The relationship between cognition, achievement, and social competence in children.

By
Celin T. Gelgec
B.Appl.Sc. (Psych.) (Hons.)

School of Psychology
Deakin University
Melbourne Campus
Australia

Submitted in fulfilment of the requirements for the degree of
Doctor of Psychology (Clinical)

May, 2011
I am the author of the thesis entitled

‘The relationship between cognition, achievement, and social competence in children.’

submitted for the degree of

Doctor of Psychology (Clinical)

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For reasons unclear it is said that the ones we hold close are often the ones who bear the grunt. This seems undeniably true in my case, as my parents in particular will admit. Mum and Dad, although you found it difficult at times to understand the processes of this project, you still understood my motions and provided me with the love and support I needed. For this I am eternally grateful. My supervisor, Dr Jarrad Lum is another person who may if prompted admit to the vicissitudes of this project. It was a rough climb, but your knowledge and words of wisdom, (although at the time I may not have always thought they were wise), always managed to pull me through even when there were 15, 974kms between us. Thank you for your mentorship.

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Do language, attention and working memory indirectly affect social competence? 

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ABSTRACT

The primary aim of this thesis was to investigate the role of language, attention, and working memory in explaining the relationship between social competence and academic achievement in children. In considering the research that examined the relationship between social competence and academic achievement, it was identified that these studies did not seem to fully consider the research that has shown that children with poor academic achievement also have difficulties with cognitive functioning. This difficulty with cognitive functioning was argued to be associated with social competence. Two studies were conducted to address the aim of this thesis. The rationale for conducting Study 1 was to examine whether social competence and cognitive problems were present in children performing poorly at school. Twenty-five children with low academic achievement (LAA) and 25 typically developing (TD) children aged between 81 and 113 months participated in this study. All children were presented with standardised measures of IQ, language, attention, working memory, social competence, and academic achievement. The results showed differences between groups on all of the measures of cognition and academic achievement, and only on some measures of social competence. Despite these initial differences, the effects attenuated after controlling for learning. This indicates that after controlling for learning, the measures of cognition did not share a strong association with the measures of social competence. Study 2 extended Study 1 by considering whether language, attention, and working memory had a direct effect on children’s social competence irrespective of their academic achievement, or if these three cognitive processes had an indirect effect on children’s social competence through their association with academic achievement. An unselected sample of children aged between 75 and 115 months ($N = 104$) participated in Study 2 and were administered the same tests as for Study 1. Generally it was shown that the measures of cognition had a direct effect on skills based measures of social competence even after controlling for learning. An indirect effect was also shown between the measures of cognition and some
outcome measures of social competence through their association with academic achievement.

The results of this thesis re-affirmed the need to assess social competence as a multi-dimensional construct since cognition was not shown to have a uniform effect on social competence.
CHAPTER 1: ACADEMIC ACHIEVEMENT AND SOCIAL COMPETENCE IN PRIMARY SCHOOL AGED CHILDREN

Introduction

The research undertaken in this thesis is concerned with understanding the role cognitive abilities play in the relationship between academic achievement and social competence. Considerable importance is placed on children’s ability to succeed academically in their primary/elementary school years. Research has shown that academic failure during the formative years of schooling can have a negative effect on later years (Shonkoff & Phillips, 2000). Indeed, it has been shown that initial differences between high and low academic achievers in primary school account for later difficulties as children become older (Skibbe et al., 2008). Given this, it is important that the barriers to academic achievement in the primary school years are understood so that children who struggle in this area can be helped.

One aspect of primary education that has received considerable attention concerns the relationship between social competence and academic achievement (Kavale & Forness, 1996; Nowicki, 2003; H. L. Swanson & Malone, 1992). At a general level social competence can be considered as the efficacy of one’s social interactions with other people (Rose-Krasnor, 1997). A more complete definition along with associated controversies with defining this construct is to be presented in Chapter 2. Research has shown that children whom struggle academically often have problems with social competence (Gresham & Elliot, 1989; Nowicki, 2003). This means that some children in primary school are faced with both academic difficulties and problems with social interactions.

The relationship between social competence and academic achievement is not completely understood. Inspection of research undertaken in the learning disabilities (LD) literature indicates that a range of explanations have been forwarded to account for the
relationship. Some have proposed that academic achievement problems cause social
competence problems in children (Gresham, 1992; Gresham & Elliot, 1989), or that social
competence problems cause academic achievement problems (Gresham, 1992; Gresham &
Elliot, 1989; Gumpel, 2007); while others still considered deficits in these two areas to not
be causally related (Crick & Dodge, 1994; K. A. Dodge, 1986). One issue often overlooked
in this body of research is that children who struggle academically also present with a range
of other cognitive problems that most likely contribute to their academic problems (T.P.
Alloway & Gathercole, 2006; Aram & Nation, 1980; McGee & Share, 1988; H. L. Swanson,
1994). The principal research question addressed in this thesis is whether domain general
cognitive abilities that are related to academic achievement might also be related to social
competence problems in primary school aged children.

The outline of this thesis is as follows. First, before examining the research on social
competence and academic achievement, the theoretical and methodological issues associated
with social competence are examined. Specifically, Chapter 2 will address the problems
associated with conceptualising and operationalising social competence. A
multidimensional model is then presented as one way of overcoming the difficulties
discussed. This model was used to guide the selection of tests and the interpretation of
results in the studies undertaken in the empirical chapters. The research examining the
relationship between academic achievement and social competence is also reviewed in
Chapter 2. A key point forwarded in this chapter is that while much research demonstrates a
relationship between these two variables, the nature of the relationship is not completely
understood. It is suggested that domain general cognitive abilities, in particular language,
attention, and working memory may directly or indirectly be related to social competence.
Chapter 3 outlines the theory and supporting research that describes how language, attention,
and working memory may be related to social competence and academic achievement. The
relationship between cognitive functioning and social competence are tested in the empirical chapters. The first study, which is presented in Chapter 5, examines cognitive functioning and social competence in average and below average academic achievers. The rationale for conducting this study is to examine whether social competence and cognitive functioning are negatively affected in children performing poorly at school. The second study presented in Chapter 6 examines in detail whether language, attention, and working memory are directly or indirectly related to social competence. In Chapter 7 it was concluded that cognitive abilities have both a direct and indirect effect on social competence, depending on the outcome being measured.
CHAPTER 2: A REVIEW INTO THE SOCIAL COMPETENCE AND THE ACADEMIC ACHIEVEMENT OF PRIMARY SCHOOL AGED CHILDREN

This chapter reviews the evidence concerning the relationship between social competence and academic achievement. Before this literature is considered, a description of the problems associated with measuring social competence is forwarded and a theoretical framework that considers social competence as a multidimensional construct is presented.

Social competence is generally conceptualised as one’s overall ability to engage in successful social interactions (K. A. Dodge, Pettit, McClaskey, & Brown, 1986; Rose-Krasnor, 1997; Semrud-Clikeman, 2007). The types of competencies needed to engage in social interactions include effectively acquiring social skills (e.g., turn taking in a conversation) and social behaviours (e.g., smiling at appropriate times), and applying these to social situations in an adaptable way (Gresham & MacMillan, 1997; Gutstein & Whitney, 2002; Haager & Vaughn, 1995; Semrud-Clikeman, 2007). It has been argued that these skills and behaviours, among others, play a central role in social interactions allowing one to effectively interact with other people (K. A. Dodge & Murphy, 1984; Odom, McConnell, & McEvoy, 1992; Rose-Krasnor, 1997; Segrin, 2000; Vickerstaff, Heriot, Wong, Lopes, & Dossetor, 2007).

Some of the factors that shape social competence are well understood. For instance, a child’s home environment has been demonstrated to play a key role (Denham, 2007; Kouros, Cummings, & Davies, 2010; Shinohara et al., 2010a). This perspective is forwarded on the grounds that a child’s relationship with a primary caregiver is one of the first social relationships he or she establishes (Ainsworth, Blehar, Waters, & Wall, 1978). While positive interactions may lead to pro-social behaviours, negative interactions such as inter-parental conflict or neglect may lead to aggressive behaviours and low social competence in children (Kouros, et al., 2010).
Research has shown that children who meet the criteria for LD or who have below average levels of academic achievement are typically found to have lower levels of social competence (Nowicki, 2003). Children with LD are typically defined as having poor academic achievement that is significantly lower than their predicted scores of general intelligence (American Psychiatric Association, 2000; World Health Organisation, 1994). The prevalence rate of these difficulties is estimated to be between 2 - 10% of children (American Psychiatric Association, 2000). Social competence problems are not limited to those with LD. Research has shown that children who do not meet the DSM criteria for LD, yet still have below average levels of academic achievement with intelligence in the normal range, also have lower levels of social competence (Nowicki, 2003). In this thesis, children with below average levels of academic achievement are considered to have learning difficulties in areas of reading, spelling, and or mathematics despite normal intelligence, but do not necessarily exhibit a significant discrepancy between their academic achievement and general intelligence. Similar definitions have been used in other research examining social competence and academic achievement (see Siegel, 1989).

The causes of poor academic achievement are yet to be universally agreed upon. In general terms, the learning difficulties in children are considered secondary to some type of atypical development of the central nervous system which gives rise to cognitive problems that support learning (e.g., McLean & Hitch, 1999). Some of the cognitive problems considered to negatively impact on academic achievement include general intelligence (Wechsler, 2003), language (Aram & Nation, 1980; Campisi, Serbin, Stack, Schwartzman, & Ledingham, 2009), attention (McGee & Share, 1988), and more recently working memory (S. E. Gathercole, Alloway, Willis, & Adams, 2006; H. L. Swanson & Jerman, 2007; H. L. Swanson & Sachs-Lee, 2001). Children’s academic achievement can further be influenced by poor socio-economic circumstances (K. R. White, 1982). However, research suggests
that the relationship between different socio-economic backgrounds and low academic achievement is mediated by language and cognitive functioning (Lee & Burkham, 2002).

In addition to poor academic achievement and cognitive functioning, children with LD or low academic achievement have also been repeatedly shown to perform poorly on measures of social competence (Gresham & Elliot, 1989; Nowicki, 2003). In one meta-analysis it was estimated that up to 75% of children who struggle academically have deficits in the area of social competence (Kavale & Forness, 1996). The reason social competence difficulties often accompanies poor academic achievement is not well understood (Gresham, 1992). One view is that difficulties with social competence are caused by poor academic achievement (Gresham, 1981; 1986; 1992). Others have proposed difficulties with social competence as being associated with deficits in social information processing, which are argued to be independent from deficits that are associated with academic achievement (Crick & Dodge, 1994; K. A. Dodge, 1986). It has also been suggested that social competence and academic achievement are not causally related but co-occur in children with learning difficulties (Gresham & Elliot, 1989; H. L. Swanson & Malone, 1992).

In the literature relating to difficulties with academic achievement and social competence, few have examined whether co-occurring cognitive problems might also contribute to these difficulties (Gresham, 1992). This is despite research from other areas linking poor cognitive functioning with poor academic achievement (T.P. Alloway & Gathercole, 2006; Fazio, 1996; Pennington & Bishop, 2009; Polderman, Boomsma, Bartels, Verhulst, & Huizink, 2010). Before the literature concerning the relationship between social competence and academic achievement is reviewed, an overview of the difficulties associated with defining and operationalising social competence will be presented first.
Reconciling Differences in Definitions of Social Competence

The aim of this section is to review the issues associated with conceptualising and operationalising social competence as a construct. The first issue to be addressed considers the lack of consensus concerning the definition of social competence. This has been the subject of numerous literature reviews (K. A. Dodge, 1986; Rose-Krasnor, 1997; H. L. Swanson & Malone, 1992; Waters & Sroufe, 1983), and is noted as an ongoing concern within the field (Green & Cillessen, 2008; Semrud-Clikeman, 2007). The second issue to be addressed concerns how social competence has been operationalised in past research. Social competence has often been conceptualised as a uni-dimensional construct (Cavell, 1990). A concern with this approach is that it gives rise to measurement problems leading to conceptual and operational inconsistencies. In an attempt to reconcile these differences, a model will be forwarded which describes social competence as a multi-dimensional construct. This model will be used to select a set of measures of social competence in the empirical chapters of this thesis.

Conceptual and Operational Definitions of Social Competence

To date, a number of different definitions of social competence have been proposed. These were identified in reviews by Dodge et al. (1986) and Rose-Krasnor (1997). To highlight the range of these definitions, they are summarised in Table 1.

Table 1. Definitions of Social Competence used in Previous Research

<table>
<thead>
<tr>
<th>Study</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goldfried &amp; d'Zurilla (1969, p. 158)</td>
<td>‘Effective response of the individual to specific life situations’</td>
</tr>
<tr>
<td>White (1959, p. 297)</td>
<td>‘Organisms capacity to interact effectively with its environment’</td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------</td>
</tr>
<tr>
<td>McFall (1982, p.1)</td>
<td>‘Judgement by another person that an individual has behaved effectively’</td>
</tr>
<tr>
<td>Trower (1982, p. 419)</td>
<td>‘The possession of the capability to general skilled behaviour’</td>
</tr>
<tr>
<td>Putallaz &amp; Gottman (1983, p. 7)</td>
<td>‘Aspects of social behaviour that is important with respect to preventing physical illness or psychopathology in children and adults.’</td>
</tr>
<tr>
<td>Waters &amp; Sroufe (1983, p. 81)</td>
<td>‘The competent individual is one who is able to make use of environmental and personal resources to achieve a good developmental outcome.’</td>
</tr>
<tr>
<td>Definitions identified by Rose-Krasnor (1997)</td>
<td></td>
</tr>
<tr>
<td>Ford (1982, p. 323)</td>
<td>‘The attainment of relevant social goals in specified social contexts, using appropriate means and resulting in positive developmental outcomes.’</td>
</tr>
<tr>
<td>Duck (1989, p. 92)</td>
<td>‘Ability to achieve desired outcomes and show adaptability across contexts.’</td>
</tr>
<tr>
<td>Goldfried &amp; d’Zurilla (1969, p. 161)</td>
<td>‘The effectiveness or adequacy with which an individual is capable of responding to various problematic situations which confront him’</td>
</tr>
<tr>
<td>Howes (1987, p. 253)</td>
<td>‘Behaviour that reflects successful social functioning’ (p. 253). ‘A judgment by another that an individual has behaved effectively’ (p. 1)</td>
</tr>
<tr>
<td>Rubin &amp; Rose-Krasnor (1992, p. 285)</td>
<td>‘The ability to achieve personal goals in social interactions while simultaneously maintaining positive relationships with others over time and across settings’</td>
</tr>
<tr>
<td>Taylor &amp; Asher (1984, p. 57)</td>
<td>‘The formulation and adoption of personal goals that are appropriate and adaptive to specific social situations and implementing effective behavioural strategies for achieving goals’</td>
</tr>
<tr>
<td>Author</td>
<td>Definition</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Waters &amp; Sroufe (1983, p. 80)</td>
<td>‘An ability to generate and coordinate flexible, adaptive responses to demands and to generate and capitalize on opportunities in the environment’ (i.e., effectiveness).</td>
</tr>
<tr>
<td>Weinstein (1969, p. 755)</td>
<td>‘The ability to accomplish interpersonal tasks and the ability to manipulate others' responses’</td>
</tr>
<tr>
<td>White (1959, p. 297)</td>
<td>‘An organism's capacity to interact effectively with its environment’</td>
</tr>
<tr>
<td>Yeates &amp; Selman (1989)</td>
<td>‘The development of social-cognitive skills and knowledge, including the capacity for emotional control, to mediate behavioural performance in specific contexts, which in turn are judged by the self and others to be successful and thereby increase the likelihood of positive psychosocial adjustment’</td>
</tr>
</tbody>
</table>

In Table 1 it can be seen that there are similarities between the definitions of social competence at an abstract level. For instance, there appears to be some consensus on the idea that social competence is defined with respect to how adaptive and effective an individual is at interacting with his/her social environment. The concepts of adaptive and effective behaviours appear in the definitions offered by Cavell (1990), Dodge and Murphy (1984), Goldfried and d’Zurilla (1969), and White (1959). However, differences with defining social competence often appear when researchers attempt to quantify the concepts of adaptive and effective behaviour (i.e., social competence).

Attempts have been made to categorise different definitions of social competence. Cavell (1990) argued that operational definitions can be summarised into those which focus on skills that are considered a requisite for social competence, and into those which focus on the outcomes of being socially competent. Requisite skills were argued to include social behaviours such as saying “please” and “thank-you”, encoding relevant information for processing, and having the ability to adequately engage in social interactions. The outcomes
were argued to comprise peer acceptance, global judgements of skills made by others, and
the goals and attainments of individuals. As can be seen in Table 1, definitions which
describe requisite skills needed for social competence are offered by Howes, (1987), Trower
(1982), Weinstein (1969), White (1959), and Yeates and Selman (1989). Definitions which
describe the outcomes of requisite skills are offered by Duck (1989), Ford (1982), Goldfried

Rose-Krasnor (1997) argued that definitions of social competence can be placed into
one of four categories: social skills, socio-metric status, relationship quality, and direct
functional outcomes. The social skills approach to defining social competence involves
trying to identify a specific set of social skills that comprise social competence (Howes,
1987; Trower, 1982; Weinstein, 1969; R. White, 1959; Yeates & Selman, 1989). Such skills
describe the process of social interactions and can include one’s ability to interpret social
skills, perspective take, initiate a conversation, turn take in a conversation, smile at
appropriate times, and know when to say “please” and “thank-you”.

