occurring – was recognized at the outset of this study, and this was the goal behind including the qualitative description items. Oblique RA and PA components did not appear to be separated much by including these additional items, however, and the degree of failures to detect and/or correctly classify aggressive behaviours remains unknown. Such error also remains a principal concern since it very quickly neutralizes the ability to detect relations that differ in direction of effect.

The apparent qualitative shift in relations between RA/PA and correlates from kindergarten to the first and second grade signals an even more strongly felt need to know more about how teacher-rated items behave at different ages, and for teacher ratings to be supplemented by observer ratings in order to tease apart the possible explanations for this shift. Teacher-rated items that can be counted on to work similarly across age groups may ultimately be discovered and validated through research that combines these methods. Longitudinal, multi-informant study would, of course, also address many of the questions raised by the current findings.

Multi-informant study, including observations, will be required in order to replicate and investigate the finding that reactive aggression was associated with denial of victimization, whereas proactive aggression was not, and if this behaviour is related to other indices of neuroticism (Little, et al., 2003; Miller & Lynam, 2006).

Future studies could measure autonomic reactivity as a way of testing hypotheses about children who display both RA and PA. Since one cannot be both physiologically over- and under-reactive, It will be interesting to see if such measures reveal RA and PA to be mutually exclusive as they would seem to, and to examine how the outcome variables measured here correlated with these physiological dimensions. Study of the physiological correlates of RA and PA may ultimately enable identification of effective rating scale items such that this kind of intrusive measurement is rendered unnecessary.

Conclusions

This study adds some validity support to claims that there are separable reactive and proactive-aggressive syndromes that have quite different developmental pathways and outcomes. Social cognitive ability and inhibitory control may play a role in the pathway to reactive aggression and do not appear to do so for proactive aggression. Further attention to each of these domains is warranted on the basis of the present results.

The problem of overlap between RA and PA scores for children was not measurably improved through use of prototype descriptions as teacher-rated items. If this persistent overlap problem can be interpreted as resulting from rater-error, then the divergent correlates in this study were found in spite of this error and are expected to become more robust if measurement can be improved. There are at least two promising ways of accomplishing this, including use of physiological measures and observer ratings. These intrusive and labour-intensive methods may in turn help to identify better teacher-rated items.

If the correlates for RA and PA do in fact diverge as expected when measurement improves, then many of the negative long-term outcomes for childhood aggression may need to be re-interpreted and re-examined. It may be that links with long term negative outcomes are much stronger for reactive aggression than for proactive aggression, and much stronger for RA than originally thought on the basis of studies that have looked at outcomes for undifferentiated aggressive syndromes.

Replication of unique links between RA and emotional and social problems highlights the self-perpetuating and exacerbating aspect of RA that further separates it from PA, and that increases clinical concern and the need for early and accurate identification. Unfortunately, routinely-used clinical measures (e.g., the TRF, and to a lesser extent, the CBCL) do not appear to adequately distinguish RA from PA. Efforts to develop and validate clinical measures that can do so should continue.

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APPENDICES

Appendix A - Aggressive Behavior Scale

Child's name or ID _____ Date _____

Rated by (teacher) _____ School _____

Part 1. Please consider the descriptions contained in each of the following items below and rate the extent to which each of these descriptions applies to this child. Please circle only one response per item.

	1	2	3	4	5	
	<u>Doesn't apply</u>	<u>Rarely applies</u>	<u>Applies sometimes</u>	<u>Often applies</u>	<u>Certainly/always applies</u>	
1	2	3	4	5		1. When this child has been teased or threatened, he gets angry easily and strikes back
1	2	3	4	5		2. This child claims that other children are to blame in a fight and that they started the trouble
1	2	3	4	5		3. This child gets angry when corrected
1	2	3	4	5		4. This child is irritable, and quick to "fly off the handle"
1	2	3	4	5		5. This child gets mad when s/he doesn't get his/her own way
1	2	3	4	5		6. This child exposes him/herself to harm (e.g., from stronger children) when aggressive
1	2	3	4	5		7. This child bullies other children
1	2	3	4	5		8. This child threatens other children
1	2	3	4	5		9. This child uses force to dominate other children
1	2	3	4	5		10. This child hides aggressive acts
1	2	3	4	5		11. This child plays mean tricks on other children
1	2	3	4	5		12. This child picks on smaller kids

*** PLEASE COMPLETE THE OTHER SIDE ***

Part 2. Please read the following narrative descriptions and indicate how well they describe this child. Please circle only one response per item

1. This child seems to engage in impulsive aggression – aggression that is unplanned and “out of the blue”. When aggressive, this child “flies off the handle” and his aggression is often accompanied by visible signs of anger, distress, or sulking. This child seems easily provoked and may sometimes misperceive benign actions as provocations. This child’s aggression seems to be self-defeating – it brings negative reactions from others that may include more of the provocations that led to aggression in the first place. Other kids may take pleasure in “getting a rise out of” this child.

To what extent does the above describe this child?