The second approach to defining social competence has been in terms of assessing a
child’s socio-metric status (Rose-Krasnor, 1997). Socio-metric status refers to how well a
child is liked by their peers (i.e., popularity). This approach differs from social skills
because it focuses on the outcome of social interactions and not the process, as is the case
with social skills. Socio-metric status is commonly measured by asking children to rate their
peers with respect to likeability (Newcomb, Bukowski, & Pattee, 1993). The third approach
is a variation of socio-metric status and defines social competence by way of focusing on the
quality of relationships with others such as peers, parents, or teachers (Rose-Krasnor, 1997).
Focusing on the quality of relationships also considers social competence in terms of an
outcome. However, unlike socio-metric status, this later viewpoint centres on the quality of
relationships rather than quantity. The assumption with this approach is that socially competent children have one or more close friendships. In Table 1, quality of relationship approaches are offered in definitions by Howes (1987), McFall (1982), and Yeates and Selman (1989).

The fourth approach Rose-Krasnor (1997) identified focuses on the direct functional outcomes of children’s social interactions. Functional outcomes are defined as the collective product of a child’s social skills that are preceded by children’s social problem solving abilities (K. A. Dodge, 1986). Social problem solving abilities relate to skills that require a child to (a) clarify the goals they want to achieve within a particular social situation; (b) search for the appropriate social response within their repertoire of schemas; (c) decide on an appropriate response after evaluating possible outcomes; and (d) act out the selected response while gauging the effects of that response on others (Crick & Dodge, 1994). Definitions which relate to this fourth approach presented in Table 1 include those by Duck (1989), Ford (1982), Goldfried and d’Zurilla (1969), McFall (1982), Putallaz and Gottman (1983), Rubin and Rose-Krasnor (1992), Taylor and Asher (1984), and Waters and Sroufe (1983).

A concern with defining social competence only in terms of social skills, socio-metric status, relationship quality, or direct functional outcomes relates to the problem of treating this construct, either implicitly or explicitly, as uni-dimensional. Rose-Krasnor (1997) noted two key limitations with this approach. First, it has been shown that the associations between the four approaches noted above share only moderate correlations (e.g., Parker & Asher, 1987). This indicates that assessing one aspect of social competence may not relate to other aspects of social competence. The second limitation noted by Rose-Krasnor (1997) was how to quantify social competence. Although there is agreement with the broader level definitions of the construct, difficulties are encountered when researchers
attempt to simplify the construct by utilizing specific definitions. In so doing, little guidance is provided on how the construct can be measured.

When social competence has been defined as a set of specific abilities, behaviours, or outcomes, it can make it difficult to compare results across studies due to the various dependent variables used. One way of overcoming this limitation is by adapting an integrative model of social competence in order to capture the full impact of social competence difficulties in children. One such model is a multi-dimensional model put forth by Rose-Krasnor (1997). The detail of this model is discussed next.

*A Multi-Dimensional Model of Social Competence*

Rose-Krasnor (1997) put forward a model that attempted to integrate the aforementioned definitions into a multi-dimensional construct. This multi-dimensional model of social competence is summarised in Figure 1. Rose-Krasnor (1997) proposed that the construct of social competence could be subdivided into three levels: Theoretical, Index and Skills. In broad terms, the Theoretical Level describes social competence as the sum of all the parts involved in engaging in effective social interactions. This corresponds to the most abstract definition of social competence, which defines this construct as how effective an individual is at interacting with other people. The processes involved in determining ones efficacy at social interactions are described by two components termed the Index and Skills Levels.
The Index Level of the model represents the functional outcomes of a child’s social competencies (Rose-Krasnor, 1997). According to Rose-Krasnor, functional outcomes describe success in attaining goals, the feelings associated with a positive self-concept in social situations, the quality of relationships with others, socio-metric status, and meeting other’s expectations of acceptable and responsible social behaviours. These functional outcomes are further divided into Self- and Other-Domains of the Index Level. Functional outcomes that have an external focus are said to comprise the Other-Domain, while functional outcomes that have an internal focus comprise the Self-Domain. Functional outcomes that represent the Other-Domain include experiencing quality relationships with others, socio-metric status, and meeting other’s expectations of acceptable and responsible social behaviours; while functional outcomes at the Self-Domain include attaining goals and feelings of social self-efficacy. Self-concept and self-esteem can also be included within the Self-Domain since it represents a child’s general sense of well-being (Coopersmith, 1967; Wadman, Durkin, & Conti-Ramsden, 2008). Self-concept and self-esteem represent functional outcomes of social competence because they reflect children’s own perceptions of their efficacy in social interactions (Wylie, 1961). Outcomes at the Self- and Other-
Domains of the Index Level are measured via evaluations made by oneself or other people (e.g., teacher, parent, peers), and may vary depending upon who is making the evaluation of the outcome, and in which context the evaluation is being made (Rose-Krasnor, 1997).

Within Rose-Krasnor’s (1997) model shown in Figure 1, the Index Level is supported by a Skills Level of functioning. The Skills Level includes any skill or competency necessary for successful social interactions such as turn taking in a conversation, empathy, emotion regulation, or processing social information in an effective way (Elliot, Gresham, Frank, & Beddow, 2008).

**Measuring Social Competence**

Rose-Krasnor’s (1997) model can be applied to guide the selection of measures to quantify social competence. Measuring the Index Level of social competence primarily consists of focusing on the outcomes of skills and competencies that represent the Skills Level. Methods of evaluating social competence at the Other-Domain of the Index Level can include using teacher ratings of friendship quality, socio-metric status, and other’s perceptions of socially acceptable and responsible behaviours. Rose-Krasnor further proposed that the Other-Domain is largely assessed via ratings made by other people such as teachers, parents, and/or peers. Measures of social competence at the Self-Domain include outcomes such as ones social self-concept and self-esteem that are assessed using self-reports. Finally, evaluations made at the Index Level are viewed to be dependent upon contextual factors and the developmental stage of a child.

According to the model proposed by Rose-Krasnor (1997), once measures of social competence have been determined at both the Self- and Other-Domains of the Index Level then associated skills can be identified. For instance, if a child has low socio-metric status, then the Skills Level may give insight into underlying factors that may influence this such as emotion regulation. Similarly, if children develop poor quality friendships then this may
indicate that they experience difficulties with empathy. Therefore, measuring the Skills Level of social competence primarily consists of focusing on one’s social skills and competencies. The Skills Level can be measured using standardised measures and/or checklists that are filled out by teachers or parents.

*Social Competence and Academic Achievement: What is the Nature of the Relationship?*

Research has consistently demonstrated a positive association between children’s academic achievement and social competence. However, there is some variability between the strength of the association and different aspects of social competence. Furthermore, agreement is yet to be reached concerning the nature of the relationship between social competence and academic achievement. Several competing hypotheses have been forwarded to explain this relationship. One approach views difficulties with academic achievement to cause social competence problems. An alternative model posits that social competence is caused by academic achievement problems; while a third model considers the presence of a non-causal relationship between academic achievement and social competence. In this section it is also highlighted that children who have academic difficulties also present with a range of different cognitive problems. In addition, these cognitive problems might also play a role in understanding the relationship between social competence and academic achievement.

*Social Competence and Academic Achievement*

A large number of studies have been conducted that report a positive association between social competence and academic achievement (e.g., DeRosier & Mercer, 2009; Elias & Haynes, 2008; McWayne & Cheung, 2009; Milsom & Glanville, 2010; Walker & Nabuzoka, 2007). Much of the research examining the relationship between academic achievement and social competence has been summarised in several meta-analyses that
collectively synthesise research published between 1957 and 2003 (e.g., Kavale & Forness, 1996; Nowicki, 2003; Ochoa & Olivarez, 1995; H. L. Swanson & Malone, 1992).

One of the first meta-analyses examining the relationship between social competence and academic achievement was conducted by Swanson and Malone (1992), which synthesised the results of 39 studies (reduced from an initial 117 studies) that were published between 1957 and 1990. All studies included in the meta-analysis compared different aspects of social competence in children with below average academic achievement ($n = 1,099$) to those without academic problems ($n = 2,846$). The studies included in the meta-analysis were primarily undertaken with children who were in Grades 3 to 6. Average effect sizes (e.s.) were computed using the standardised mean difference, which describes the difference between two means in standard deviation units. According to Cohen (1988), values of .2 can be considered a small effect size, .5 medium, and .8 large. Standardised mean differences can also be expressed as the mean percentile rank of the study group, which in this case was children with academic difficulties who were compared to children without academic difficulties. With this in mind an effect size of .2 corresponds to the 42nd percentile, .5 the 31st percentile, and .8 to the 21st percentile.

In the context of Rose-Krasnor’s model (1997), Swanson and Malone’s (1992) synthesis of the literature examined both the Index and Skills Levels of social competence. The Index Level of social competence was examined with respect to social acceptance and rejection, and a range of behavioural problems including immature behaviour, aggressive behaviour, on task behaviour, and personality problems. Variability with respect to the effect sizes associated with these different components was noted. Large effect sizes were observed for social acceptance (e.s. = .79) and social rejection (e.s. = .78). In relation to behavioural problems, large effect sizes were also observed for personality problems (e.s. = .87), on-task behaviour (e.s. = .83), and immature behaviour (e.s. = .98); while a medium
effect size was observed for aggressive behaviour (e.s. = .49). The Skills Level was investigated with respect to children’s performances across studies on tasks of social skills, with large effect sizes reported for these measures (e.s. = .80). Overall, the results from this meta-analysis show that children with low levels of academic achievement experience poor social competence at both the Index and Skills Levels. However, it is interesting to note that within the Index Level there is some degree of variability in effect sizes. For example, the average effect size was largest for immature behaviour compared to the smallest for aggressive behaviour. This suggests that this aspect of social competence might be more closely related to academic difficulties.

A meta-analysis by Nowicki (2003) reported similar problems for children who had both low levels of academic achievement and difficulties with social competence. Nowicki synthesised the results of 32 studies published between 1990 and 2000. The median grade participants were enrolled in across the studies was Grade 3. In the context of Rose-Krasnor’s (1997) model the Skills Level of social competence was evaluated via teacher ratings of social skills, and the Index Level was evaluated via examining socio-metric status, positive peer nominations, negative peer nominations, self-perceptions of social acceptance, self-perceptions of academic competence, and global self-worth. Consistent with the findings of Swanson and Malone (1992), a large average effect size was observed with respect to the Skills Level measures (e.s. = .80). Similarly, there was also variability in effect sizes with respect to the different components of the Index Level. For example, a large effect size was observed for measures of socio-metric status (e.s. = 1.00), which comprises the Other-Domain of the Index Level. Conversely, the average effect size computed for self-perception, which measures the Self-Domain was found to be small (e.s. = .16). Taken together, these results show that while children struggling academically may be considered by others as having poor social skills and problems interacting with others, they
may not be aware of these problems. To account for these results Nowicki (2003) argued that children with low levels of academic achievement were unable to accurately reflect on their self-perceived social competence due to the complexity of the processes involved when making social inferences. Such processes involved in making social inferences can include interpreting non-verbal cues, monitoring intonations, and understanding other people’s perspectives.

Nowicki (2003) also examined whether there were differences in social competence between those children who met the DSM classification for LD and those who had low levels of academic achievement, but did not meet the criterion for a discrepancy between academic achievement and general intelligence. The results revealed only small effect sizes within all domains of social competence evaluated in this meta-analysis. Specifically, average effect sizes for self-perceived academic competence, social preference, teacher ratings of social competence, global self-worth, and self-perceived social competence ranged from .13 to .41. Thus there were no differences in social competence between children whom met the DSM criteria for having a LD and those children with low levels of academic achievement.

In another meta-analysis, Kavale and Forness (1996) replicated and extended the initial meta-analysis undertaken by Swanson and Malone (1992) by synthesising the results of studies published between 1957 and 1994. These studies encompassed the results from 6,353 children with and without academic difficulties (Kavale & Forness, 1996). A total of 152 studies were included in the analyses that examined social competence in children with LD and TD children. The mean age of the children included in this meta-analysis was 10 years. Kavale and Forness computed separate effect sizes for studies examining social skills, behaviour problems, and socio-metric status aspects of social competence. In this context the social skills measures describe the Skills Level of Rose-Krasnor’s (1997) model.
of social competence; while measures of behavioural problems and socio-metric status describe the Index Level. In the first analysis an overall average effect size computed across all domains was found to be .63 which indicates that up to 75% of children with academic problems also have social competence problems (Kavale & Forness, 1996). This finding is important because it highlights that social competence problems are very common in children who are struggling academically.

The second question examined by Kavale and Forness (1996) was whether poor social competence between children with and without academic difficulties was equally observed when the rater was a teacher, peer, or oneself. Results from this analysis revealed considerable consistency between raters when effect sizes were averaged across the different measures of social skills, behaviour problems, and socio-metric status. Specifically, when teachers evaluated social competence, the mean effect size observed across studies was found to be .65. When peers undertook the evaluations the mean effect size was .63, and when students with LD were rating themselves on measures of social competence, the mean effect size was .68. From these results it is evident that children’s social competence is judged similarly across raters.

A third question examined by Kavale and Forness (1996) was whether the magnitude of the difference between LD and TD children on measures of social competence was constant across the different dimensions of social competence as noted above. Effect sizes for the different dimensions of social competence were computed separately for teachers, peers, and self-assessments. For the dimensions evaluated by teachers, the largest effect sizes were generally observed for externalising behaviour problems such as hyperactivity (e.s. = .82) and distractibility (e.s. = .82). Medium effect sizes were reported for social skills such as lack of tact (e.s. = .42) and internalising behaviour problems (e.s. = .32), and small effect sizes were reported for seemingly more extreme externalising behaviour. For
example the effect size observed for behaviours consistent with conduct disorder was found to be .21. When peers evaluated children’s social competence, the largest effect sizes were observed for measures of peer acceptance and peer rejection (e.s. ≈ .78), and medium effect sizes were observed for cooperation (e.s. = .47) and popularity (e.s. = .46). When social competence was evaluated by oneself, social skills was found to have the highest effect size (e.s. = .90), while medium effect sizes were reported for self-concept (e.s., = .52), self-esteem (e.s. = .50), and locus of control (e.s. = .42). These results suggest that children performing poorly in school obtain lower ratings on a range of different dimensions of social competence, regardless of who is completing the evaluation. Specifically, the largest effect sizes appear to be found for non-clinical externalising behavioural problems such as hyperactivity and distractibility, as well as for social skills.

Finally, another meta-analysis examining social competence in children with LD and TD children was conducted by Ochoa and Olivarez (1995). Unlike the previous meta-analyses reviewed, Ochoa and Olivarez examined social competence by focusing exclusively on socio-metric status (i.e., peer ratings of likeability). Seventeen studies published between 1978 and 1991 were included in the analyses. The median number of participants classified as LD was 20, and the median number of TD participants across studies was 22. Only nine of the 17 studies reported the general intelligence level of the children with LD. The mean level of general intelligence reported from these nine studies was 96.4. The average effect size found in this meta-analysis was .60, which can be considered to be a medium effect size. These results are comparable to the average effect sizes for socio-metric status reported in the previous meta-analyses, indicating that perhaps not all children with LD are disliked by their peers.

It should be noted that there appear to be limitations with evaluating social competence using socio-metric status. When socio-metric status is used as a measure of
social competence, it assumes that this is an adequate representation of the skills and behaviours required to engage in successful social interactions. However recent research has shown that socio-metric status does not often characterise a child as having an adequate repertoire of skills and behaviours required to engage in successful social interactions (Cillessen & Mayeux, 2007; Vaughn et al., 2009). For example, Vaughn, Vollenweider, Bost, Azria-Evans, and Snider (2003) examined aggressive behaviour and its impact upon social competence in two samples of preschool children. One sample of children was drawn from a community population ($n = 472$), while the other comprised children who had engaged in a Head Start program ($n = 471$). Social competence was operationalised via observations of children’s socio-metric status. The results of the study revealed counterintuitive positive correlations between socio-metric status and aggressive behaviour. This means that as peer likability increased, so did aggressive behaviour. These findings show that children may have high socio-metric status, but this does not seem to be related to pro-social behaviours.

The results from all four meta-analytic studies demonstrate that generally, children who struggle academically often have poor social competence in the areas of social skills, socio-metric status, and friendship quality, but do not seem to have poorer levels of self-esteem and self-concept (Kavale & Forness, 1996; Nowicki, 2003; Ochoa & Olivarez, 1995; H. L. Swanson & Malone, 1992). In the context of Rose-Krasnor’s (1997) model the meta-analyses suggest that children with low levels of academic achievement can be expected to have problems at the Skills Level of social competence and also at the Other-Domain of the Index Level. There do not seem to be difficulties at the Self-Domain of the Index Level of social competence. However, it is important to note that within the Other-Domain of the Index Level there was variability in average effect sizes, suggesting that the difference between children with academic difficulties and those without is not constant with this
component of social competence. An outstanding question yet to be addressed concerns the relationship between the Index and Skills Levels. As noted earlier, Rose-Krasnor (1997) suggested that the Skills Level of social competence supports outcomes at the Index Level. Given this, a correlation between the different levels might be expected. The meta-analyses reviewed did not specifically examine correlations between these different levels of social competence. Thus an empirical question yet to be addressed is whether a correlation exists between the Skills and Index Levels of social competence.

**Hypothesised relationships between Social Competence and Academic Achievement**

The literature reviewed thus far indicates a positive association between academic achievement and social competence. However, what remains unclear is why an association between these two variables has been repeatedly observed. In a review of the literature Gresham and Elliot (1989) identified three potential hypotheses that might explain this relationship. One hypothesis asserts that academic achievement problems cause difficulties with social competence. An alternative hypothesis was that social competence difficulties cause problems with academic achievement (Wentzel, 1991b). A third hypothesis considered that academic achievement and social competence co-occurred but were not causally related (Bauminger, Edelsztein, & Morash, 2005; Gresham & Elliot, 1989). Each of these hypotheses will now be considered in detail.

**Hypothesis 1: Low academic achievement causes poor social competence.** One hypothesis identified by Gresham (1992; Gresham & Elliot, 1989) was the proposal that poor academic achievement causes social skills deficits. When forwarding this hypothesis Gresham and colleagues did not explicitly outline a mechanism describing how academic achievement might cause social competence problems. However, one proposal forwarded elsewhere (e.g., Coie & Krehbiel, 1984) argued that children who experienced academic difficulties tend to become frustrated with the learning demands of the classroom. Another
possibility was that such children might also tend to become bored within the classroom because they do not understand the content of the instructions given by their teachers. In both of these scenarios internalising or externalising behavioural problems might arise as children engage in behaviours that disrupt others or become withdrawn. Moreover, social competence problems may arise in children with academic problems if they are negatively evaluated by others and become rejected by their peers. In this case children may end up being isolated from others.

Gresham and Elliot (1989) note that evidence supporting the hypothesis that academic achievement problems cause social competence problems can be found from academic remediation studies. In a study by Coie and Krehbiel (1984), children with academic problems who were also identified as having the least number of friends were randomly assigned to intervention groups that aimed to improve their academic performance or social competence. The results showed that children in the academic intervention group showed significant improvements in mathematics, spelling, and reading. Children in the social competence intervention group were found to only have significant improvements in reading. It was also shown that children in the academic intervention group were more liked by their peers and evidenced less disruptive behaviour following academic remediation. However, no significant changes were found with respect to social skills. This result provides support that some aspects of social competence, in particular socially acceptable behaviour, may be causally related to academic achievement. At the same time improving social skills relating to interactions with peers do not seem to be tied to academic achievement.

**Hypothesis 2: Poor social competence causes poor academic achievement.** An alternative hypothesis considered by Gresham (1992) was that poor social competence causes difficulties with academic achievement. This hypothesis was proposed on the
grounds that children who are able to demonstrate appropriate social skills are better able to attend to and comprehend information being presented in the classroom (Cartledge & Milburn, 1978; Wentzel, 1991b). For example, if children are asked to work in groups to create a picture storybook, then they will need to utilise appropriate social skills such as cooperating with their peers in the group during negotiations of what should be included in the story. If children are able to do this effectively, then they are seemingly able to participate in classroom related learning activities to enhance their academic competence. If children are unable to do this due to their inability to interact with others effectively, then they may be unable to participate in such activities, which in turn may compromise their learning experience.

Support for Hypothesis 2 has been shown in studies that have examined both the Skills and Index Levels of social competence in both children and adolescents (McClelland, Morrison, & Holmes, 2000; Milsom & Glanville, 2010; Wentzel, 1991a). For instance, Wight and Chapparo (2008) examined teacher’s perceptions of social competence in 21 boys with LD and 21 TD boys aged between 5 and 11 years. Social competence was measured using a measure of social skills that was completed by teachers. This measure assessed observable social behaviours within the classroom, children’s ability to make and maintain friendships, and emotion regulation. The results of the study showed that boys with LD were rated by their teachers as having poorer social skills in all areas, with the most significant problem being within the classroom, followed by making and maintaining friendships, and emotion regulation. It was inferred that the classroom setting was where the most disruptive social behaviours occurred according to teacher reports. Collectively, studies which support Hypothesis 2 indicate that children with LD have poor social skills, which in turn can affect one’s level of academic achievement.
Hypothesis 3: Academic achievement and social competence are correlated but not causally related. A third hypothesis proposed is that problems with social competence and academic achievement are not causally related (Gresham, 1992; Kavale & Forness, 1996; H. L. Swanson & Malone, 1992). Research cited to this claim argues that not all children with LD or whom struggle academically experience difficulties with social competence, and not all children who experience poor social competence have LD (Gresham & Elliot, 1989). Indeed, if there was a causal relationship between social competence and academic achievement, then one might expect the correlation to be closer to 1.0. Thus the suggestion here is that if learning difficulties and poor social competence were causally related, then all children with academic difficulties should present with poor social competence (Gresham & Elliot, 1989). With this assumption, what needs consideration is the possibility of effects from a moderator variable that may also affect this relationship.

One instance where academic achievement and social competence problems may be correlated but not causally related can be found in social information processing accounts of social competence. Social information processing accounts consider that domain general cognitive abilities assert a direct influence on social competence independently of their influences on academic achievement and other abilities (Crick & Dodge, 1994; K. A. Dodge, 1986; Ladd & Crick, 1989; K. H. Rubin & Krasnor, 1986). Crick and Dodge (1994) proposed that social information processing was dependant on the ability to (a) encode social cues by attending to and storing the relevant information; (b) interpret these cues; (c) clarify the goals needed to achieve within a particular social situation; (d) search for the appropriate social response within long-term memory; (e) decide on an appropriate response after evaluating possible outcomes; and (f) act out the selected response while gauging the effects of that response on others. Research has been presented showing that impairments in one or more of these steps is associated with less socially competent behaviour (K. A.
Dodge & Price, 1994). Importantly, these components were argued to be reliant on domain general cognitive processes that support attention, learning, and memory, all of which enable children to encode and retrieve information in social interactions. According to this position, deficits in one or more domain general cognitive abilities may also have an effect on social competence, independently of their effects on academic achievement (Bauminger, et al., 2005; Toro, Weissberg, Guare, & Liebenstein, 1990; Tur-Kaspa & Bryan, 1994).

*Cognition and Social Competence: Reconsidering Alternative Explanations.*

The three hypotheses previously described propose different pathways between social competence and academic achievement. Hypotheses 1 and 2 assume a causal relationship between academic achievement and social competence. Hypothesis 3 assumes no causal relationship between academic achievement and social competence. Another possibility that is yet to be tested is that cognitive problems may be indirectly related to social competence problems in children.

Children who struggle academically have also been shown to experience difficulties with language (Aram & Nation, 1980; Campisi, et al., 2009), attention (McGee & Share, 1988), and working memory (S. E. Gathercole, Lamont, & Alloway, 2006; H. L. Swanson & Jerman, 2007). If Hypothesis 1 is accurate, that is, if academic achievement problems cause social competence problems, then cognitive abilities that initially disrupt academic achievement may eventually give rise to difficulties with social competence. This means that cognitive abilities may influence social competence indirectly through their initial influence on academic achievement. Alternatively, social-information processing accounts argue that domain general cognitive abilities also support social competence since attention in particular influences how children perceive and encode social interactions (Crick & Dodge, 1994; K. A. Dodge, 1986). This implies a direct association between cognition and the Skills and Index Levels of social competence. From this perspective, poor cognitive
functioning independent of academic achievement may directly explain poor social competence in children with low academic achievement. It is an empirical question whether cognitive processes also affect social competence at both the Skills and Index Levels of Rose-Krasnor’s (1997) model of social competence. These proposals thus indicate that at a conceptual level, it is possible that cognitive abilities may be directly and/or indirectly related to social competence.

A starting point in considering different cognitive abilities that might be related to social competence problems in children with low academic achievement would be to focus on cognitive abilities found to correlate with academic achievement. One process to consider may be domain general cognitive abilities as measured by intelligence (IQ). A relationship between IQ and academic achievement has been repeatedly demonstrated (Wechsler, 2003). However, children with LD or low academic achievement are reported to have normal levels of intelligence (Nowicki, 2003). Thus there is some evidence to suggest that general intelligence may not be a useful factor to consider in social competence difficulties. Other cognitive abilities to consider may be language, attention, and working memory. These abilities are suggested because they can be somewhat dissociated from general intelligence (e.g., American Psychiatric Association, 2000), and as noted earlier they have been found to be present in children whom have poor academic achievement (Aram & Nation, 1980; Campisi, et al., 2009; S. E. Gathercole, Lamont, et al., 2006; McGee & Share, 1988; H. L. Swanson & Jerman, 2007; H. L. Swanson & Sachs-Lee, 2001). Consequently it could be that one or more of these cognitive abilities contribute to social competence problems. The evidence concerning the relationship between social competence and the aforementioned cognitive abilities is examined in the next chapter.
In this chapter the problems with conceptualising and operationalising social competence were first considered. A model was put forward which operationalises social competence as a multi-dimensional construct. It was argued that a multidimensional approach to the measurement of social competence is necessary because it enables researchers to assess the different aspects of this construct since all aspects have only been found to be moderately correlated. The research examining the relationship between social competence and academic achievement was also reviewed in this chapter. Overall there appears to be a close relationship between academic achievement and social competence in the early years of schooling. Closer inspection of this relationship showed that there seems to be variability in the severity of the social competence deficits experienced, depending on which domain of social competence was being assessed. Different hypotheses were considered that attempted to explain the relationship between social competence and academic achievement. It was noted that children experiencing academic difficulties commonly presented with cognitive difficulties in language, attention, and working memory. It was proposed that these cognitive difficulties might also explain the relationship between academic achievement and social competence. Chapter 3 evaluates the evidence that considers whether language, attention, and working memory might also contribute to the social competence problems in children with below average levels of academic achievement.
CHAPTER 3: A REVIEW INTO THE ROLE OF LANGUAGE, ATTENTION, AND WORKING MEMORY IN SOCIAL COMPETENCE.

The purpose of this chapter is to consider how language, attention, and working memory problems might contribute to poor social competence. For each of these different cognitive abilities two proposals concerning how they might influence social competence will be evaluated. The first is that each might directly affect social competence at the Skills and Index Levels. The second proposal evaluated considers whether these cognitive abilities indirectly affect social competence by increasing the risk of poor academic achievement, which in turn may impact social competence. As noted in Chapter 2, one hypothesis proposes that poor academic achievement causes social competence problems. If this hypothesis is accurate, then antecedents to poor academic achievement, such as poor cognitive abilities may then indirectly affect social competence.

The structure of the following chapter is as follows. The evidence concerning the importance of language in social competence and academic achievement will be evaluated first, followed by attention, and then working memory. For each of these cognitive abilities the theory that links these abilities to the Skills and Index Levels of social competence will initially be presented and the empirical evidence will be reviewed second.

Language and Social Competence in Children

At a theoretical level an association between language and problems with social competence in children has been proposed within the Social Adaptation Model (SAM) forwarded by Redmond and Rice (1998). The central claim made by the SAM is that the types of social behaviour exhibited by children with language impairments are influenced by their previous interactions with others. In cases where interactions have been problematic, Redmond and Rice argued that children with language problems use compensatory strategies to cope with initiating and responding to people. Compensatory strategies include
being less assertive and relying on others to mediate communications. These strategies are thus considered maladaptive because they may lead to a decrease in motivations to engage in further social interactions.

In the context of Rose-Krasnor’s (1997) model of social competence, the SAM predicts that poor language skills may negatively impact on the Skills Level, and on the Other- and Self-Domains of the Index Level. In relation to the Skills Level, problems with the deployment and development of basic social skills such as initiating and ceasing conversations may not develop if compensatory processes such as relying on other people are used. In relation to the Other-Domain of the Index Level, children with language problems who are unable to successfully engage in social interactions may have fewer friends leading to lower socio-metric status, and may be judged by others as being less socially competent (Fujiki, Brinton, Hart, & Fitzgerald, 1999). At the same time, the Self-Domain of the Index Level may be implicated if children with language problems are aware of their reliance on compensatory strategies to engage in social interactions, in turn leading them to develop low self-concepts and/or self-esteem (Jerome, Fujiki, Brinton, & James, 2002).


The question addressed in this section is whether the evidence supports an association between language functioning and the Skills Level of social competence. As noted earlier, Rose-Krasnor’s (1997) conceptualisation of the Skills Level of social competence is described by specific competencies that are necessary for engaging in effective social interactions. Specific competencies can include social information processing, emotion regulation, communication, and turn taking in conversations. Research undertaken with children with specific language impairment (SLI) is presented to further investigate this issue.
The study of children with SLI represents a good test case for examining the relationship between language and the Skills Level of social competence. SLI is characterised by clinically significant deficits in language which occur in the absence of intellectual impairments, sensory loss (e.g., hearing impairments), and/or neurological disease or damage (American Psychiatric Association, 2000; World Health Organisation, 1994). Research shows that the language deficits often occur alongside one or more cognitive impairments (e.g., Im-Bolter, Johnson, & Pascual-Leone, 2006; Miller, Kail, Leonard, & Tomblin, 2001). These include possible difficulties with processing auditory information (Tallal, 2004), problems with short-term phonological memory (i.e., the short term storage of auditory information; S. E. Gathercole, 2006; S. E. Gathercole & Baddeley, 1990), or difficulties with both the procedural and declarative long-term memory systems (Lum, Gelgec, & Conti-Ramsden, 2010; Ullman & Pierpont, 2005). With the exception of these difficulties, children with SLI are otherwise healthy and are not exposed to adverse environmental problems that may impact on their development (American Psychiatric Association, 2000). If it is the case that language and social competence are related, children with SLI would be expected to have difficulties in the area of social functioning.

There is some support to suggest that language difficulties affect the Skills Level of social competence. Children with SLI have been shown to experience problems with perspective taking (e.g., Farrant, Fletcher, & Mayberry, 2006), emotion regulation (e.g., Fujiki, Spackman, Brinton, & Hall, 2004), and empathy (e.g., Fujiki, Brinton, & Clarke, 2002). Studies have also shown that children with SLI may experience difficulties with processing social information because of their difficulty with language (e.g., Bauminger, et al., 2005; Farmer, 2000; Farrant, et al., 2006; K. Marton, Abramoff, & Rosenzweig, 2004; Zadeh, Im-Bolter, & Cohen, 2007); while others have shown that these children’s general
ability to communicate their wants and needs to others are also impeded by their poor language skills (Brinton, Fujiki, & McKee, 1998).

Fujiki, Brinton, and Todd (1996) examined social skills in children with SLI aged between 8 and 12 years. In their study, social skills was examined using the Social Skills Rating System (Gresham & Elliot, 1990). The SSRS is a standardised instrument for assessing social skills in children. The test assesses social skills via a checklist that can be completed by teachers or parents. In young children, the test collectively assesses a wide range of social skills including cooperation, assertion, and self-control. The test produces an overall social skills score that evaluates whether a child can be considered to have problems with social skills (Gresham, Elliott, Vance, & Cook, 2011). Fujiki et al. (1996) reported that the children with SLI obtained a significantly lower score than non-language impaired children on the measure of social skills. This suggests that children with poor language abilities experience difficulties with social skills.

The combined effects of specific social skills difficulties at the Skills Level may also lead to problems in other skills and competencies such as those required for negotiation. Negotiation can be conceptualised at the Skills Level of social competence because it requires a combination of skills such as social problem solving, perspective taking, emotion regulation, and communication to engage in social interactions. Brinton et al. (1998) examined the negotiation skills of 54 children with and without SLI aged between 8 and 12 years. Children were split into 18 groups of 3 (1 SLI, 1 TD, and 1 child with similar language abilities to those with SLI). Each group’s negotiation skills were observed in their interactions during a bargaining game. The results showed that of the three groups, children with SLI displayed poorer negotiation skills. It was also noted that during the task, children with SLI relied on their peers to make decisions as evidenced by the way they mirrored the wants and needs of others, or used language that was not consistent with their age. The
reliance of the children with SLI on others during the task is consistent with the SAM. Moreover, it was concluded that children with SLI displayed poorer negotiation skills because of poor communication skills and social problem solving difficulties. This study provides further support suggesting that poor language skills directly affect social skills.


The presence of language problems can also be seen to impact the Index Level of social competence. As noted earlier, according to Rose-Krasnor (1997) the Other-Domain of the Index Level is described as a child’s functional outcomes of their social skills including other’s perceptions of acceptable and responsible social behaviour, a child’s sociometric status, and the quality of relationships they have with others; while the Self-Domain represents a child’s level of social self-concept and self-esteem.

Past research which has examined the association between language and the Other-Domain of the Index Level has shown that children with SLI have fewer and poorer quality friendships (e.g., Botting & Conti-Ramsden, 2000; Brinton & Fujiki, 1999), are less confident with others (e.g., van Agt, Essink-Bot, van der Stege, de Riddler-Sluiter, & de Koning, 2005), and are generally less popular with others (e.g., Brinton & Fujiki, 1999). However it is important to note that not all children with language problems have poor social competence at the Other-Domain of the Index Level. Fujiki, Brinton, Hart, and Fitzgerald (1999) investigated the reciprocal friendships of eight children with SLI aged between 6 and 10 years. Socio-metric status was measured using peer nominations of friendships, whereas friendship quality was measured by asking children to nominate who they liked to play with. Asking children this question assessed friendship quality because it is assumed that children like to play with peers with whom they experience quality interactions. The results revealed that only three of the children had few friends and poor quality relationships, but the remainder of the sample did not have problems in this area.
Overall, there is support to suggest that poor language skills are associated with a range of poorer outcomes with respect to the Other-Domain of the Index Level. However, the finding that some language-impaired children have normal friendships suggests that language problems alone do not seem to result in poor social competence.

Research does not necessarily support the idea that language deficits directly affect the Self-Domain of the Index Level of social competence. Jerome et al. (2002) examined the development of self-esteem in both younger and older children with SLI in comparison with their TD peers. The younger age group consisted of 46 children (23 SLI; 23 TD) aged between 6 and 9 years, while the older group consisted of 34 children (17 SLI; 17 TD) aged between 10 and 13 years. The measure of self-esteem assessed areas of scholastic competence, athletic competence, behavioural conduct, social acceptance, and physical appearance. The results showed that the younger group of children with SLI did not perceive themselves differently in areas of academic competence and social acceptance compared to their TD peers. However the older group of children rated themselves more poorly in these areas compared to their TD peers. Based on these results it seems that language deficits alone do not impede self-esteem in younger children, but do for older children. This result suggests that at the level of the Self-Domain, factors other than language may play a role in explaining these children’s difficulties. If language were the sole causal factor then differences in self-esteem would be observed across the different age groups. Rather, the results suggest that factors in addition to language might influence social competence at the Self-Domain.