1 **2** **3** **4** **5**
not at all somewhat very well

2. When this child is aggressive, actions are usually well planned, and occur without the display of anger or sadness. This child’s aggression doesn’t seem to be “provoked” – s/he seems to be the one doing the provoking. You may suspect that this child is involved in an aggressive act, but he “covers his tracks” well. This child seems to be “on the ball” socially. Aggression doesn’t seem to adversely affect social status and it may bring positive social consequences. Some children may not like this child (particularly his victims), but you get the sense that s/he could gain their approval if he wanted to.

To what extent does the above describe this child?

1 **2** **3** **4** **5**
not at all somewhat very well

Appendix B – Additional Parent Questions

PARTICIPANT CODE _____

SFU Study - Parent Questionnaire 2

1. Please DESCRIBE any concerns you might have about your child's social skills, social behaviour and/or social development

2. How concerned are you about (1)? mildly moderately extremely

2. Has your child received a behavioral or mental health diagnosis?

a. no yes (please describe) _____

b. If YES to 2a, What type of professional provided this diagnosis?

GP Psychiatrist Pediatrician Psychologist

Other (PLEASE DESCRIBE) _____

3. Does your child receive medication for a behaviour problem or mental health diagnosis? (e.g., Ritalin)?

no yes (please describe) _____

4. Were any of the forms hard to read and/or understand for you?

no yes (please describe or say how / why) _____

Appendix C – Social Understanding Task Protocol

Inference task

Summary:

This task requires children to make a simple inference, and to predict another person's simple inference.

Two boxes and a pair (e.g., a blue and a yellow highlighter) of items are on the table

Essentially, 1) children look away; 2) items are hidden in the boxes; 3) one, both or neither child gets to look in his own box; and, 4) the testee is questioned about what he and his partner "know" about the contents of each other's box

The testee gets 4 trials where "who gets to look in their box" is what varies over trials – (i.e., both people look, only the testee looks, only the partner looks, or neither child looks)

Record Form:

Both Look trials:

Q1: Do you know what color is inside [partner's name] box? [TOUCH PARTNER'S BOX]

If YES, then

Q2: What colour?

Q3: How do you know that?

If NO, then

Q2: Why don't you know that?

Now, remember that [partner's name] had a look inside his box.

Q4: Does [partner's name] know what's inside your box? [TOUCH TESTEE'S BOX]

If YES, then

Q5: What colour?

Q6: How does he know that?

If NO, then

Q5: Why doesn't he know that?

Partner Looks Trials:

Q1: Do you know what color is inside [partner's name] box? [TOUCH PARTNER'S BOX]

If YES, then

Q2: What colour?

Q3: How do you know that?

If NO, then

Q2: When you open your box, and look inside it, will you know what color is inside [partner's name] box?

Q3: How will you know that? OR Why won't you know that?

Now, remember that [partner's name] had a look inside his box.

Q4: Does [partner's name] know what's inside your box? [TOUCH TESTEE'S BOX]

If YES, then

Q5: What colour?

Q6: How does he know that?

If NO, then

Q5: Why doesn't he know that?

Testee Looks Trials:

Q1: Do you know what color is inside [partner's name] box? [TOUCH PARTNER'S BOX]

If YES, then

Q2: What colour?

Q3: How do you know that?

If NO, then

Q2: Why don't you know that?

Now, remember that [partner's name] has not looked inside his box

Q4: Does [partner's name] know what's inside your box? [TOUCH TESTEE'S BOX]

If YES, then

Q5: What colour?

Q6: How does he know that?

If NO, then

Q5: When partner opens his box and looks inside, will he know what color is inside your box?

Q6: How will he know that? OR Why won't he know that?

Nobody Looks trials:

Q1: Do you know what color is inside [partner's name] box? [TOUCH PARTNER'S BOX]

If YES, then

Q2: What colour?

Q3: How do you know that?

If NO, then

Q2: Why don't you know that?

Now, remember that [partner's name] has not looked inside his box

Q4: Does [partner's name] know what's inside your box? [TOUCH TESTEE'S BOX]

If YES, then

Q5: What color?

Q6: How does he know that?

If NO, then

Q5: When partner opens his box and looks in, will he know what color is inside your's?

Q6: How will he know that? OR Why won't he know that?

Belief based emotion task

Summary:

The story involves a "mean surprise", where a character has a false belief that he is about to get a positive outcome and children must predict the feeling that goes with the naïve belief

The story requires two puppets (Larry Lion and Chris Crocodile), a miniature Coke can, a miniature mild carton.

Record form:

This is a story about two friends, Chris the Crocodile and Larry the Lion. Chris is a very naughty crocodile, and likes to play tricks on his friend Larry. Now, Larry really likes Coke, mmmm. In fact it's his very favourite drink. Look! Here is Larry's can of Coke.

Q1: How does Larry feel when he gets a can of Coke?

Larry doesn't like any other drinks though and he really doesn't like milk, yuck! Yuck!. Look here's some milk.

Q2: *How does Larry feel when he gets some milk?*

One day, Larry went out for a walk, and naughty Chris decided to play a trick on his friend Larry. He poured out the coke, "Pssssshhhh!" and instead he poured in some milk, "Glug-glug-glug". Then he put the milk away and went outside to watch Larry through the window. Now when Larry comes back from his walk, he's really thirsty. He can see the can on the table, but he can't see what's inside the can.