There is less research concerning the association between self-concept and language difficulties. A study by Farmer et al. (2007) investigated the social self-concept of older children with and without SLI aged between 9 and 13 years. Children’s social self-concepts were measured with respect to how they perceived their abilities to interact with other
people. The results showed that children with SLI had less developed self-concepts with respect to how they interacted with other people compared to TD children. This suggests that children with SLI perceived themselves as having poorer interpersonal relationships compared to TD children. It was argued that although children with SLI showed an interest in pursuing interpersonal relationships, they seemed to lack the ability to pursue such relationships. That is, these children may want to develop friendships and engage effectively in social interactions, but they may be unable to do so as a result of their language difficulties.

The research reviewed indicates an association between language impairments and difficulties at the Skills and Index Levels of social competence. This provides some evidence that poor language skills may have a direct effect on social competence. However, additional research is required to better understand the relationship between language and social competence. Much of the evidence cited in this section revealed that generally, individuals with SLI also have lower levels of social competence. However, as noted earlier these children also have problems with a range of other cognitive abilities (e.g., S. E. Gathercole, 2006; S. E. Gathercole & Baddeley, 1990; Tallal, 2004) that might also explain the relationship between SLI and social competence problems. Fujiki et al. (1996) also point out that children with disabilities (such as those with SLI) may be negatively perceived on the basis of having a disability. Thus, associations between language functioning and social competence derived from children with SLI does not rule out the possibility that their association with a disabled group, rather than their language functioning per se, might better explain the relationship. Another issue that is to be examined is the possibility that language problems indirectly affect social competence via its influence on academic achievement. This is reviewed next.
Language may also have a negative influence on social competence through causing problems with academic achievement. As noted in Chapter 2, one hypothesis considered poor academic achievement to cause problems with social competence. If this hypothesis is accurate, language may also indirectly affect social competence in children through its effects on academic achievement.

Considerable research has been presented showing an association between language and academic achievement. Studies have shown that between 40 - 55% of children with academic difficulties also have a language impairment (Aram & Nation, 1980; McArthur, Hogben, Edwards, Heath, & Mengler, 2000). Additionally, children with language impairment have been repeatedly shown to have difficulties with academic achievement (Botting & Resing, 2007; N. J. Cohen, 2001; Fazio, 1996; McArthur, et al., 2000). At a broad level, language skills are considered important for learning because many classroom activities require being able to listen and communicate with teachers and peers (Botting & Resing, 2007; Conti-Ramsden, Durkin, Simkin, & Knox, 2009; Herbert-Myers, Guttentag, Swank, Smith, & Landry, 2006).

Language functioning has been shown to be important for more specific academic activities such as reading (Catts, 1993; McArthur, et al., 2000; Rescorla, 2000; Snowling, Bishop, & Stothard, 2000) and mathematics (Andersson, 2010; Aram & Nation, 1980). Language problems may impact on reading in two ways. In the first instance, the presence of phonological processing deficits may negatively impact on reading because reading involves converting sounds to words and words to sentences, if converting sounds to words is affected through language deficits then children may experience difficulties in reading (Pennington & Bishop, 2009; Tallal, 1980). Second, language contributes to difficulties in reading comprehension (Pennington & Bishop, 2009) which involves understanding and
combining sentences to make coherent meaning. If one has difficulty comprehending oral language then there might also be problems with reading comprehension (Botting, Simkin, & Conti-Ramsden, 2006). Language difficulties have also been shown to affect mathematical learning (Fazio, 1994, 1996, 1999). One idea linking math and language problems is that some numeracy skills are dependent upon the verbal encoding of information. Taken together, these studies show that the ability to effectively engage in classroom activities and communicate with peers and teachers is dependent on a child’s language skills.

Attention and Social Competence in Children

Attention is another cognitive ability that may be related to social competence. Attention is considered to be important in the processing of information because it determines the type of information that will be considered in a given task or situation (Berk, 2003). A number of models have been proposed which attempt to describe different types of attention (Driver, Haggard, & Shallice, 2007; Posner & Boies, 1971). One approach distinguishes between selective attention, sustained attention, and divided attention (Manly et al., 2001; Manly, Robertson, Anderson, & Nimmo-Smith, 1998). Selective attention is described as the ability to resist distraction, such as being able to read the newspaper while simultaneously blocking out surrounding chatter in a noisy café. Sustained attention is the ability to keep one's mind focused on a task, such as completing an exam paper; whereas divided attention is the ability to switch the focus of attention from one task to another. An example of a task, which involves divided attention, is the ability to focus on what is being said in a conversation whilst chatting to a group of friends in the playground.

At a general level, the importance of attention for social competence can be considered with respect to social-information processing models of social behaviour (Crick & Dodge, 1994). According to Crick and Dodge (1994) the extent to which an individual
can respond appropriately in a social situation is influenced by their ability to adequately process social cues. It has been argued by these researchers that these cues are processed sequentially. The sequence initially involves the encoding of social cues followed by the representation of social cues, the accessing of possible behavioural responses, the evaluation of which response is the most appropriate, and the execution of the most appropriate response. Decoding social cues requires one to be able to interpret facial expressions, auditory expressions, and non-verbal cues, all of which are needed to make inferences about another person’s mental state so an appropriate response can be made (Phillips, Tunstall, & Channon, 2007). Dodge, Pettit, McClaskey, and Brown (1986) point out that these processes in attention influence children’s initial ability to encode and select different social cues. In typical development, it is proposed that improvements in attention underscore improvements in determining which social cues should be attended to and which ones should be ignored.

Andrade, Brodeur, Waschbusch, Steward, and McGee (2009) outlined possible roles for sustained and selective attention in social competence. First, it was suggested that sustained attention might play an important role in social interactions that require adherence to social rules such as those during classroom activities or during games based on social interactions. In these contexts, it was considered that failure to maintain attention to specific rules would lead to rule breaking behaviour. Another possibility proposed by these authors was that sustained attention plays an important role in processing relevant social cues. In particular, if a child’s sustained attention skills are characterised by sporadic levels of engagement s/he may not only fail to capture all of the relevant social cues, but s/he may also have an incomplete set of social schemas on how to behave during social interactions. Andrade et al. also outlined a potential role for selective attention in social competence. They highlighted that during social interactions there is a considerable amount of irrelevant
information that needs to be ignored in order to process the relevant social cues. This ability to ignore irrelevant information may also increase the efficiency of processing social information associated with social interactions.

Attention can be considered to impact on both the Skills and Index Levels of Rose-Krasnor’s (1997) model of social competence. Attention may be important for the Skills Level because it allows individuals to process and encode relevant internal and external (i.e., environmental) cues needed to carry out social interactions, while ignoring irrelevant cues. For example, children need to be able to select relevant cues from the environment during social interactions in order to then be able to sustain and divide their attention, enabling them to encode and respond to such cues. If children experience difficulties in encoding information due to poor selective, sustained, and/or divided attention, then this may affect the way they respond to social cues. Children’s responses to social cues may be affected if they have difficulties interpreting and understanding the social behaviours of others (Crick & Dodge, 1994; Semrud-Clikeman, 2007).

Attention may also impact on the Other- and Self-domains of the Index Level of social competence. Several studies have shown that children with attention deficit/hyperactivity disorder (ADHD) experience difficulties with social behaviour (Nixon, 2001). One reason for these children’s social and behavioural difficulties has been argued to be a result of inattentive and hyperactive behaviours, which may be influenced by these children’s difficulties in processing social information (Kofler et al., in press). In particular, research has shown that boys with ADHD display more antisocial and aggressive behaviours which influence the quality of interactions they have with others (Landau & Moore, 1991), as well as affecting their level of socio-metric status (Coie, Dodge, & Kupersmidt, 1990; Guevremont & Dumas, 1994). As a result, these children may withdraw from social interactions or may display an increase in aggressive behaviours, in turn affecting their
levels of self-esteem and self-concept (Houck, Kendall, Miller, Morrell, & Wiebe, in press; Nixon, 2001).


The relationship between social competence and attention has been studied with respect to children with ADHD. These children have been shown to struggle socially (Huang-Pollock, Mikami, Pfiffner, & McBurnett, 2009; Nixon, 2001), with up to 82% of children with ADHD being identified as experiencing clinically significant impairments in social competence (Huang-Pollock, et al., 2009). In addition, children with ADHD have been shown to perform poorly in school (Lambert & Sandoval, 1980; McGee & Share, 1988; Semrud-Clikeman, 2007). As a group, children with ADHD thus present with problems with social competence and academic achievement. Furthermore, children with ADHD have been shown to experience difficulties with selective attention (Chan et al., 2009), sustained attention (Aase & Sagvolden, 2006), and divided attention (Kaufmann et al., 2010).

There is research which indicates an association between attention and the Skills Level of social competence (Landau & Moore, 1991; Nixon, 2001). To date, the types of social skills deficits reported in children with ADHD include difficulties in social cognition (Uekermann et al., 2010), and emotion regulation and empathy (I. Marton, Wiener, Rogers, Moore, & Tannock, 2008). A study by Van der Oord, Van der Meulen, Prins, Oosterlaan, Buitelaar and Emmelkamp (2005) aimed to examine social skills in 123 children with ADHD and 239 controls using the Social Skills Rating System. This instrument was the same one used by Fujiki et al. (1996) to examine social skills in children with SLI. The children in Van der Oord et al.’s (2005) study had a mean age of 10 years. In their study children with ADHD performed significantly poorer in all areas of social skills compared to TD children, with the largest group differences observed in areas assessing cooperation,
assertion, and self-control. Despite these results it is important to note that a potential problem with inferring a causal link between attention and social competence problems in children with ADHD is that this group of children also have learning difficulties (Biederman et al., 2004). Therefore, it is difficult to differentiate whether children with ADHD struggle socially as a result of their difficulties with learning; if their difficulties are a result of their inattention; or if there is a more complex pathway at play that involves both difficulties with learning and inattention.

Investigating social competence problems in children with ADHD provides a useful starting point for examining the relationship between social competence and attention. However, focusing on group comparisons alone between children with and without ADHD does not necessarily address how selective, sustained, or divided attention affects poor social competence. The extent to which these different components of attention relate to the Skills Level of social competence is yet to be addressed in detail.


There is evidence to suggest that an association may be apparent between attention and the Index Level of social competence based on research undertaken in children with ADHD. As a reminder, the Index Level is the functional outcomes of children’s skills and competencies at the Skills Level (Rose-Krasnor, 1997). This level is further divided into the Other- and Self-Domains. Outcomes at the Other-Domain can include socio-metric status, the quality of relationships children have with others, and other’s opinions of children’s socially acceptable behaviours, while outcomes at the Self-Domain include a child’s level of social self-concept and self-esteem (Rose-Krasnor, 1997).

Associations between the Other-Domain of the Index Level and attention have been shown in research which has examined social competence in primary school aged children with ADHD and TD children (Andrade et al., 2009; Merrell & Boelter, 2001). Specifically
research has shown that children with ADHD have lower socio-metric status (Mrug, Hoza, Pelham, Gnagy, & Greiner, 2007), experience poor quality friendships (Heiman, 2005), and are considered by others to display less acceptable and anti-social behaviours (Thorell & Rydell, 2008). Merrell and Boelter (2001) operationalised social competence using parent ratings of social behaviours and the ability to apply social behaviours in different contexts. These describe the Other-Domain of the Index Level because they assess other’s expectations of acceptable and responsible social behaviours (Rose-Krasnor, 1997). The results revealed that parents of children with ADHD rated their children as having poorer levels of social behaviour and poorer ability in applying social behaviours in different contexts compared to the parents of TD children (Merrell & Boelter, 2001). Despite these results it is acknowledged that they need to be interpreted with caution because the parents in this study were aware of their child’s diagnostic status, and thus could have rated their children lower in pro-social areas because of the stigma attached to the diagnosis as opposed to their actual behaviour in different contexts.

Andrade, et al. (2009) examined the association between sustained and selective attention and social competence in children with poor attention. One hundred and one children aged between 72 and 144 months participated in their study. The total sample was divided into two groups of children. The first comprised those who met a DSM-IV (American Psychiatric Association, 2000) diagnosis of ADHD, while the second group were classified as children with sub-clinical difficulties with attention. All children were administered a test of sustained and selective attention, while teachers were asked to report on children’s social behaviours. The results showed that all children’s scores on a task assessing sustained attention predicted poorer social behaviour. With respect to selective attention, the results showed that after controlling for hyperactive behaviour, which is typically exhibited by some children with ADHD, selective attention did not significantly
explain poor social behaviour. These results indicate that sustained attention is important for social competence in relation to social behaviour; however selective attention does not seem to be important for social competence. Therefore it seems that there is empirical evidence for an association between sustained attention and social competence, but not for selective attention.

The importance of sustained attention in the Other-Domain of the Index level has also been demonstrated in TD children. Bennet-Murphy, Laurie-Rose, Brinkman, and McNamara (2007) examined the relationship between sustained attention and social competence in 40 TD children aged between 3 and 5 years. Sustained attention was measured using a continuous performance test (e.g., Kerns & Rondeau, 1998) in which children were repeatedly presented with different visual stimuli but asked only to report upon seeing one of them. Social competence was evaluated with respect to children’s pro-social characteristics (i.e., gregariousness) and anti-social characteristics (i.e., aggression). The results showed that children with better levels of sustained attention were more gregarious and those with poorer sustained attention were more aggressive. This suggests that the processes that comprise sustained attention may support the Index Level of social competence.

Research undertaken with children with ADHD has also examined the Self-Domain of the Index Level. This research has reported inconsistent associations when examining self-concept and self-esteem in these children. Some studies have shown that children with ADHD rate their self-concept comparably to their TD peers (e.g., Barber, Grubbs, & Cottrell, 2005; Hoza et al., 2004), while other studies have reported that children with ADHD do not report lower levels of self-concept (e.g., Houck et al., in press). Research examining an association between attention and self-esteem on the other hand has shown more consistent results (e.g., Edbom, Granlund, Lichtenstein, & Larsson, 2008; Ek,
Westerlund, Holmberg, & Fernell, 2008; Nixon, 2001). Specifically, research has shown that children with ADHD reported comparably lower levels of self-esteem compared to TD children (Nixon, 2001). Collectively these studies indicate that some children who have difficulties with attention report low levels of self-concept and self-esteem.

**Attention and Academic Achievement in Children**

As with language functioning, an argument can also be formulated to consider that attention may indirectly affect social competence through negatively impacting on academic achievement. Researchers to date have attempted to describe how difficulties with attention may lead to poor academic achievement. Difficulties with attention have been proposed to affect academic achievement since the ability to effectively engage in classroom activities involves children being able to sustain attention in the classroom (Polderman, et al., 2010; Semrud-Clikeman, 2007). These difficulties have been documented in children from clinical populations (Barkley, 1997; Martinussen & Tannock, 2006) and children with sub-clinical problems with attention (G. H. Taylor, Anselmo, Foreman, Schatschneider, & Angelopoulous, 2000).

For instance, Taylor et al. (2000) examined the sensitivity of kindergarten teacher ratings in identifying early learning problems in children. Kindergarten teachers rated the progress of approximately 303 students in six academic domains of knowledge of letter names, knowledge of letter sounds, awareness of correspondences of letters and words with oral language, naming of numbers one through to ten, counting to ten with one to one correspondence, and matching numerals with sets of objects from zero to ten. These domains were agreed upon by teacher consensus. Thirty-eight children were classified as being at risk for developing learning problems and were matched to 34 children with satisfactory ratings in all six domains (i.e., the control group). The results revealed that children at risk of developing LD were shown to have increased difficulties with attention as
reported by teachers. Follow-up of this sample in the first grade revealed that 24 of the 34 (i.e., 71% of children) children identified as at risk of developing LD, had consistent difficulties with attention and academic achievement. Taken together these results indicate that difficulties with attention are predictive of learning difficulties.

**Working Memory and Social Competence in Children**

Working memory is generally considered to support both the short-term storage and processing (or manipulation) of information (Miyake & Shah, 1999). There is some debate concerning the architecture of the working memory system (D'Esposito, 2007). In some models, the short-term storage and processing functions are undertaken by a single component (Just & Carpenter, 1992). In other models, the short-term storage and manipulation of information occur based upon dedicated sub-components. For example, Baddeley and Hitch's (A. Baddeley, 2004; A. D. Baddeley & Hitch, 1974) model of working memory comprises two modality specific slave systems: the phonological loop and the visuo-spatial sketchpad. These two systems are responsible for supporting the short-term storage of auditory and visual information respectively. Tasks that involve an examinee to temporarily store visual or verbal information primarily assess the capacity of these slave systems. In this model the central executive regulates the flow of information into the slave systems. A fourth component to this model, the episodic buffer, was introduced by Baddeley (2000). The episodic buffer is considered to be a storage system capable of integrating information from a variety of sources such as that from long-term memory, but it is limited in its capacity. The central executive can access information that is briefly held in the episodic buffer via conscious awareness. Similarly, Cowan (1988) proposed that working memory is comprised of a central executive system that relays information to and from long-term memory stores. These processes were argued to be
reliant on the processes of attention, and were argued to allow individuals to be able to manipulate and process information.

At present, little research has been conducted to examine whether working memory directly influences social competence. At a conceptual level, social-information processing models of social competence can be considered to implicate working memory. As noted earlier, domain general cognitive abilities influence the extent to which an individual can process social cues, as well as retrieve appropriate social schemas from long-term memory. Within this model working memory may play a role in both the encoding of social cues and the retrieval of appropriate social schemas from long-term memory stores. Phillips et al., (2007) suggested that working memory might be important for the processing of social information since the encoding of social cues requires the simultaneous integration and manipulation of several pieces of relevant information including verbal cues (e.g., intonations in speech), non-verbal cues (e.g., body language), and facial expressions.

Another proposal that may support a link between working memory and social competence is forwarded by Rapport, Chung, Shore, and Isaacs (2001). Rapport et al. argued that working memory might indirectly contribute to social competence through contributing to inattentive and hyperactive behaviour. Low working memory was argued to affect children’s inattentive behaviour if children showed a lack of interest in an activity within the classroom setting, or relinquished from an activity if the demands of the task exceeded their working memory capacity. On the other hand, low working memory may affect hyperactive behaviour because of its association with an increase in behavioural activity as a way of facilitating central nervous system arousal (Andreassi, 1995). In this situation, it is proposed that hyperactive behaviour aims to compensate for under stimulated cortical levels (Rapport et al., 2009). In both cases low working memory is seen to share an association with inattentive or hyperactive behavioural problems. According to Rapport et
al. these behavioural problems then lead to social competence deficits because children are considered to be disinterested in or are disruptive during social interactions.

The proposals previously outlined concerning the role of working memory in social competence can also be applied to understanding how working memory problems might be related to the Skills and Index Levels of social competence proposed by Rose-Krasnor (1997). First, working memory can be considered to impact the Skills Level because of its role in encoding and retrieving relevant social information such as turn taking in a conversation (Crick & Dodge, 1994). In relation to the Other-Domain of the Index Level, children may be considered less socially competent if they are disinterested in social interactions or exhibit disruptive or hyperactive behaviour, which in turn may lead to low socio-metric status or negative evaluations regarding socially acceptable behaviours. Finally, working memory might also impact the Self-Domain of the Index Level if children are aware of their difficulties in misinterpreting social processes that may affect their self-esteem and self-concept.


A number of studies have been conducted which have demonstrated an association between working memory and the Skills Level of social competence. However, much less research has been specifically conducted to examine the relationship between working memory, social competence, and academic achievement in children. Evidence indicating that working memory supports the encoding of social information was demonstrated by Phillips et al., (2007). In their study undergraduate students completed two tasks, the first which required students to watch two videos of social dilemmas and to provide a response, while the second task was a dual paradigm where students were required to watch the two videos separately whilst completing a working memory task. The two videos consisting of social dilemmas lasted for 2 seconds and 30 seconds in duration. The results from the study
showed that when students were watching the 2-second videos there was no difference in performance between the first and second tasks. However, a significant decrease in performance between the two tasks was observed when students watched the 30-second videos. That is, students’ responses to the social dilemma were not affected when they were required to watch the 30-second video without completing a working memory task, but their performance declined when they were required to watch the 30-second video whilst completing a working memory task. The authors went on to conclude that working memory is seemingly involved in encoding long and possibly more complex social information, but not short social information. This indicates that if working memory was not implicated in the processing of social information at all, then there would be no differences in performance between the two tasks.

Correlational research undertaken with paediatric clinical populations also supports the role of working memory at the Skills Level of social competence. Kiley-Brabeck and Sobin (2006) examined the relationship between measures of working memory and social skills in children with 22q11 Deletion Syndrome. This genetic disorder is characterised by physical facial anomalies that vary in severity as well as cognitive impairments in working memory and attention (Sobin et al., 2005). In the study by Kiley-Brabeck and Sobin (2006) a significant correlation was found between working memory and a social skills checklist. However, the results do not entirely discount the role of other cognitive abilities. This is because significant correlations were also reported for measures of attention and executive functioning. This suggests that although working memory was associated with social skills, the role of other cognitive abilities such as attention may also explain difficulties at the Skills Level of social competence, since they are also considered to be a part of working memory functioning.
Donlan and Masters (2000) examined the correlations between memory and a measure of social skills in children with language impairments. The memory tasks assessed the short-term storage of verbal and visual information. The measure of social skills was a checklist that assessed children’s ability to interpret facial expressions and their ability to make eye contact during a conversation. Correlational analyses revealed that the measures of verbal short-term memory but not visual short-term memory were correlated with the social skills measure. Interestingly, the study did not find statistically significant correlations between the social skills measure and measures of comprehension and receptive vocabulary. This study provides some evidence suggesting a specific role for memory and the Skills Level of social competence.

Associations between working memory and social skills have also been demonstrated in unselected paediatric samples. Alloway, Gathercole, Adams, Willis, Eaglen, and Lamont (2005) examined associations between measures of phonological short term memory, phonological working memory, and the episodic buffer with a general measure of social skills completed by teachers. Children participating in the study had an approximate mean age of 5 years. The results showed that of the three working memory components assessed, the episodic buffer was the only component that was related to teacher ratings of social skills. Because the role of the episodic buffer is to integrate information from long-term and working memory, it was inferred that perhaps children might experience difficulty processing information stored in their long-term memory.

**Working Memory and the Index Level of Social Competence: Empirical Evidence.**

Much less research has examined the relationship between working memory and social competence at the Index Level. Evidence that exists in relation to this association is mixed. Alloway, Gathercole, Kirkwood, and Elliot (2009) examined the behavioural profiles and self-esteem in 3189 primary school aged children. Behavioural profiles relate to
the Other-Domain of the Index Level while self-esteem relates to the Self-Domain. Of the total sample, 308 children were identified as having low working memory. The results showed that while the children with low working memory were reported to have difficulties with academic achievement, few were considered to have broader externalising behavioural difficulties such as hyperactivity. In addition, the results did not indicate that the children with low working memory had lower levels of self-esteem. Thus this research does not provide evidence suggesting that working memory directly affects both the Other- and Self Domains of the Index Level of social competence.

In research undertaken with children with ADHD, evidence has been presented suggesting an association between working memory and the Other-Domain of the Index Level of social competence. Kofler et al. (in press) examined associations between symptoms associated with ADHD (i.e., inattentiveness and hyperactivity), working memory, and social competence. Social competence was operationalised as externalising and internalising behavioural problems as indexed by the Child Behaviour Checklist (see Achenbach, 1994). Participants in Kofler et al.’s (in press) study included 23 children with ADHD and 16 TD children with an approximate mean age of 10 years. One result to emerge from this study was that the central executive component of working memory was associated with children’s behaviour; however this association was found to weaken when children’s symptoms of ADHD (i.e., hyperactivity and inattention) were considered. That is, the central executive was more strongly associated with children’s hyperactive and inattentive behaviour and not with social behaviour per se. Rather, children’s hyperactive and inattentive behaviour was argued to be influential in these children displaying poor social behaviours. The results also showed that the phonological loop and visuo-spatial sketchpad components of working memory were also associated with children’s social behaviour through their effects on their symptoms of ADHD. Specifically, the phonological
loop was shown to affect behaviour through its effects on hyperactivity, while the visuo-
spatial sketchpad was shown to affect behaviour through its effects on inattention. These
results indicate that both processes of working memory as well as attention seem important
for behaviour during social interactions.

Collectively, the results concerning the relationship between working memory and
the Index Level of Social competence is somewhat unclear. There is limited evidence to
suggest that working memory is not directly related to children’s self-esteem, which
indicates that this aspect of cognition is not associated with the Self-Domain of social
competence. Results concerning the relationship between working memory and the Other-
Domain of the Index level are less clear. Whereas Alloway et al. (2009) did not report an
association between working memory and inattentive behaviour, Kofler et al. (in press) did.
One reason for these differences in findings is that the participants in Kofler et al.’s findings
were children with ADHD. Thus, the association observed between working memory and
inattention may be explained with reference to another variable that correlates with ADHD
such as attention. That is, it could be that attention and low working memory are correlated
with inattentive behaviour. To clarify this issue additional research is required to control for
the influence of other cognitive processes on the different aspects of social competence. The
study by Kofler et al. also highlights that working memory may indirectly influence social
competence. The idea that cognitive abilities such as working memory indirectly affecting
social competence is yet to be investigated in detail in children with below average levels of
academic achievement.

Working Memory and Academic Achievement in Children

Another way working memory may influence social competence is via an indirect
association through negatively effecting academic achievement. In support of this proposal
considerable evidence has been presented linking working memory problems to poor
academic achievement. In the first instance working memory functioning has been shown to be related to performances in reading (S. E. Gathercole, Alloway, et al., 2006; S. E. Gathercole, Lamont, et al., 2006; H. L. Swanson, 1999; H. L. Swanson & Jerman, 2007), writing (S. E. Gathercole, Lamont, et al., 2006), and mathematics (McLean & Hitch, 1999; H. L. Swanson, 2006; H. L. Swanson, Jerman, & Zheng, 2008; H. L. Swanson & Sachs-Lee, 2001). Moreover, other research has shown that working memory is a stronger predictor of academic achievement than general intelligence (T. P. Alloway, Gathercole, et al., 2009).

The importance of working memory for academic achievement and general performance in classroom activities is well described in an observation study conducted by Gathercole, Lamont, and Alloway (2006). In their study three children with low working memory were observed in various areas of academic achievement and general classroom performance. The first problem noted with all three children was that they were frequently found to forget the teacher’s instructions. For example, one child was instructed to work at a particular computer but later forgot which computer to use. These children were also found to perform poorly on tasks that required both the short-term storage and processing of information. One example of such a task provided by Gathercole et al. involved counting words in a sentence and then writing the sentences. Another common difficulty observed in the children was losing track in long and difficult tasks such as writing down sentences spoken by their teacher. In addition to poor literacy abilities, the children with low working memory also demonstrated problems in numeracy. For example, in completing long-division the children were required to keep their place as they worked through the problem; however they struggled to do so. Based on these observations it was concluded that low working memory impacts on a wide range of learning activities within the classroom.
The relationship between working memory and poor academic achievement is further supported in another study by Pickering and Gathercole (2004), who examined the working memory skills in 83 children and adolescents aged between 4 and 15 years. The participants were divided into four groups: one group comprised children who primarily had language difficulties; another group consisted of children with literacy problems; the third group consisted of children with general academic problems including literacy and numeracy difficulties; while the fourth group consisted of children who were identified as having emotional and behavioural problems, ADHD, Asperger’s, or presented with autistic type behaviours. Working memory was assessed using standardised tests that assessed the phonological loop, visuo-spatial sketchpad, and central executive. Results showed that the children with general academic problems performed significantly more poorly on the measures of the phonological loop, visuo-spatial sketchpad, and central executive. The children with language problems performed poorly on the measures of the phonological loop and central executive, and the children with reading problems had slightly below average scores on all of the different components of working memory. These findings show that children with different types of learning problems performed poorly on one or more measures of working memory.

Interestingly, Pickering and Gathercole (2004) did not find impaired working memory functioning in the group consisting of children with behavioural problems. This might suggest that working memory does not directly affect the Index Level of social competence. However, it was not reported in the study whether these children with behavioural problems also had academic difficulties. Thus the results do not necessarily discount the possibility that working memory indirectly affects social competence through its effects on academic achievement.
Concluding Comments

This chapter examined whether language, attention, and working memory might be related to poor social competence in children with low levels of academic achievement. From the review of the literature there is much evidence to suggest that each of the examined cognitive abilities is related to academic achievement. Thus there is evidence to suggest that children with below average academic abilities might also have problems in one or more of the reviewed areas of cognitive functioning. Furthermore, if it is the case that there is a causal relationship between academic achievement and social competence, then language skills, attention, and working memory may have an indirect effect on children’s social competence. The first key point to emerge from this chapter is that there is evidence to suggest that cognitive functioning may affect social competence via academic achievement.

The evidence is less clear concerning whether language, attention, and working memory directly affect social competence. In relation to language and attention, the research shows that these two cognitive abilities impact on the Skills and Index Levels of social competence. However, within the Index Level the effects do not seem to be clear. For example, poor language skills were found to be associated with poor socio-metric status but not necessarily with self-esteem. However, within the construct of socio-metric status one study showed that not all children with language problems experienced difficulties forming friendships. There appears to be less support for the idea that working memory may directly contribute to social competence problems in children who struggle academically. There is some evidence linking working memory to the Skills Level, but its relationship to the Index Level is mixed. Thus it is not clear whether working memory problems directly support social competence.
CHAPTER 4: RE-FORMULATING EARLY HYPOTHESES AND RATIONALE FOR THE CURRENT STUDIES

The purpose of this chapter is to re-evaluate the hypotheses forwarded in Chapter 2 concerning the relationship between academic achievement and social competence. This will be done in light of the evidence concerning the role of the cognitive abilities that were reviewed in Chapter 3. After these revised hypotheses have been considered, the rationale and overview of the empirical chapters will be presented.

Re-conceptualising early Hypotheses of Social Competence

The research reviewed in Chapter 2 indicated that children with below average academic achievement are typically reported to have low social competence. One hypothesis reviewed was the proposal that social competence and academic achievement problems were not causally related. However, according to social information processing theory, there may be common antecedents that independently contribute to social competence and academic achievement. An extension to this theory was forwarded based on the studies that were reviewed in Chapter 3. It was proposed that cognitive abilities may either directly contribute to poor social competence or academic achievement. This proposal is presented in Figure 2. The model represented in Figure 2 predicts two independent associations. This first association is a direct link between social competence and language, attention, and working memory. The second association is a direct link between language, attention, working memory, and academic achievement. This conceptualisation will be referred to as the direct effect model and will be known as Hypothesis 4 for the remainder of this thesis.
The second proposal, that language, attention, and working memory may indirectly affect social competence through its effects on academic achievement is schematically presented in Figure 3. This proposal is forwarded based on another hypothesis that was also reviewed in Chapter 3, which claimed that problems with academic achievement caused social competence problems. Since language, attention, and working memory functioning are associated with academic achievement then another possibility is that these cognitive abilities may indirectly affect social competence. This re-conceptualisation is referred to as the indirect effect model and will be known as Hypothesis 5. Empirical evidence supporting this hypothesis would be found if one or more cognitive abilities were found to influence social competence via academic achievement.
Rational for the Current Studies

The aim of this thesis was to investigate the role of language, attention, and working memory in explaining the relationship between social competence and academic achievement. Two studies were conducted to address this aim. One claim forwarded in Chapter 3 was that cognitive abilities might contribute to academic achievement and social competence problems in children who struggle academically. An assumption of this model is that problems with social competence as well as with language, attention, and/or working memory are all present in this group of children. This assumption was tested in Study 1. Specifically, Study 1 examined whether children with low academic achievement (LAA) had difficulties with social competence and cognitive functioning compared to TD children.

Another claim forwarded in Chapter 3 was that cognitive abilities of language, attention, and working memory may directly or indirectly influence social competence. The purpose of Study 2 was thus to empirically test whether the three cognitive processes of language, attention, and working memory had a direct effect on children’s social competence, or if these three cognitive processes had an indirect effect on children’s social competence through its associations with academic achievement. Answering these questions is important since they will assist in developing a comprehensive and theoretically consistent understanding of children’s social competence difficulties.
CHAPTER 5: STUDY 1

THE RELATIONSHIP BETWEEN SOCIAL COMPETENCE AND COGNITION IN CHILDREN WITH LAA

Introduction

Chapters 2 and 3 considered whether problems with language, attention, and working memory might be related to poor social competence in children who struggle academically. In considering the relationship between academic achievement and social competence, it was proposed that cognitive abilities might have a direct effect on social competence difficulties or indirectly influence social competence through disrupting children’s ability to succeed academically. An assumption associated with both proposals is that children whom struggle academically have both cognitive and social competence problems.

A review of the social competence literature in children with learning problems presented in Chapter 2, revealed that very little is known about the presence of both cognitive and social competence difficulties in children with poor academic achievement. Study 1 aimed to readdress this gap in the literature by examining social competence and cognitive functioning in children identified as having LAA and those with average levels of academic achievement (i.e., TD children). Study 1 also aimed to examine whether there were group differences between children identified as having LAA and TD children at the Skills and Index Levels of social competence identified by Rose-Krasnor (1997). As noted in Chapter 2, Rose-Krasnor proposed that social competence is a multi-dimensional construct that comprises a Skills and Index Level of functioning. Research suggests that there are moderate correlations between measures of social competence (Parker & Asher, 1987). This might suggest that children with problems or deficits in one aspect of social competence may not have problems or deficits in another. This issue was also examined in Study 1.
In this study children identified as having LAA were compared to TD children. Both children with LAA and TD children were presented with tests assessing the Skills and Index Levels of social competence. The children were also presented with tests assessing language, attention, and working memory. Three hypotheses were forwarded in this study. First, it was predicted that children with LAA would obtain significantly lower scores on the tests assessing social competence. Second, it was hypothesised that children with LAA would perform significantly lower on cognitive measures of language, attention, and working memory compared to TD children. In addition, to examining whether cognitive functioning was related to social competence, exploratory analyses involving the computation of correlations between language, attention, working memory, and social competence was also undertaken.

Method

Participants

A total of 25 children with LAA (13 male, 12 female) and 25 TD children (14 male, 11 female) aged between 81 and 113 months participated in this study. All children had English as a first language and were recruited from six schools located in various demographic locations across Melbourne, Australia. Children considered as both LAA and TD were recruited from the same schools.

Identification of children with LAA and TD children. A total of 169 children were initially screened across the six schools for participation in this study. From this sample, 54 children were excluded from analyses because they were identified as children with English as a second language. Appropriate normative data were not available from the tests used to accurately classify these children. Of the remaining 115 children, a selection criterion was used to select the two groups (i.e., LAA and TD). The 50 children identified as LAA or TD
were done so based on their scores from the Wechsler Individual Achievement Test – 2nd Edition – Australian Abbreviated (WIAT-II-A; The Psychological Corporation, 2001) which assesses children in areas of reading, spelling, and mathematics. Research has shown this test to be a robust measure of academic performance within the classroom (The Psychological Corporation, 2001). The WIAT-II-A has been standardised using an Australian sample of children aged between 5 and 19 years. A general achievement composite score, which represents the aggregate performance in reading, spelling, and mathematics, was used to identify children as either LAA or TD. The general achievement composite score is standardised to a mean of 100 and a standard deviation (SD) of 15. Separate standardised scores are also available for the reading, spelling, and mathematics components of the WIAT-II-A. These are also standardised to a mean of 100 and SD of 15.