Q3a: *When Larry first comes back from his walk, how does he feel—*

Q3b: *Does he feel happy or not happy?*

If HAPPY, then ASK **Q4:** *Why does he feel happy?*

If NOT HAPPY, then SAY "Actually, he feels great and happy!" and ASK **Q4:** *Why does he feel happy?*

Q5: *What does Larry think is in the can?*

Q6: *What's in the can really?*

Q7: *How does Larry feel after he's had a drink—happy or not happy?*

Q8: *Why is he happy / not happy?*

Ambiguous reference task:

Summary:

This task involves a character who makes an ambiguous reference that confuses another character. Children are asked to explain the confusion

The task requires puppets Maxi and Mary, two blocks, and two playing cards

Step by step protocol:

SHOW MAXI AND MARY PUPPETS – BOTH ARE ABOVE THE TABLE

SAY: *Now we are going to play a game with Maxi and Mary. While they are under the table and can't see and you look away, I will hide a sticker under*

one of these cards. Then they can come out and I will give them a clue about where to look for the sticker

HIDE THE STICKER UNDER THE CARD WITH A LARGE RED BLOCK

SAY Okay Maxi & Mary, the clue is "The sticker is under the card with the big block"

MAXI REMAINS UNDER THE TABLE

SAY Mary, show us where you think the sticker is

MARY SAYS: *I think the sticker is under the card with the big red block*

MAXI COMES OUT AND MARY GOES UNDER THE TABLE

SAY Okay, Maxi, you show us where you think the sticker is

MAXI SAYS: *I think it's under the card with the big blue block*

A. ASK Explanation questions:

SAY I told them that the sticker is under the card with the big block.

Q1: *Why does Mary think the sticker is under the card with the big red block and at the same time Maxi thinks it's under the card with the big blue block?*

Q2: *Is it silly for Mary to say one thing and Maxi to say something else?*

Q3: *Why?* PROBE AS REQUIRED TO ASSESS CHILD'S UNDERSTANDING OF DIFFERENT INTERPRETATION

B. ASK Prediction Questions:

SAY Mary thinks it's under the card with the big red block, and Maxi thinks it's under the card with the big blue block. Now we will tell Charlie that the sticker is under the card with the big block.

Q4: *Would you know what Charlie would say –do you think she would say it's under the card with the big blue block or the card with the big red block?*

IF CHILD TAKES A POSITION, ASK

Q5: *How can you tell what she will think?*

IF CHILD SAYS "I DON'T KNOW" OR EQUIVALENT, ASK

Q6: *Why is it hard to tell what she would think?*

C. Deviant Interpretation (check comprehension)

Remember we said the sticker is under the big block? Well, Joe says the sticker is under the card with the small red block.

Q7: *Is that silly or not silly?*

Q8: *Why?*

Doodles Task

Summary:

This task requires children to predict and explain what a character will think about a picture when they haven't seen the whole thing. Children often have trouble with it because they have seen the whole thing, and (younger children) will assume that others know what they know.

The task requires two pictures, two envelopes with square holes cut out (which allow for a restricted view of the picture inside), and two dolls or puppets.

For the first picture, you show the child the full view and then show the doll the restricted view before asking the child about what the doll thinks.

The second picture is the same, except the child gets the restricted view first and tries to guess what the whole picture is. Then, you show the child the full view, show the doll the restricted view and ask the child about what the doll thinks.

Record Form:

PICTURE 1: (Ship saving a drowning witch) – DON'T SHOW YET

SAY: *Here are Charlie and Larry. I want you to pretend that these dolls are real people just like you and me. That means that they see and hear and know things just like real people. Okay? They live together in this box—their doll house. When Charlie and Larry are inside their house, they can't hear what we're saying, and they can't hear what we're doing.*

PLACE DOLLS IN BOX

SAY: *Okay, we're going to look at some pictures together. Charlie and Larry have not seen these before.*

SHOW CHILD FULL PICTURE

ASK: *What's this a picture of?*

CORRECT IF NECESSARY (e.g., "This is a ship and this is a witch...")

DIRECT ATTENTION TO RELEVANT PARTS

PUT DROODLE BACK IN ENVELOPE

SAY: *Good. Now I'm going to cover up the picture so we can see only this very small part of it, okay? Now remember that Charlie and Larry have never seen this picture before. We're going to show it to them, but all they're going to see is this right here –POINT TO HOLE (THE PART THAT DOLLS WILL SEE)*

SAY: *Let's get Charlie out of the house and show her the picture first.*

GET Charlie

SAY: *So Charlie has never seen this picture before*

Q1: *What will she say this is?*

Q2: *POINT TO PARTS – What will Charlie say this part is...and this part?*

PUT CHARLIE BACK

SAY: *Now let's get Larry out of the house and show him the picture*
GET LARRY

SAY: *So Larry has never seen this picture before*

Q3: *What will Larry say this is?*

Q4: POINT TO PARTS – *What will Larry say this part is...and this part?*

IF SAME RESPONSE AS FOR CHARLIE

Q5: *Could Larry say something different? What else could he say?*

RETURN DOLLS TO BOX

PICTURE 2: (Elephant sniffing a watermelon)