Children with LAA were identified on the basis of obtaining a composite score that was one or more SD’s below the mean (i.e., ≤ 85). That is, all children classified in the LAA group were required to obtain a score of 85 or below on the WIAT-II-A. Children in the TD group obtained a standard score that was 90 or greater on this measure. It should be noted that correlations between each of the subtests for the current sample were moderate. For the entire group the correlation between the math subtest with the reading and spelling subtests was .59 and .42 respectively (p < .001). The correlation between the reading and spelling subtest was .66 (p < .001). These correlations indicate that all children from the current sample consistently obtained low or high scores across all subtests on the WIAT-II-A.

Both groups of children participating in the study were also presented with the Wechsler Abbreviated Scale of Intelligence (WASI; The Psychological Corporation, 1999). The WASI is a standardised measure of IQ. In this study children were presented with the Vocabulary and Matrix Reasoning subtests. These subtests are combined to provide an estimate of a child’s Full Scale IQ (FSIQ) score that is standardised to a mean of 100 and SD
of 15. All children participating in this study were required to obtain a score that was no less than 1 SD below the mean (i.e., all children obtained a score that was greater than or equal to 85). That is, for children to be classified as LAA or TD children, they were required to achieve a score that was equal to or greater than 85 on the WASI. This criterion implied that none of the children identified as LAA or TD could be considered to have global intellectual impairments. The remaining 65 children of the original sample of 169 did not meet the above criteria and hence were not included in the analyses. Additionally, it is important to note that children who were classified in both groups were not involved in academic, speech, and/or language remediation programs.

Summary statistics for the groups’ age, FSIQ scores, and scores from the WIAT-II-A are presented in Table 2. Comparisons between groups on the tests were examined using independent samples t-tests and the effect size measure Cohen’s $d$ (1988). As to be expected, Table 2 shows significant differences and large effect sizes on the measure assessing academic achievement. A medium and significant effect size was observed with respect to FSIQ scores as measured by the WASI. Because of this result WASI-FSIQ standard scores were used as a covariate in the analyses comparing the two groups. Finally, the groups did not differ with respect to age.

**Materials**

The participants were also presented with standardised tests of cognition and social competence. A description of each test and the operationalisation of the different measures of social competence are now described in turn.

**Measures of Cognition.**

As discussed in Chapter 3, it was proposed that problems with language, attention, and working memory might also be related to social competence difficulties in children with

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1 According to Cohen (1988) a Cohen’s $d$ value of .8 is considered a large effect size, .5 medium, and .2 small.
Table 2. Summary Statistics for Age, FSIQ, and Academic Achievement Reported by Group.

<table>
<thead>
<tr>
<th>Variable</th>
<th>TD (n = 25)</th>
<th>LAA (n = 25)</th>
<th>Comparison of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>Range</td>
</tr>
<tr>
<td>Age (Months)</td>
<td>97.6</td>
<td>6.8</td>
<td>87 - 109</td>
</tr>
<tr>
<td>WASI-FSIQ</td>
<td>99.8</td>
<td>8.8</td>
<td>83 - 119</td>
</tr>
<tr>
<td>WIAT-II-A Composite Score</td>
<td>102.8</td>
<td>6.5</td>
<td>92 - 114</td>
</tr>
<tr>
<td>WIAT-II-A (Reading Subtest)</td>
<td>107.4</td>
<td>6.6</td>
<td>98 - 127</td>
</tr>
<tr>
<td>WIAT-II-A (Spelling Subtest)</td>
<td>96.6</td>
<td>8.7</td>
<td>88 - 116</td>
</tr>
<tr>
<td>WIAT-II-A (Math Subtest)</td>
<td>104.6</td>
<td>7.7</td>
<td>82 - 120</td>
</tr>
</tbody>
</table>

*Abbreviations:* WASI = Wechsler Abbreviated Scale of Intelligence; WIAT-II-A = Wechsler Individual Achievement Test-II-Abbreviated.

*Notes:* WASI-FSIQ and WIAT-II-A Composite and Subtests scores are standardised to a mean of 100 and standard deviation of 15.

*"p < .05; **p < .001
poor academic achievement. Subsequently children participating in this study were presented with well-validated standardised tests that evaluated these aspects of cognition.

**Measure of Language Functioning.** In this study, language was assessed using the Clinical Evaluation of Language Fundamentals 4th Edition – Australian (CELF-4; Semel, Wiig, & Secord, 2003). The CELF-4 is a norm-referenced measure of language functioning and has been standardised using an Australian sample of children and adults aged between 5 and 21 years.

For children aged between 5 and 8 years, expressive and receptive language skills were assessed with the Concepts and Following Directions, Word Structure, Recalling Sentences, and Formulated Sentences subtests.

Concepts and Following Directions is a subtest that assesses receptive language abilities because it requires children to follow a set of instructions. Specifically, the child is required to observe a series of pictures and then to point to the pictures in the order given in the instruction (e.g., “Point to the house after you point to the cars. Go”). Recalling Sentences is a subtest of expressive language (Semel, et al., 2003) and has also been considered a test of the episodic buffer (T.P. Alloway, et al., 2005). In this test children are verbally presented with phrases and are required to repeat them verbatim. An example of a phrase is “The boy fell and hurt himself”. The Word Structure subtest assesses children’s expressive and receptive language (Semel, et al., 2003). This test requires children to respond by adding the appropriate suffixes to the end of the phrase (e.g., “Here the dog is jumping a fence. This is the fence that the dog [jump-ed]”). Lastly, Formulating Sentences is a subtest that assesses expressive language. In this test children are given a word and shown a picture. They are then asked to construct a sentence about the picture using the word given. The subtests used to assess language skills in children aged 9 to 12 years comprise Concepts and Following...
Directions, Recalling Sentences, and Formulated Sentences. The structure of these tasks is the same as for children aged between 5 and 8 years. In addition, the older children are also administered the Word Classes subtest. This involves showing children a selection of pictures and then asking them to choose the two pictures that go together best. Children are then asked to provide a reason for their choice. Thus, the Word Classes subtest assesses both expressive and receptive language. All subtest scores on the CELF-4 are standardised to a mean of 10 and SD of 3.

In this study the dependent variable used to describe language functioning was the Core Language Score (CLS). The CLS is an overall measure of receptive and expressive language skills. The subtests that comprise the CLS for 6 to 8 year olds are Concepts and Following Directions, Recalling Sentences, Word Structure, and Formulating Sentences. For 9 year olds the CLS is comprised of Concepts and Following Directions, Recalling Sentences, Formulating Sentences, and Word Classes. The reliability coefficients for the CLS for children aged 6, 7, 8, and 9 years range between .93 and .96 (Semel, et al., 2003). The CLS is standardised to a mean of 100 and SD of 15.

Measure of Attention. Attention was measured using the Test of Everyday Attention for Children (TEA-Ch; Manly, et al., 1998). The TEA-Ch is an individually administered test measuring levels of attention in children aged between 6 and 16 years. Children participating in this study were presented with the Score!, Walk, Don’t Walk, and Creature Counting subtests from this instrument. The Score! and the Walk, Don’t Walk subtests provide measures of sustained attention, and the Creature Counting subtest was administered to provide a measure of divided attention. These tests were chosen because research into the psychometric properties of the TEA-Ch has found these subtests to be sensitive measures of sustained and divided attention without being a dual task (Manly, et al., 2001). A test of selective attention was not administered to limit the demands of the tasks given the children’s
age. Selective attention was omitted over sustained and divided attention since research has shown that selective attention does not seem to significantly explain poor social competence in children (Andrade et al., 2009).

In the Score! subtest children were required to maintain attention to auditory stimuli. This subtest comprises 10 trials in which children hear “scoring” auditory stimuli that are similar to those heard on a computer game. On each trial children were asked to count the number of “scoring” sounds which they heard variably between nine and 15 times. These were played to the children using a CD player. The auditory stimulus was 345 ms in duration and the interval between each stimulus was between 500 and 5,000 ms. A child’s response to a single trial was coded as correct if s/he was able to identify all of the scoring sounds played in a trial. The maximum score attainable on this task was 10. Reliability for the Score! subtest is 76.2% (percentages within 1 SD were reported to avoid ceiling effects). The dependent variable used in this task for the analyses were standard scores that have a mean of 10 and SD of 3.

In the Walk, Don’t Walk subtest children were given a laminated A4 sheet of paper with designated “paths” that were made up of 14 squares. Each square had a picture of a footprint on it. The children were instructed to listen to the CD which was going to play one sound which was a “go” tone, signalling to move to the next square, or a “no-go” tone, signalling to the child that it was not “safe” to move to the next square. The moves were made by “dotting” each square with a pen. The task required children to listen to the entire sound before making their response. The “go” tones were presented in a regular, rhythmic fashion, and the no-go tone occurred unpredictably within the sequence (i.e., between the 2nd and 12th steps). Two demonstration trials and two practise trials were given before the test items. The maximum raw score a child could achieve on this subtest was 20. The reliability
score for this subtest was 71%. The dependent variable used in the analyses was a standard score that had a mean of 10 and $SD$ of 3.

On the Creature Counting subtest children were presented with a visual stimulus that comprised up to 15 creatures. The creatures were interspersed with arrows that pointed either up or down. The children were asked to count the number of creatures on the page. Children began counting from one and continued to count by ones. When children came to an arrow that pointed upwards they needed to continue counting by ones from smallest to largest. However, when children came to an arrow that pointed downwards they needed to continue counting in reverse order by ones. A correct response was recorded if children accurately identified the number of creatures on the page with respect to the arrows on the page. Prior to starting this subtest a preliminary test ensured all children could count to 15. The maximum raw score for accuracy was 7. The time children took to complete the task was also recorded. The dependent variable for this subtest used in the analyses was a standard score that has a mean of 10 and a $SD$ of 3. The reliability score for this subtest is .71.

Measure of Working Memory. Working memory was measured using the Automated Working Memory Assessment (AWMA; T.P. Alloway, 2007). The AWMA is a computer administered standardised test. The short-form of this test was presented to the children in this study. This version comprised two working memory measures and two short-term memory measures (T.P. Alloway, 2007; T. P. Alloway, Gathercole, et al., 2009). The two working memory measures were Backward Digit Recall and Spatial Span. In the context of Cowan’s (1988) and Baddeley and Hitch’s (1974) models of working memory, these tasks were considered to assess the central executive plus the short-term storage of verbal and visuo-spatial memory respectively. Both tasks required the short-term storage and processing of information. The two measures of short-term memory were Dot Matrix and Nonword Recall. These tasks were considered to assess the visuo-spatial sketchpad and the
phonological loop components of Baddeley and Hitch’s model of working memory respectively. Moreover, both tasks were considered to mainly depend on the short-term storage of information.

During the Backward Digit Recall task children were required to recall a sequence of spoken digits in the reverse order of presentation (T.P. Alloway, 2007). This task has also been considered to be a measure of verbal working memory. This test comprised six blocks of digits, with six series in each block. Children were first presented with two digits for the first block, three digits for the second block and so on until the sixth block that comprised seven digits. The task was discontinued if children responded incorrectly to three series of digits in any given block. Performance on the task was measured as the number of series recalled correctly. Test-retest reliability for this test is .86. The dependent variable obtained from this task that was used in the analyses was a standard score that has a mean of 100 and SD of 15.

In the Spatial Span task, children were required to view a picture of two arbitrary shapes (T.P. Alloway, 2007). The shape on the right side of the screen had a red dot on top of it. The child was required to identify whether the shape with the red dot was the same or opposite of the shape on the left side of the screen. The shape with the red dot was rotated in some trials. The response for this part of the task was recorded as a precision score. On conclusion of each trial, children were required to recall the location of the red dot in order of appearance. Children did this by pointing to a picture with three compass points that were possible locations for the red dot. Responses for this task were recorded as the dot location score. Children were presented with six trials over seven blocks. The first block consisted of one trial, the second block with two trials, and so on until the seventh block, which consisted of seven trials. The task was discontinued if children responded incorrectly to three series of dot location responses in one block. Performance on the task was described with the
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precision and dot location score. The dependent variable used in the analyses was a standard score that had a mean of 100 and $SD$ of 15. The test-retest reliability for this subtest is .79.

The Nonword Recall subtest was administered to assess verbal short-term memory (T.P. Alloway, 2007). In this task children were required to listen to a list of one-syllable non-words and then to recall the list in the same order they were presented. There were six series of non-words over six blocks of trials. The first block contained one non-word in each series, increasing in even increments until the 6th block comprising six non-words in each series. The task was discontinued if children incorrectly recalled the series three times in a block. The performance on this task was measured as whether children recalled all non-words within a single block. The dependent variable used in the analysis was standard scores, which had a mean of 100 and $SD$ of 15. Test-retest reliability for this subtest is .69.

Lastly, the Dot Matrix task was administered as a test of visuo-spatial short term memory (T.P. Alloway, 2007). In this task children were presented with a series of four by four matrices on a computer screen. Children were then shown the position of a red dot in a series of trials. At the end of each trial the children were asked to recall the positions of the dot by tapping the squares on the computer screen in order of appearance. There were nine blocks of six trials for this test. The first block consisted of one dot per trial; the second block had two dots per trial and so on until the ninth block that comprised of nine dots per trial. The task was discontinued if the child was unable to accurately respond three times in a block of trials. Children’s performance on this task was quantified as the number of trials correctly recalled. The dependent variable used in the analysis was standard scores that had a mean of 100 and $SD$ of 15. Test-retest reliability for this test was .85.

In addition to these four tasks, the Recalling Sentences subtest from the CELF-4 was used as a measure of the episodic buffer component from Baddeley and Hitch’s (1974) model of working memory. As noted earlier, the episodic buffer has been proposed to integrate
information held in short and long-term memory (A. D. Baddeley & Hitch, 1974; Cowan, 1988, 1995). Research has been presented suggesting that sentence recall or repetition tasks may assess this component of working memory (T.P. Alloway, et al., 2005).

Measures of Social Competence.

To maintain theoretical consistency with Rose Krasnor’s (1997) model of social competence various standardised tests were used to measure the Skills Level and the Other- and Self-Domains of the Index Level of social competence. Each of these is now described.

Measures of the Skills Level. According to Rose-Krasnor’s (1997) model of social competence the Skills Level consists of specific abilities and behaviours that are considered important to social competence. The types of abilities and behaviours that are relevant to social competence can be delineated using a skills approach to social competence. For instance Rubin, Bukowski, and Parker (2006) proposed that perspective taking, communication, empathy, emotion regulation, and social problem solving are skills that comprise social competence. These skills are conceptualised as a part of the social competence construct because they are necessary to maintain successful social interactions in a variety of contexts (Odom, et al., 1992; Segrin, 2000; Vickerstaff, et al., 2007).

In this study the Skills Level was assessed using the Social Skills Improvement System Rating Scales (SSIS-RS; Gresham & Elliot, 2008) teacher report form. This test is a standardised, norm-referenced instrument that assesses the skills of cooperation, communication, assertion, responsibility, empathy, engagement, and self-control. These skills were assessed because research has shown these seven skills to be considered important within the classroom setting by teacher’s (Elliot, et al., 2008). The SSIS-RS has an age range of 3 to 18 years.

On this test, teachers were asked to rate children’s skills and competencies with respect to cooperation, communication, assertion, responsibility, empathy, engagement, and
self-control. Teachers completed this rating scale without knowledge about children’s performance on the achievement, intelligence, or cognitive tests. Ratings on this test are obtained using a 4-point likert-scale between 0 (“never”) to 3 (“almost always”). Examples of questions from this measure include, “Responds well when others start a conversation or activity” and “Takes turns in conversations”. The maximum raw score a child could achieve on this measure was 138, with raw scores below 85 indicating social skills difficulties. Reliability coefficients for the social skills teacher report form of the SSIS-RS are .96 for females and .97 for males aged between 5 and 12 years. Scores on the SSIS-RS are standardised to a mean of 100 and SD of 15. It should be noted there are no standardised scores for the different aspects of social skills assessed by this instrument.

An additional test of the Skills Level was included which measured children’s ability to interpret social cues and make social inferences. Interpreting social cues and making social inferences are considered to be part of the Skills Level because they are necessary for successful social interactions (Crick & Dodge, 1994; Rose-Krasnor, 1997). In this study, the Test of Pragmatic Language – 2nd Edition (TOPL-2; Phelps-Terasaki & Phelps-Gunn, 1992) was used to test children’s abilities in these areas.

The TOPL-2 is a standardised test that assesses pragmatic skills in children and adolescents aged between 6 and 18 years (Phelps-Terasaki & Phelps-Gunn, 1992). In this test the examinee was shown pictures of everyday events featuring a character and was verbally provided with a short description of a social dilemma the characters faced. Following the presentation of each picture, children were asked to infer what the character in the picture might be feeling or how s/he should respond. For example, in one picture it was explained: “Matt was in a hurry to pass out all the cookies. He forgot to give one to Kate. Kate said, ‘Matt, you are so rude. You forgot me on purpose. Give me a cookie.’ Matt stopped and turned around. He told Kate that she was the rude one. Kate knew she needed to fix things
between them. And she still wanted a cookie. What did she say to fix things?” In this scenario, the child was expected to indicate in their response an effort to repair the communicative breakdown through the use of an apology for being rude or hurtful, and a request or persuasion to get a cookie.

The TOPL-2 demonstrates strong internal reliability for children aged 7, 8, and 9 years (r = .86 - .91; Phelps-Terasaki & Phelps-Gunn, 1992). It has been demonstrated that the maximum score attainable on this task was 17 for children aged 7; and 43 for children aged 8 and 9. These scores were converted to a pragmatic language usage index (PLU). The PLU is a standard score with a mean of 100 and SD of 15. The PLU was the dependent variable used in the analyses.