PRESENT DROODLE (RESTRICTED VIEW)

SAY: *What's this a picture of?* [DIRECT ATTENTION TO RELEVANT PARTS]

SAY: *That's good, have another guess*—RECORD TWO GUESSES

SAY: *Good. Here's the whole picture.* SHOW FULL VIEW

PUT DROODLE BACK IN ENVELOPE

SAY: *Good. Now, I'm going to cover the picture again so we can see only this very small part of it, okay? Now remember that Charlie and Larry have never seen this picture before. We're going to show it to them, but all they're going to see is this right here.*

GET CHARLIE FROM HOUSE

SAY: *Let's get Charlie out of the house and show her the picture first*

SAY: *So Charlie has never seen this picture before.*

Q1: *What will Charlie say this is?*

Q2: *What will Charlie say this part is...and this part? (trunk and watermelon parts)*

PUT CHARLIE TO THE SIDE

SAY: *Now let's get Larry out of the house and show him the picture* GET LARRY

SAY: *So Larry has never seen this picture before.*

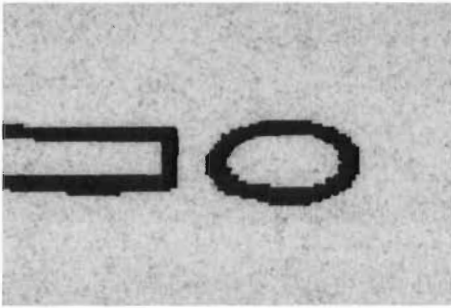
Q3: *What will Larry say this is?*

Q4: *What will Larry say this part is....and this part? (trunk and watermelon parts)*

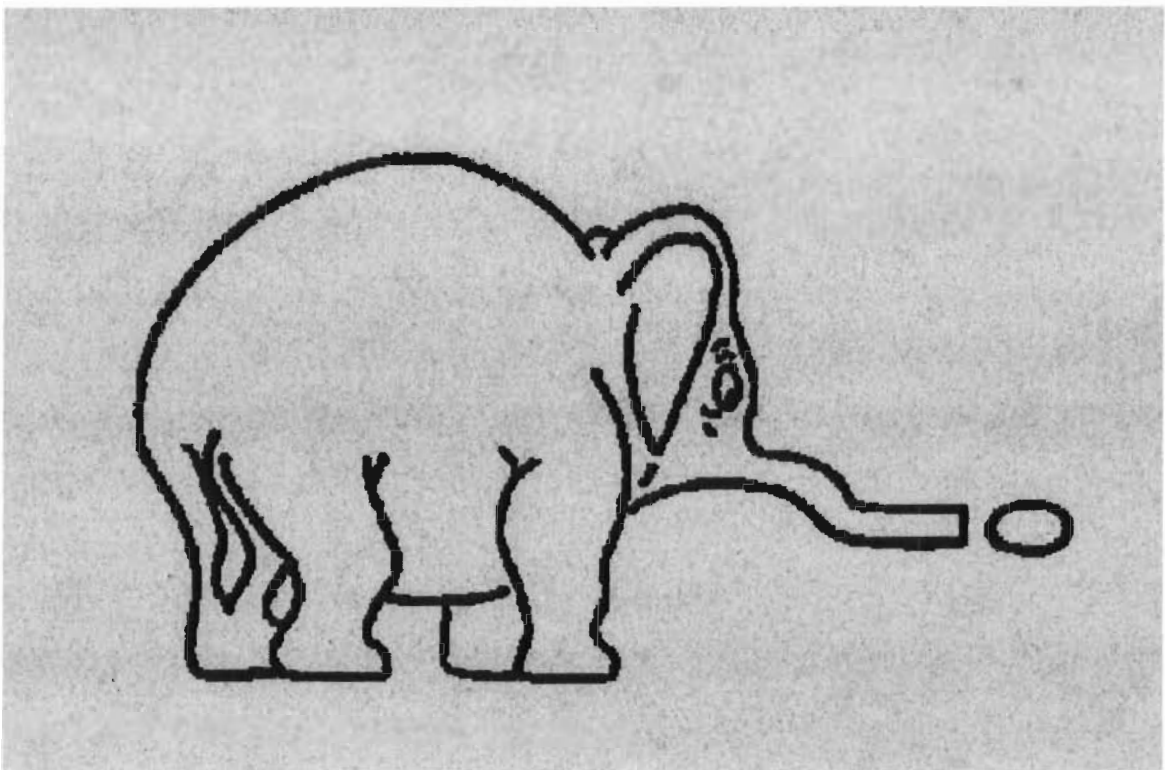
Q5: *Remember when I first showed you this [SHOW RESTRICTED VIEW AGAIN]? What was your first guess? What was your second guess?*

Appendix D – Visual Stimuli for Doodles Task

Elephant Condition – Restricted View



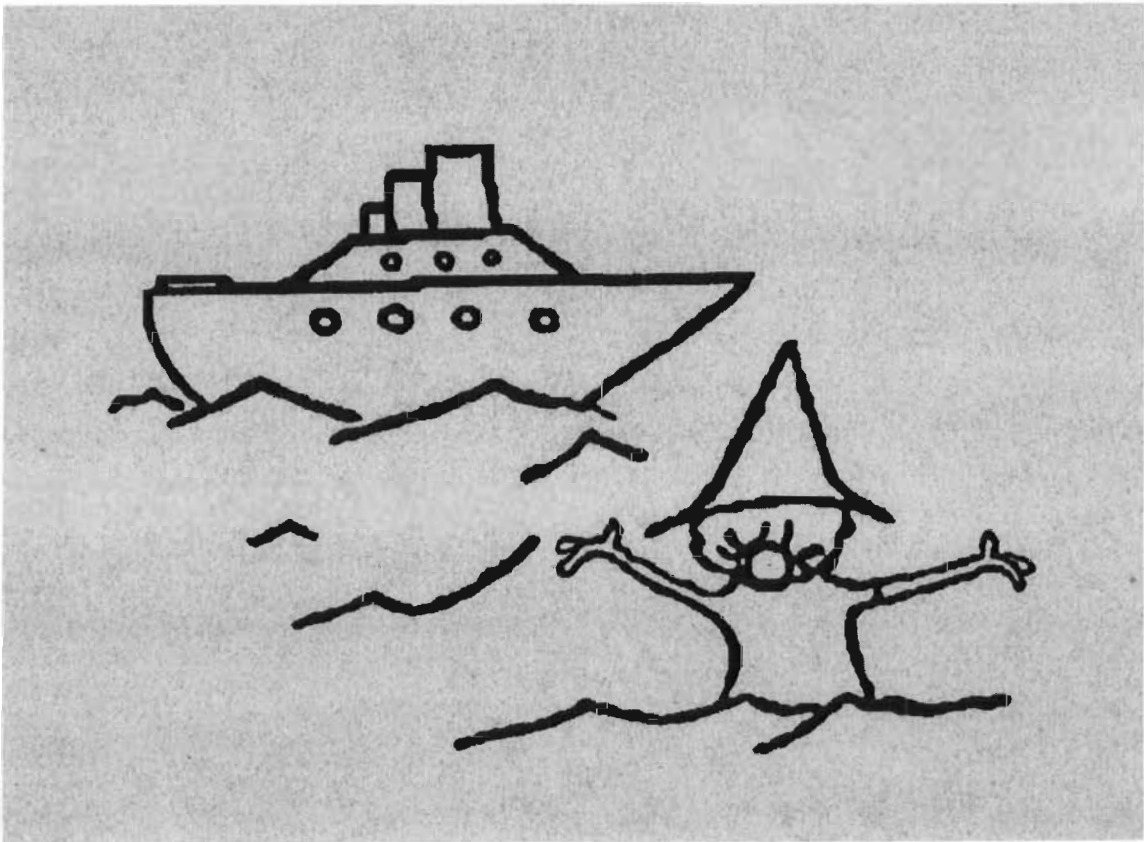
Elephant Condition – Unrestricted View



Ship Condition – Restricted View



Ship Condition – Unrestricted View



Appendix E – Social Cognitive Coding Manual and Variable Creation

Social Cognitive Composite:

This variable was created by summing children's standard scores (i.e. their z-score) for all four social cognitive tasks: the Inference Task, the Belief-Based Emotion Task, the Ambiguous Reference Task, and the Doodles Task.

Non-Interpretive Composite:

This variable was created by summing children's standard scores for the two non-interpretive tasks – the Inference Task, and the Belief-Based Emotion Task.

Inference task:

The inference task performance variable was created by summing the scores for each of the items below.

Testee looks condition:

Q1: *Do you know what colour is inside [partner's name] box?*

Children are scored 1 for affirming their own inference and 0.5 for beginning with "no" and then spontaneously changing their mind (or lapsing, and then correcting, so long as the "final answer" is correct).

Q3: *How do you know that?*

Children are awarded one point for correctly explaining their own inference with reference to seeing their own box OR there being just two colours; children only have to refer to one of these elements to get one point; no part marks were given for explanations

Q4: *Does [partner's name] know what's inside your box?*

Children are awarded one point for denying their partner's ability to make an inference. They are given 0.5 for beginning incorrectly, and then spontaneously changing their mind

Q5: *When partner opens his box and looks inside, will he know what colour is inside your box?*

Children are awarded one point for correctly predicting their partner's inference, and part marks (0.5) for correcting initially erroneous responses (or lapsing, and then correcting, so long as the "final answer" is correct)

Q6: *How will he know that? OR Why won't he know that?*

Children are awarded one point for correctly explaining their partner's future inference with reference to his seeing his own box OR and there being just two colours; children only have to refer to one of these elements.

Nobody looks:

Q1: *Do you know what colour is inside [partner's name] box?*

Children are scored 1 for correctly denying their own ability to make an inference and 0.5 for beginning with "no" and then spontaneously changing their mind (or lapsing, and then correcting, so long as the "final answer" is correct).

Q3: *Why don't you know that?*

Children are awarded one point for correctly explaining their inability to make an inference with reference to not having seen their own box and having no basis to make an inference. Responses that indirectly conveyed children's lack of basis for making an inference (e.g., "I'm not a mindreader") are given one point.