*Measure of the Index Level: Other-Domain.* The Other-Domain of the Index Level was evaluated using the teacher report form of the Child Behaviour Checklist (CBCL; Achenbach, 1994). In particular, this test was used so that separate measures of children’s internalising and externalising behaviours could be obtained. Research has shown this test to be applicable in distinguishing behavioural difficulties within an Australian community sample (Nolan et al., 1996). Internalising behaviour assessed by the CBCL includes anxious, depressed, and withdrawn behaviour. The general type of externalising behaviour measured by the CBCL includes aggressive and anti-social behaviour. According to Rose-Krasnor’s (1997) model of social competence the Other-Domain of the Index Level focuses on whether the child has healthy relationships with children and adults as well as exhibiting appropriate social behaviour. The Internalising and Externalising subtests from the CBCL thus appear to map on to this aspect of social competence. Moreover, the assessment of behaviour is warranted at this level because it assesses other people’s expectations about acceptable and responsible social behaviours (Rose-Krasnor, 1997). Internalising and externalising behaviours were chosen as outcomes of the Other-Domain over socio-metric status because of
research which has shown that peer likability does not often characterise a child as having an adequate repertoire of skills required to engage in successful social interactions (Cillessen & Mayeux, 2007; Vaughn, et al., 2009).

The CBCL teacher report form is comprised of 113 questions that produce nine clinical scales. Collectively these scales describe internalising and externalising behaviours. Teachers were required to respond to each question on a 3-point likert scale ranging from 0 (“not true as far as you know”) to 2 (“Very true or often true”). Examples of such questions include “Cries a lot”, “Talks out of turn”, “Gets in many fights”, “Sudden changes in mood or feelings”, and “Overly anxious to please”. The internal consistencies of the Externalizing behaviour scale range between .92 to .96, and the reliability of the Internalizing scale ranges between .88 to .92 (Furlong & Wood, 2004). Moderate to high sensitivity and specificity rates (70.5% and 88.6% respectively for T-scores greater than 63) have also been reported with Australian community samples (Nolan, et al., 1996). Within these scales, the questions of sexual behaviour and suicidal ideation were omitted for ethical reasons, and were thus not included in subsequent analyses. Omitting these questions did not affect the outcome of the results or affect the reliability of the test used (cf., Biederman et al., 2001; Rosner, Hodapp, Fidler, Sagun, & Dykens, 2004). The dependent variables used in the analyses were separate T-scores (which are standardised to a mean of 50 and SD of 10) obtained for the Externalising and Internalising behaviour scales. T-scores greater than 65 indicate problem behaviour that is in the clinical range.

Measure of the Index Level: Self-Domain. A measure of the Self-Domain of the Index Level was obtained using the Beck Youth Inventories-Self-Concept Scale (BYI-SCS; Beck, Beck, Jolly, & Steer, 2005). Rose-Krasnor (1997) argues that the Self-Domain describes whether an individual is able to achieve his or her own goals with respect to social interactions. In this study the BYI-SCS was used to tap into this aspect of social competence
via providing a measure of children’s self-reported perceptions of their self-concept and self-esteem.

The BYI-SCS (Beck, et al., 2005) is standardised for children and adolescents aged between 7 and 18 years. The inventory comprises 20 items to which children respond on a 4-point Likert scale ranging from 0 (“never feel that way”), to 3 (“always feel that way”). Examples of questions include “I am just as good as the other kids”, “People think I’m good at things”, and “I do things well”. Reliability figures of the BYI-SCS for children aged between 7 and 10 years are strong for both males and females ($r = .91$ and .89 respectively). Additionally, this test has been shown to be sensitive to clinical differences in self-concept and self-esteem (Beck, et al., 2005). That is, scores from this scale have been shown to be sensitive in identifying children with poor self-concepts and/or self-esteem. Furthermore, research has shown that the BYI-SCS can be sub-divided into two factors that describe self-concept and self-esteem based on the factor loadings of each item (Steer, Kumar, Beck, & Beck, 2005). The maximum total raw score a participant can achieve for this measure is 60. The dependent variable used in the analyses was T-scores that have a mean of 50 and $SD$ of 15.

Procedure

Participants were recruited from six primary schools across various demographic locations in Melbourne, Australia. Prior to sampling, ethics approval was obtained from Deakin University Human Research Ethics Committee (see Appendix A), the Department of Education and Early Childhood Development (see Appendix B), and the Catholic Education Office, Melbourne (see Appendix C). A random sample of schools was selected from an online government register. Written consent from the Principals of the randomly chosen schools was then obtained before parents could be approached (see Appendix D for the plain language statement and letter of informed consent respectively). Consent forms and plain
language statements were then distributed to the parents of each child in Grades 1, 2 and 3 (see Appendix E for the plain language statement and letter of informed consent respectively). Those who returned signed consent forms were eligible to participate in this study.

Each child was individually tested in a quiet room at each school for one 30-40 minute session a week over four consecutive weeks. All children were administered the WASI and the WIAT-II-A in the first session as a screening measure. Only children who had English as a first language were administered the CELF-4 in the second session, the TEA-Ch and the BYI-SCS in the third session, and the TOPL-2 and the AWMA in the final session. Presentation of each test within each session was counterbalanced to average potential carryover practise effects. In addition to this, classroom teachers for each child were asked to fill out the CBCL teacher report form and the SSIS-RS teacher report form. Teachers were kept blind to children’s performances on the WIAT-II-A, WASI, CELF-4, TEA-Ch, BYI-SCS, TOPL-2, and AWMA.

Results

The results from this study are presented in four sections. The first section describes preliminary analyses that were undertaken. In the second section comparisons between the two groups of children are examined on the different measures of social competence. The third section compares the groups on the different tests of cognitive functioning. The final set of analyses examines the relationship between cognitive functioning and measures of social competence.

Preliminary Analyses

The preliminary analyses examined the relationship within and between the different measures of social competence. First, bivariate correlations were computed between the different components of the SSIS-RS. As noted earlier, performance on this test is
summarised with a single composite value. However, the composite score is comprised of subcomponents that assess different behaviours that relate to social skills. These are Cooperation, Communication, Assertion, Responsibility, Empathy, Engagement, and Self-Control. To ensure that the composite score of the SSIS-RS adequately represented these different behaviours for the current sample of children, bivariate correlations were computed between these subscales and the SSIS-RS composite score. Bivariate correlations between each of the sub-components of the SSIS-RS and the composite score are presented in Table 3.

Table 3. *Bivariate Correlations between SSIS-RS Composite Score and Sub-Components.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. SSIS-RS (Composite)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. SSIS-RS (Communication)</td>
<td>.778**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. SSIS-RS (Cooperation)</td>
<td>.864**</td>
<td>.648**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. SSIS-RS (Assertion)</td>
<td>.722**</td>
<td>.591**</td>
<td>.476**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. SSIS-RS (Responsibility)</td>
<td>.869**</td>
<td>.618**</td>
<td>.849**</td>
<td>.456**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. SSIS-RS (Empathy)</td>
<td>.865**</td>
<td>.537**</td>
<td>.702**</td>
<td>.628**</td>
<td>.739**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. SSIS-RS (Engagement)</td>
<td>.851**</td>
<td>.666**</td>
<td>.615**</td>
<td>.560**</td>
<td>.638**</td>
<td>.738**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. SSIS-RS (Self Control)</td>
<td>.788**</td>
<td>.408**</td>
<td>.715**</td>
<td>.402**</td>
<td>.735**</td>
<td>.632**</td>
<td>.621**</td>
<td></td>
</tr>
</tbody>
</table>

*Abbreviations. SSIS-RS = Social Skills Improvement System Rating Scales.*

** p < .001, * p < .05.

Table 3 shows that the SSIS-RS Composite Score was highly correlated with all of the different social skills assessed by this instrument. Also of note was that statistically significant correlations between the different components assessed by this instrument (i.e., Communication, Cooperation, Assertion, Responsibility, Empathy, Engagement, and Self-Control) were also high. Collectively, these data suggest that the SSIS-RS Composite Score adequately measured the different skills assessed by the SSIS-RS.
The next analysis examined bivariate correlations between the TOPL-2, SSIS-RS, CBCL, and BYI-SCS scores. These correlations are presented in Table 4. As noted in the Method section, the TOPL-2 and SSIS-RS are considered to be measures of the Skills Level of social competence, and the CBCL and BYI-SCS are considered to relate to the Other and Self-Domains of the Index Level respectively.

Table 4. Bivariate Correlations between Measures of Social Competence

<table>
<thead>
<tr>
<th>Variable</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. TOPL-2 (Pragmatics)</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. SSIS-RS (Social Skills)</td>
<td>.295*</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. CBCL (Internalising Behaviour)</td>
<td>-0.133</td>
<td>-.440*</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. CBCL (Externalising Behaviour)</td>
<td>-0.218</td>
<td>-.368*</td>
<td>0.175</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>5. BYI-SCS (Self-Concept)</td>
<td>-0.007</td>
<td>.340*</td>
<td>-0.237</td>
<td>-0.07</td>
<td>-</td>
</tr>
</tbody>
</table>

**Abbreviations:** TOPL-2 = Test of Pragmatic Language – 2nd Edition; SSIS-RS = Social Skills Improvement System Rating Scales; CBCL = Child Behaviour Checklist; BYI-SCS = Beck Youth Inventories – Self-Concept Scale.

* p < .05, ** p < .001.

Table 4 shows significant correlations between the TOPL-2 and SSIS-RS, providing some evidence that the two measures were adequately assessing the Skills Level. Table 4 also shows significant correlations between the two measures from the CBCL that assess Internalising and Externalising behaviour. Note that the negative correlation indicates that an increase in externalising behaviour corresponds to a decrease in internalising behaviour (and vice versa). This also provides some evidence that these two subtests are measuring the Other-Domain of the Index Level. There are also significant correlations between the SSIS-RS and the Internalising and Externalising subtests from the CBCL suggesting some overlap between the measure of social competence at the Skill and Index Levels. Despite these consistencies, the BYI-SCS was not found to correlate significantly with any of the other
measures of social competence. At this point it is important to note that overall the magnitude of the correlations between the measures of social competence were less than .5, suggesting that there was no evidence of singularity and multi-collinearity between the measures of social competence. This was an important assumption to examine because MANCOVA techniques were to be used in the primary analyses for this study.

The bivariate correlations between each of the measures of cognitive functioning were also examined. The rationale for examining associations between these measures was to ensure there was no singularity and multi-collinearity between each of these variables (i.e., \( r > .8 \)). These correlations are presented in Table 5. Table 5 shows that the measure of language was significantly correlated with most of the measures of attention and working memory. As to be expected the correlation coefficient between Recalling Sentences and the CLS was high. This is because computation of the CLS score comprises scores from the Recalling Sentences subtest. Following this, the highest correlation observed was between the measure of the episodic buffer and verbal short-term memory (\( r = .52 \)).

Social Competence in Children with LAA and TD Children

The first set of analyses examined differences between the groups with respect to the different measures of social competence. The summary statistics for each measure of social competence reported by group is presented in Table 6. Differences between groups on these tasks were first investigated using a one-way between subjects MANCOVA. The dependent variables in the analyses were the different measures of social competence presented in Table 6. The covariate used in this analysis was WASI-FSIQ scores.
Table 5. *Bivariate Correlation Coefficients for Measures of Cognition*

<table>
<thead>
<tr>
<th>Variables</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7.</th>
<th>8.</th>
<th>9.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Core Language Score (Language)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Score! (Sustained Attention)</td>
<td>.285*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Creature Counting (Divided Attention)</td>
<td>.181</td>
<td>- .046</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4. Walk Don't Walk (Sustained Attention)</td>
<td>.470**</td>
<td>- .066</td>
<td>.314*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5. Nonword Recall (Verbal Short Term Memory)</td>
<td>.395*</td>
<td>- .036</td>
<td>- .044</td>
<td>- .054</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6. Backward Digit Recall (Verbal WM)</td>
<td>.445**</td>
<td>.098</td>
<td>.368*</td>
<td>.173</td>
<td>.273</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7. Dot Matrix (Visuo-Spatial Short Term Memory)</td>
<td>.091</td>
<td>.287*</td>
<td>.182</td>
<td>.161</td>
<td>-.022</td>
<td>.167</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8. Spatial Span (Visuo-Spatial WM)</td>
<td>.279*</td>
<td>.078</td>
<td>.383*</td>
<td>.000</td>
<td>.379</td>
<td>.425</td>
<td>.125</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9. Recalling Sentences (Episodic Buffer)</td>
<td>.821**</td>
<td>.141</td>
<td>-.033</td>
<td>.351</td>
<td>.516*</td>
<td>.339*</td>
<td>.035</td>
<td>.271</td>
<td>-</td>
</tr>
</tbody>
</table>

*Notes.*  \( p < .05;  \ ^* \( p < .005 \)
As noted earlier, the decision to include WASI-FSIQ scores as a covariate in the analysis was to control the possibility that differences between groups reflected differences in intellectual functioning (see Table 2). Assumption testing prior to running the MANCOVA found a violation in the assumption of the homogeneity of covariance matrices: Box’s $M = 32.627, F (15, 9276.632) = 1.930, p = .016$. Subsequently multivariate differences between the groups were evaluated using Hotellings $T^2$ which has been reported to be robust against this violation when there are two groups of equal sizes (Hakstian, Roed, & Lind, 1979). No other assumptions were violated.

The MANCOVA for social competence revealed a significant multivariate effect for group: Hotellings $T^2 = .492, F (5, 43) = 8.680, p < .001, Partial \eta^2 = .502$. Univariate tests were then conducted using the Holm’s Procedure (Aicken & Gensler, 1996; Holm, 1979), to control for an inflated Type I error rate arising from multiple comparisons. The Holm’s procedure was preferred over the Bonferroni method for adjusting the alpha level because it has been shown to be a more robust measure when group differences are of interest (Aicken & Gensler, 1996). Univariate tests showed significant differences between the groups on the measure of

### Table 6. Summary Statistics for Measures of Social Competence Reported by Group.

<table>
<thead>
<tr>
<th>Social Competence</th>
<th>TD ($n = 25$)</th>
<th></th>
<th></th>
<th></th>
<th>LAA ($n = 25$)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>Range</td>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>Range</td>
</tr>
<tr>
<td>Skills Level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOPL-2 (Pragmatics)</td>
<td>89.3</td>
<td>7.8</td>
<td>75 - 106</td>
<td></td>
<td>96</td>
<td>9</td>
<td>80 - 117</td>
</tr>
<tr>
<td>SSIS-RS (Social Skills)</td>
<td>95.6</td>
<td>11.1</td>
<td>77 - 123</td>
<td></td>
<td>110.8</td>
<td>11.3</td>
<td>87 - 132</td>
</tr>
<tr>
<td>Index Level (Other)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBCL (Internalising Behaviour)</td>
<td>44</td>
<td>10.7</td>
<td>37 - 65</td>
<td></td>
<td>47.8</td>
<td>8.9</td>
<td>37 - 75</td>
</tr>
<tr>
<td>CBCL (Externalising Behaviour)</td>
<td>43.8</td>
<td>3.7</td>
<td>41 - 52</td>
<td></td>
<td>51.4</td>
<td>8.5</td>
<td>41 - 68</td>
</tr>
<tr>
<td>Index Level (Self)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BYI-SCS (Self-Concept)</td>
<td>49</td>
<td>6.7</td>
<td>39 - 64</td>
<td></td>
<td>48</td>
<td>6.1</td>
<td>36 - 58</td>
</tr>
</tbody>
</table>


 pragmatics: $F(1, 47) = 8.028, p = .007, \text{Partial } \eta^2 = .143$; social skills: $F(1, 47) = 22.944, p < .001, \text{Partial } \eta^2 = .382$; and externalising behaviour: $F(1, 47) = 16.508, p < .001, \text{Partial } \eta^2 = .256$. Non-significant differences and small to medium effect sizes were observed on the measure of internalising behaviour: $F(1, 47) = 1.910, p = .173, \text{Partial } \eta^2 = .038$; and self-concept: $F(1, 47) = .331, p = .568 \text{Partial } \eta^2 = .007$.

**Cognition in Children with LAA and TD Children**

The next set of analyses examined differences between the groups on the different measures of cognitive functioning. Descriptive statistics of the measures of cognitive functioning reported by group are presented in Table 7. These data were analysed using a series of one-way between subjects ANCOVA and MANCOVA. Examination of assumptions did not reveal violations.

The first analysis examined differences between the groups with respect to language. The results of a one-way ANCOVA, with WASI-FSIQ scores as a covariate, revealed that the LAA group obtained significantly lower language scores than the TD group: $F(1, 47) = 32.913, p < .001, \text{partial } \eta^2 = .478$.

The next analysis examined differences between the groups on the measures of attention. These data were analysed using a MANCOVA with the Score, Walk Don’t Walk, and Creature Counting subtests as the dependent variables. Children’s scores from the WASI-FSIQ were used as a covariate in the analysis. Assumption testing did not reveal any violations. The multivariate effect for group was found to be statistically significant: Wilks $\Delta = .788, F(3, 45) = 4.025, p = .013, \text{Partial } \eta^2 = .212$.

Univariate tests revealed significant group differences on the Score! subtest: $F(1, 47) = 9.047, p = .004, \text{partial } \eta^2 = .161$. No significant differences were observed on the Creature Counting: $F(1, 47) = 1.886, p = .176, \text{partial } \eta^2 = .039$ or the Walk, Don’t Walk subtests: $F(1, 47) = .641, p = .427, \text{partial } \eta^2 = .013$. 

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The final MANCOVA examined differences between the groups on the subtests assessing working memory. The dependent variables in this analysis were Nonword Recall, Backward Digit Recall, Dot Matrix, Spatial Span and Recalling Sentences. Examination of assumptions did not reveal violations. The multivariate effect for group was found to be statistically significant: Wilks $\Delta = .392$, $F (5, 43) = 3.659$, $p = .008$, $Partial \eta^2 = .371$.

Univariate post-hoc tests revealed significant differences between the groups on Nonword Recall: $F (1, 47) = 4.771$, $p = .034$, $Partial \eta^2 = .090$, Backward Digit Recall: $F (1, 46) = 10.786$, $p < .001$, $Partial \eta^2 = .183$; Spatial Span: $F (1, 47) = 16.851$, $p < .001$, $Partial \eta^2 = .260$; and Recalling Sentences: $F (1, 47) = 46.20$, $p < .001$, $Partial \eta^2 = .501$. The difference between the groups was not found to be significant on the Dot Matrix subtest: $F (1, 47) = 1.58$, $p = .215$, $Partial \eta^2 = .033$.