Q4: *Does [partner's name] know what's inside your box?*

Children are awarded one point for denying their partner's ability to make an inference. They are given 0.5 for beginning incorrectly, and then spontaneously changing their mind

Q5: *When partner opens his box and looks inside, will he know what colour is inside your box?*

Children are awarded one point for correctly predicting their partner's inference, and part marks (0.5) for correcting initially erroneous responses (or lapsing, and then correcting, so long as the "final answer" is correct)

Q6: *How will he know that? OR Why won't he know that?*

Children are awarded one point for correctly explaining their partner's inference with reference to his seeing his own box OR and there being just two colours; children only have to refer to one of these elements.

Both look condition:

Q1: *Do you know what colour is inside [partner's name] box?*

Children are scored 1 for correctly affirming their own inference and 0.5 for beginning incorrectly and then spontaneously fixing their response (or lapsing, and then correcting, so long as the "final answer" is correct).

Q3: *How do you know that?*

Children are awarded one point for correctly explaining their own inference with reference to seeing their own box OR there being just two colours; children only had to refer to one of these elements to get one point

Q4: *Does [partner's name] know what's inside your box?*

Children are awarded one point for correctly affirming their partner's ability to make an inference. They are given 0.5 for beginning incorrectly, and then spontaneously fixing their response

Q6: *How does he know that?*

Children are awarded one point for correctly explaining their partner's inference with reference to his seeing his own box OR and there being just two colours; children only had to refer to one of these elements.

Partner looks condition:

Q1: *Do you know what colour is inside [partner's name] box?*

Children are awarded one point for correctly denying their ability to make an inference and 0.5 for beginning incorrectly, and then fixing their answer (or lapsing, and then correcting, so long as the "final answer" is correct).

Q2: *When you open your box, and look inside it, will you know what colour is inside [partner's name] box?*

Children are awarded one point for correctly affirming their future ability to make an inference. Part marks were given for "lapses" with spontaneous repair

Q3: *How will you know that?*

Children are awarded one point for correctly explaining their future inference with reference to their being able to look in their own box, and OR there being just two colours. Children just had to refer to one of these elements for a full mark.

Q4: *Does [partner's name] know what's inside your box?*

Children are awarded one point for correctly affirming their partner's ability to make an inference. Part marks are given for lapses with spontaneous repair.

Q6: *How does he know that?*

Children are awarded one point for explaining their partner's inference with his having looked in his own box, and that there are two colours. Children must refer to just one of these elements.

Belief-based emotion task:

Belief-based emotion task performance was calculated by taking the sum of Question 3a, twice Question 3b, Question 4 and Question 5. Extra weight was given 3b due to the focus of the task being the emotion based on the false belief.

If children failed Q6 and Q7, their overall score was recoded as "0".

Q3a: *"How does he feel?"*

Children were awarded one point for answering with “happy” or some variant of positive emotion (e.g., “he’s excited about his coke”) without needing the subsequent question. Children were scored zero if they did not.

Q3b: *“Is he happy or not happy?”*

Children were awarded one or zero points for their choice here.

Q4: *Why is he happy?*

Children were awarded two points if they made an explicit reference to Larry’s beliefs or thoughts about the contents of the can (e.g., “because he thinks he has coke”); children were awarded one point for an implied belief (e.g., “because he likes his coke”); children received a score of zero if there was no recognition of the connection of his feeling to his belief about the contents of the can (e.g., “He had a nice walk”).

Q5: *“What does Larry think is in the can?”*

Children received one point for correctly stating that Larry believes coke is in the can; children received a score of zero if they could not do this.

Q6 and 7: *“What’s really in the can?” and “How does Larry feel after he’s had a drink – happy or not happy?”*

Children who passed these items were able to keep their scores from previous items. Children who failed these “check” questions, were presumed to not have understood the task and were given a score of zero for the task.

Interpretive Composite:

This variable was created by summing children’s standard scores for the two Interpretive social cognitive tasks: the Ambiguous Reference Task, and the Doodles Task.

Ambiguous Reference Task:

The Ambiguous Reference Task performance variable was created by summing children’s scores for explaining the characters’ confusion (scored out of 2), accepting versus not accepting the characters having different interpretations of an ambiguous stimulus (scored as 1 or 0), and acknowledging the difficulty involved in predicting a third character’s interpretation of an ambiguous stimulus (scored out of 2).

Children who failed the “check” question were assumed to have passed other items accidentally and so their overall scores for the task were set to zero. There were 9 children who failed the check questions, but only one child who had obtained any credit for prior questions – and both of these responses were

ambiguous as to their being accidental or reflecting understanding. This one child's score was set to zero.

Q1: *Why does Mary think the sticker is under the card with the big red block and at the same time Maxi thinks it's under the card with the big blue block?* Children were awarded two points for explaining the confusion by pointing out the ambiguity somehow (e.g., "They're both big", or "They don't know which one"). Children (31 children in total) were awarded one point for responses that attempted to explain the character's different choices with personal preferences or characteristics (as these responses may reflect an implicit understanding of the interpretation but were deemed to reflect possibly less than full understanding of ambiguity in comparison with children who explicitly pointed to the ambiguous nature of the message). Examples included "That's her / his favourite colour" and "He was closer to that one"). Children were scored zero for responses that used distortions and/or that denied the possibility of true ambiguity (e.g., "This one is bigger"; "He's right and she's wrong").

Q2: *Is it silly for Mary to say one thing and Maxi to say something else?* Children were awarded one point for saying it's not silly or it's okay and zero points for saying it was silly or not okay. Children did not have to explain why it wasn't silly or why it was okay in order to receive credit, though this question was asked and their responses were often helpful in determining their understanding.

Q4: *Mary thinks it's under the card with the big red block, and Maxi thinks it's under the card with the big blue block. Now we will tell Charlie that the sticker is under the card with the big block. Would you know what Charlie would say? – do you think she would say it's under the card with the big blue block or the card with the big red block?*

Q5: *How can you tell what she will think?*

Q6: *Why is it hard to tell what she would think?*

These three questions were used to determine children's understanding of the difficulty in predicting another's interpretation of an ambiguous message. Children were awarded two points for showing full understanding of the difficulty in predicting another's interpretation (e.g., "I can't read his mind!" or "There's two big blocks!"). Children who began with prediction but then came to clearly appreciate the interpretive nature of the situation were given full marks. Children were awarded one point if they suggested that prediction was possible, but, provided some evidence of understanding that full prediction was not possible. Children were scored zero if they took a definite position as to what Charlie would choose and showed no understanding of why it would be hard to predict in their responses to the three questions.

Q7: *Remember we said the sticker is under the big block? Well, Joe says the sticker is under the card with the small red block. Is that silly or not silly?*

Q8: Why?

This comprehension check question assessed whether children understood that “small red block” was not a valid interpretation of the message “big block”. Children who failed to demonstrate understanding were coded as having misunderstood the whole task, and were coded as zero overall.

Doodles task:

The Doodles task performance variable was created by summing children’s score for the two puppets’ predictions in two conditions (i.e., four predictions; scored out of two), children’s acceptance of the puppets having different interpretations of the ship / witch picture, and children’s memory of their own “ignorant” interpretations before being shown the full picture of the elephant / watermelon.

For the four prediction questions:

Q1: *What will Larry / Charlie say this is?*

Q2: *What will Larry / Charlie say this part is...and this part?*

Children were awarded two points if they provided interpretations for Larry and Charlie that were free of “privileged” information (i.e., contained no reference to ships or witches or elephants and watermelons). Children were awarded one point if they seemed aware that Larry or Charlie didn’t know “everything”, but lapsed into privileged information at some point. Children were scored as zero if they showed no awareness that the puppet didn’t have knowledge of the full view.

Q5: *Could Charlie say something different?*

Children were automatically awarded two points if they had already provided different and correct interpretations for the two puppets. They were also given two points if they had provided identical interpretations, but then on questioning, acknowledged the possibility of Charlie saying something different. Children were given one point for simply “reversing” the two elements. Children were scored zero for this item if their responses began with acknowledgement of diverse interpretation before “lapsing” into privileged information (i.e., references to boats and witches) or if they denied that Larry and Charlie could differ.

Q5: *Remember when I first showed you this? (Showing restricted view)*

What was your first guess? What was your second guess?

Children were awarded one point for correct recall of their two guesses (two points total).

Appendix F – Victimization Measures

Victimization Self-Report

1. There's one or some kids who say mean things and call me names and stuff

1	2	3	4	5
never	once or twice	a few times	few times per week	many times per week
1	2	3	4	5
don't care at all	don't care much	bothers me a little	it bothers me	bothers me very much

2. There's one or some kids who tell me they are going to hurt me

1	2	3	4	5
never	once or twice	a few times	few times per week	many times per week
1	2	3	4	5
don't care at all	don't care much	bothers me a little	it bothers me	bothers me very much

3. There's one or some kids who say they'll hurt me unless I give them things (like food or other things of mine)

1	2	3	4	5
never	once or twice	a few times	few times per week	many times per week
1	2	3	4	5
don't care at all	don't care much	bothers me a little	it bothers me	bothers me very much

4. There's one or some kids who come up to me and hurt me (pinch, push or hit)

1	2	3	4	5
never	once or twice	a few times	few times per week	many times per week
1	2	3	4	5
don't care at all	don't care much	bothers me a little	it bothers me	bothers me very much

5. There's one or some kids who hit, kick or push me in a mean way

1	2	3	4	5
never	once or twice	a few times	few times per week	many times per week
1	2	3	4	5
don't care at all	don't care much	bothers me a little	it bothers me	bothers me very much

6. There's one or some kids who grab or hold me in a way that I don't like

1	2	3	4	5
never	once or twice	a few times	few times per week	many times per week
1	2	3	4	5
don't care at all	don't care much	bothers me a little	it bothers me	bothers me very much

7. There's one or some kids that chase me to try and hurt me

1	2	3	4	5
never	once or twice	a few times	few times per week	many times per week
1	2	3	4	5
don't care at all	don't care much	bothers me a little	it bothers me	bothers me very much

8. There's one or some kids who tell each other mean things about me

1	2	3	4	5
never	once or twice	a few times	few times per week	many times per week
1	2	3	4	5
don't care at all	don't care much	bothers me a little	it bothers me	bothers me very much

9. There's one or some kids who don't let me play with them

1	2	3	4	5
never	once or twice	a few times	few times per week	many times per week
1	2	3	4	5
don't care at all	don't care much	bothers me a little	it bothers me	bothers me very much

10. There's one or some kids who don't ask me to play too even when they are playing right in front of me

1	2	3	4	5
never	once or twice	a few times	few times per week	many times per week
1	2	3	4	5
don't care at all	don't care much	bothers me a little	it bothers me	bothers me very much

11. There's one or some kids who play mean tricks that hurt me or scare me

1	2	3	4	5
never	once or twice	a few times	few times per week	many times per week
1	2	3	4	5
don't care at all	don't care much	bothers me a little	it bothers me	bothers me very much

12. There's one or some kids that don't answer when I ask if I can play with them

1	2	3	4	5
never	once or twice	a few times	few times per week	many times per week
1	2	3	4	5
don't care at all	don't care much	bothers me a little	it bothers me	bothers me very much

I find that the best way to make these problems better is to: _____

Victimization Parent-Report

With regard to your child, please rate how often the following negative social events occur and how much you believe they bother or distress him / her

To protect privacy, please don't put your child's name on this paper

1. Peers say mean things and call your child names

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

2. Peers spread rumors about your child

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

3. Peers threaten your child

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

4. There are peers who threaten to hurt your child unless s/he gives them things (like food or other things of his / hers)

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

5. Peers chase your child with the threat of hurting him / her

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

6. Peers play mean tricks that hurt or scare your child

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

7. Peers physically hurt your child (pinch, push or hit)

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

8. Peers don't let your child play with them when s/he asks to join

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

9. Peers don't invite your child to join play activity - perhaps even when playing nearby

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

10. Peers ignore your child when s/he indicates a desire to join in activity

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

Victimization Teacher-Report

With regard to this child, please rate how often the following negative social events occur and how much you believe they bother or distress him

To protect privacy, please don't put this child's name on this paper

1. Peers say mean things and call this child names

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

2. Peers spread rumors about this child

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

3. Peers threaten this child

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

4. There are peers who threaten to hurt this child unless s/he gives them things (like food or other things of his)

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

5. Peers chase this child with the threat of hurting him

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

6. Peers play mean tricks that hurt or scare this child

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

7. Peers physically hurt this child (pinch, push or hit)

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

8. Peers don't let this child play with them when he asks to join

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

9. Peers don't invite this child to join play activity - perhaps even when playing nearby

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

10. Peers ignore this child when he indicates a desire to join in activity

0	1	2	3	4	5
DON'T KNOW	never	once or twice	a few times	few times per week	many times per week
0	1	2	3	4	5
DON'T KNOW	doesn't seem to bother him	doesn't bother much	bothers him a little	it bothers him	it bothers him very much

Appendix G – Administration of Victimization Self-Report Items and Victimization Variable Groupings

Verbal threats and gossip – Child Questions:

2. There's one or some kids who tell me they are going to hurt me
3. There's one or some kids who say they'll hurt me unless I give them things (like food or other things of mine)
8. There's one or some kids who tell each other mean things about me

Verbal threats and Gossip – Parent and Teacher Questions:

1. Peers say mean things and call your child names
2. There are peers who threaten to hurt your child unless s/he gives them things (like food or other things of his / hers)
3. Peers threaten your child
4. Peers spread rumors about your child

Physical victimization – Child Questions

4. There's one or some kids who come up to me and hurt me (pinch, push or hit)
5. There's one or some kids who hit, kick or push me in a mean way
6. There's one or some kids who grab or hold me in a way that I don't like
7. There's one or some kids that chase me to try and hurt me
11. There's one or some kids who play mean tricks that hurt me or scare me

Physical victimization – Parent and Teacher Questions

5. Peers chase your child with the threat of hurting him / her
6. Peers play mean tricks that hurt or scare your child
7. Peers physically hurt your child (pinch, push or hit)

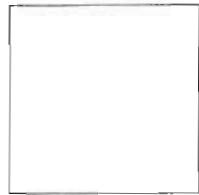
Exclusion – Child Questions

9. There's one or some kids who don't let me play with them
10. There's one or some kids who don't ask me to play too even when they are playing right in front of me
12. There's one or some kids that don't answer when I ask if I can play with them

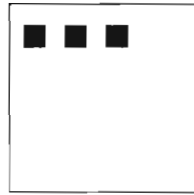
Exclusion – Parent and Teacher Questions

8. Peers don't let your child play with them when s/he asks to join
9. Peers don't invite your child to join play activity - perhaps even when playing nearby
10. Peers ignore your child when s/he indicates a desire to join in activity

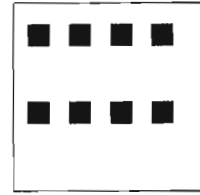
Appendix H – Visual Scaffold for the Self-reported Victimization Measure



NEVER



SOMETIMES



OFTEN



DON'T CARE



BOTHERS ME



BOTHERS ME A LOT

Dimensions: 8.5 x 11" (landscape orientation)