Examining the Relationship between Cognition and Social Competence

While results from previous studies have shown that children with LAA perform more poorly on some measures of social competence (as noted in Chapters 2 and 3), they have also shown that these children perform more poorly on measures assessing cognitive functioning. In the final set of analyses it was examined whether a linear relationship existed between the different measures of social competence and the measures of cognition. In order to investigate this issue, participants from both groups were collapsed into a single group to preserve statistical power. Bivariate correlations were computed first to investigate if there was an association between social competence and cognition in children. These results are presented in Table 8.
Table 7. Summary Statistics for Measures of Cognitive Functioning Reported by Group

<table>
<thead>
<tr>
<th>Cognition</th>
<th>TD (n = 25)</th>
<th>LAA (n = 25)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Language</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS (Language)</td>
<td>95.9</td>
<td>7.1</td>
</tr>
<tr>
<td>Attention</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score! (Sustained Attention)</td>
<td>8.3</td>
<td>3.2</td>
</tr>
<tr>
<td>Walk Don't Walk (Sustained Attention)</td>
<td>7.4</td>
<td>3.1</td>
</tr>
<tr>
<td>Creature Counting (Divided Attention)</td>
<td>7.8</td>
<td>3.9</td>
</tr>
<tr>
<td>Working Memory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonword Recall (Short Term Verbal Memory)</td>
<td>119.3</td>
<td>12.3</td>
</tr>
<tr>
<td>Backward Digit Recall (Verbal Working Memory)</td>
<td>105.8</td>
<td>14.1</td>
</tr>
<tr>
<td>Dot Matrix (Short Term Visuo-Spatial Memory)</td>
<td>101.7</td>
<td>15.2</td>
</tr>
<tr>
<td>Spatial Span (Visuo-Spatial Working Memory)</td>
<td>94.5</td>
<td>18.8</td>
</tr>
<tr>
<td>Recalling Sentences (Episodic Buffer)</td>
<td>8.7</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Notes. The test used to measure the episodic buffer is the recalling sentences subtest from the CELF-4. CLS = Core Language Score from the CELF-4. Score!, Creature Counting, and Walk Don’t Walk are subtests from the TEA-Ch. Nonword Recall, Backward Digit Recall, Dot Matrix, and Spatial Span are subtests from the AWMA.
In Table 8 it can be seen that there were significant correlations between language and pragmatic language, social skills, and internalising behaviour; sustained attention and internalising behaviour; divided attention, pragmatic language, and social skills; verbal short-term memory, social skills, and externalising behaviour; verbal working memory and social skills; visuo-spatial working memory, social skills, internalising behaviour, and self-concept; and lastly there were significant correlations between the episodic buffer and pragmatic language, social skills, and internalising behaviour.

Following this analysis, partial correlations were computed using group membership as a covariate. This allowed for the observation of the association between the different measures of cognitive functioning whilst controlling for individual differences in academic achievement. Results from these analyses are presented in Table 9. Table 9 shows that there are few significant associations between the measures of cognition and social competence. Specifically, language was only found to be correlated with the measure of pragmatics. The Spatial Span subtest was found to be positively correlated with the measure of Internalising behaviour from the CBCL. When interpreting this result, it is important to note that higher values on the measure of Internalising behaviour indicate problematic behaviour. Thus the significant correlation between these variables indicates that as Spatial Span scores increase, Internalising behaviour scores also increase. A significant negative correlation was observed between Nonword Recall and Externalising behaviour. This result indicates that as Nonword Recall Scores increased, Externalising behaviour scores decreased. No other correlations were found to be statistically significant.
Table 8. *Bivariate Correlations between Measures of Cognition and Social Competence*

<table>
<thead>
<tr>
<th>Cognitive Measure</th>
<th>Skills Level</th>
<th>Index Level</th>
<th>Index Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pragmatics</td>
<td>Social Skills</td>
<td>Internalising Behaviour</td>
</tr>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS (Language)</td>
<td>.675**</td>
<td>.539**</td>
<td>-.410*</td>
</tr>
<tr>
<td>Attention</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score! (Sustained Attention)</td>
<td>0.236</td>
<td>0.183</td>
<td>-.327*</td>
</tr>
<tr>
<td>Walk Don’t Walk (Sustained Attention)</td>
<td>0.05</td>
<td>-0.095</td>
<td>-0.176</td>
</tr>
<tr>
<td>Creature Counting (Divided Attention)</td>
<td>.286*</td>
<td>.344*</td>
<td>-0.17</td>
</tr>
<tr>
<td>Working Memory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonword Recall (Short Term Verbal Memory)</td>
<td>0.069</td>
<td>.313**</td>
<td>-0.113</td>
</tr>
<tr>
<td>Backward Digit Span (Verbal Working Memory)</td>
<td>0.163</td>
<td>.342*</td>
<td>-0.096</td>
</tr>
<tr>
<td>Dot Matrix (Short Term Visuo-Spatial Memory)</td>
<td>0.143</td>
<td>0.185</td>
<td>-0.195</td>
</tr>
<tr>
<td>Spatial Span (Visuo-Spatial Working Memory)</td>
<td>0.204</td>
<td>.401*</td>
<td>.295*</td>
</tr>
<tr>
<td>Recalling Sentences (Episodic Buffer)</td>
<td>.548**</td>
<td>.487*</td>
<td>-.285*</td>
</tr>
</tbody>
</table>

*Notes:* The test used to measure the episodic buffer is the recalling sentences subtest from the CELF-4. CLS = Core Language Score from the CELF-4. Score!, Creature Counting, and Walk Don’t Walk are subtests from the TEA-Ch. Nonword Recall, Backward Digit Recall, Dot Matrix, and Spatial Span are subtests from the AWMA.

*p < .05; **p < .001*
Table 9. Partial Correlations between Measures of Cognition and Social Competence (Controlling for Academic Achievement)

<table>
<thead>
<tr>
<th>Cognitive Measure</th>
<th>Skills Level</th>
<th></th>
<th>Index Level (Other)</th>
<th>Index Level (Self)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pragmatics</td>
<td>Social Skills</td>
<td>Internalising Behaviour</td>
<td>Externalising Behaviour</td>
</tr>
<tr>
<td>CLS (Language)</td>
<td>.425*</td>
<td>0.167</td>
<td>-0.203</td>
<td>-0.035</td>
</tr>
<tr>
<td>Attention</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score (Sustained Attention)</td>
<td>0.041</td>
<td>-0.033</td>
<td>-0.227</td>
<td>0.033</td>
</tr>
<tr>
<td>Walk Don't Walk (Sustained Attention)</td>
<td>0.064</td>
<td>0.141</td>
<td>-0.021</td>
<td>0.084</td>
</tr>
<tr>
<td>Creature Counting (Divided Attention)</td>
<td>0.044</td>
<td>-0.141</td>
<td>-0.181</td>
<td>-0.056</td>
</tr>
<tr>
<td>Working Memory</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonword Recall (Verbal Short Term Memory)</td>
<td>-0.146</td>
<td>0.175</td>
<td>0.001</td>
<td>-0.315*</td>
</tr>
<tr>
<td>Backward Digit Span (Verbal Working Memory)</td>
<td>-0.19</td>
<td>0.063</td>
<td>0.112</td>
<td>-0.151</td>
</tr>
<tr>
<td>Dot Matrix (Visuo-Spatial Short Term Memory)</td>
<td>-0.028</td>
<td>0.025</td>
<td>-0.102</td>
<td>-0.165</td>
</tr>
<tr>
<td>Spatial Span (Visuo-Spatial Working Memory)</td>
<td>-0.065</td>
<td>0.205</td>
<td>.540**</td>
<td>0.065</td>
</tr>
<tr>
<td>Recalling Sentences (Episodic Buffer)</td>
<td>0.242</td>
<td>0.132</td>
<td>-0.042</td>
<td>-0.113</td>
</tr>
</tbody>
</table>

Notes. The test used to measure the episodic buffer is the recalling sentences subtest from the CELF-4. CLS = Core Language Score from the CELF-4. Score!, Creature Counting, and Walk Don’t Walk are subtests from the TEA-Ch. Nonword Recall, Backward Digit Recall, Dot Matrix, and Spatial Span are subtests from the AWMA.

*p < .05; **p < .001
Discussion

The aim of Study 1 was to examine social competence and cognitive functioning in children with LAA and TD children. Two hypotheses were forwarded in this study. The first hypothesis predicted that children with LAA would have lower scores on all measures of social competence at both the Skills and Index Levels compared to TD children. The results partially supported this hypothesis. The LAA group was found to obtain significantly lower standardised scores than TD children on the TOPL-2 and SSIS-RS, which measured the Skills Levels of social competence. The LAA group was also found to perform significantly poorer than the TD group with respect to Externalising behaviour as measured by the CBCL. As a reminder, this measure relates to the Other-Domain of the Index Level of social competence. No significant differences were observed between the groups on the Internalising behaviour scale as measured by the CBCL, nor were there group differences on the BYI-SCS. Both these measures relate to the Other-Domain and Self-Domain of the Index Level respectively. The second hypothesis, that children with LAA would obtain lower scores on the measures of language, attention, and working memory was generally supported. This result indicates that children with below average academic abilities also have language, attention, and working memory functioning that is lower than children who have average academic achievement. Collectively, the results of this study suggest that children with below average levels of academic achievement have problems in the domains of social competence and cognitive functioning.

Study 1 provides evidence in support of the proposal forwarded in Chapters 2, 3, and 4, that cognitive functioning may be related to social competence problems in children with academic difficulties. The finding, that children with LAA obtained significantly lower scores on the tests assessing pragmatics (as measured by the TOPL-2) and social skills (as measured by the SSIS-RS) is consistent with findings reported in the meta-analyses reviewed in Chapter 2.
As a reminder these meta-analyses examined social competence in children with and without academic difficulties (Kavale & Forness, 1996; Nowicki, 2003; H. L. Swanson & Malone, 1992). It is interesting to note that in these previous meta-analyses the effect sizes reported in terms of the standardised mean difference was found to be .8. In this study the effect sizes observed for the SSIS-RS and TOPL-2 when converted to a standardised mean difference was 1.426 (CI\(_{95}\) = .96, 1.82) and 2.164 (CI\(_{95}\) = 1.69, 2.56) respectively. In both cases the effect sizes were considerably larger than observed in the previous meta-analyses. In the first instance, the difference in effect sizes between those reported in this study and those in the meta-analyses reviewed in Chapter 2 reinforces the importance of quantitatively synthesising results across studies. This is important in order to arrive at estimates that may be more likely to approach the population parameters.

When interpreted within the context of Rose-Krasnor’s (1997) model of social competence, the results of this study indicate that children with LAA experience difficulties at the Skills Level of social competence. As noted earlier, the Skills Level of social competence includes skills such as interpreting social cues, making social inferences, turn-taking in a conversation, empathy, and self-control, all of which are considered necessary to support social interactions (Elliot, et al., 2008; Gresham & Elliot, 2008). The results of this study suggest that problems in this area are apparent regardless of whether the assessment of social skills and behaviours are undertaken by a teacher or if an individually administered test is used. This is evident since children with LAA performed poorer than TD children on the SSIS-RS, which was completed by teachers, and on the TOPL-2, which was an individually administered test.

Mixed results were observed between the two groups on the tests assessing the Index Level of social competence. At the Other-Domain of the Index Level it was found that the LAA group had significantly more externalising behaviour problems than the TD group. However, no significant differences between the groups were found on the Internalising behaviour problems
scale. At the Self-Domain, no significant differences were observed between the groups for the measure of self-concept and self-esteem as assessed by the BYI-SCS. Collectively, these results suggest that the Index Level of social competence may not be uniformly deficient in children with below average levels of academic achievement.

Closer inspection of the differences at the Index Level of social competence showed that on the Externalising subscale from the CBCL, the average score of the LAA group was not in the clinical range (i.e., $T > 65$) despite significant differences between groups being observed. This indicates that on average, children in the LAA group were exhibiting more disruptive behaviour, but not enough to be considered as having a disorder. This interpretation of the data appears to be consistent with the findings from the meta-analyses reviewed in Chapter 2 examining social competence and academic achievement. As noted in Chapter 2, these meta-analyses showed that the average effect sizes for disruptive behaviour were typically larger in comparison to clinical behavioural problems such as conduct disorder. Thus it seems that on average, children identified on the basis of poor academic achievement are likely to exhibit externalising behavioural problems, but not to the extent where they can be diagnosed with a behavioural disorder.

The non-significant differences observed between the LAA and TD groups on the Internalising behaviour scale are also generally consistent with the results reported in the meta-analyses reviewed in Chapter 2. The results from one meta-analytic study indicated that the average standardised mean difference for Internalising behaviour problems was .319 (Kavale & Forness, 1996). In the current study, while the difference between LAA and TD children was not significant, the standardised mean difference was found to be .305$^2$. This is consistent with Kavale and Forness (1996) and indicates that problems relating to withdrawn behaviour were

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$^2$ Standardised mean difference converted from partial $\eta^2$
generally not found in children with below average academic achievement. As a result, it seems that within the Other-Domain of the Index Level, there appears to be differences in the types of social competence problems affected in children with learning problems.

No significant differences between the groups were observed with respect to the Self-Domain of the Index Level. The effect size expressed as a standardised mean difference observed on the BYI-SCS was found to be .156. This suggests that the Self-Domain of the Index Level in children with LAA is not different from TD children. This result is inconsistent with the results observed in the meta-analysis by Kavale and Forness (1996). In their meta-analysis the average effect size for self-esteem and self-concept was approximately .5. The results from the current study appear to be more in-line with the meta-analysis by Nowicki (2003). Nowicki reported average effect sizes for global self-worth and social self-perception of .39 and .16 respectively. Based on these results Nowicki concluded that students with learning problems may not be aware of their social competence problems. This interpretation of the data by Nowicki would also explain the overall pattern of results observed in the current study.

Explanations for the discrepancy in findings relating to the Self-Domain of social competence between Kavale and Forness (1996), Nowicki (2003), and with the current study require further investigation. However, one potential explanation might relate to the age of the participants. In the Kavale and Forness (1996) meta-analysis the mean age of the children was 10 years. In Nowicki’s (2003) meta-analysis the mean age of the participants was not reported. However, the median grade of the participants was reported to be Grade 3, which typically includes children aged between 8 and 9 years. The average age of children in the current study was also 8 years. A considerable number of studies have demonstrated developmental trends in children’s self-perception of their self-concept, especially in relation to academic achievement. Across elementary/primary school the evidence indicates a decrease in competence (Eccles, Wigfield, Harold, & Blumenfeld, 1983). For example, one study demonstrated that on average,
children aged 10 to 12 years viewed their reading abilities as being poorer than other children (Nicholls, 1978). However, children aged 6 to 8 years viewed their reading abilities as average or above average compared to others in the class. The results from these studies might suggest that young children with low levels of academic achievement do not consider themselves as being below average. Subsequently, there is a weaker association between academic ability and self-concept in younger children.

In relation to social competence, the data obtained in Study 1 re-affirm previous findings that children with poor academic achievement also appear to have lower levels of social competence, but only in specific domains. From the perspective of Rose-Krasnor’s (1997) model, the data suggests problems at the Skills Level and at the Index Level, but only in relation to externalising behaviour. This result also re-affirms the importance of appreciating the multi-dimensional nature of social competence when understanding children with LAA.

The results from the cognitive tests indicated that children in the LAA group have significantly lower functioning in areas of language, attention, and working memory. These findings are consistent with the large body of research that was reviewed in Chapter 3, which has linked poor academic achievement to language, attention, and working memory difficulties (e.g., T.P. Alloway & Gathercole, 2006; Botting & Resing, 2007; N. J. Cohen, 2001; Fazio, 1996; McArthur, et al., 2000). In addition to this, the results of this study also indicated significant associations between different cognitive abilities (see Table 5). This result indicates that children with below average levels of academic achievement are unlikely to have problems in a single area of cognitive functioning. Thus, if cognitive abilities do play a role in social competence, it might not be a single ability.

While cognitive functioning was generally found to be poorer in the LAA group, this result was not observed across all the tasks measuring cognition. Closer examination of the results showed that on the tests assessing attention, the groups did not differ on the tasks
Cognition, Achievement, & Social Competence in Children

assessing divided attention. This result may indicate that not all children with poor academic achievement experience difficulties with attention. Support for this inference is seen in research that has reported individual differences in attention. For instance, Biederman et al. (2004) examined the effect of deficits in attention in children and adolescents with and without ADHD who were also reported to have poor academic achievement. Four hundred and eighty-one children and adolescents with and without ADHD aged between 6 and 17 years participated in their study. The results revealed that of the total sample, 86 children and adolescents with ADHD had significant difficulties in inhibition and planning. Interestingly only 20% of the total sample of children and adolescents with ADHD did not experience deficits in executive functioning, including attention, but were reported to have poor academic achievement. This result indicates that not all children with lower than average levels of academic achievement experience difficulties with attention. The overall profile of children with LAA suggested by this study is one of poor cognitive functioning and social competence in some domains.

Another issue considered in this study was whether evidence could be found to suggest that social competence abilities might be related to the measures of language, attention, and working memory. In support of this proposal some bivariate correlations revealed associations between language and the Skills and Index Levels of social competence. Language was initially correlated with nearly all of the different measures of social competence; however these results attenuated when group membership was taken into account. Specifically, Table 8 showed a significant correlation between language (as measured by the CLS) and social skills (measured by the SSIS-RS), pragmatics (as measured by the TOPL-2), and Internalising behaviour (as measured by the CBCL). One interpretation of the result relating to language and the Skills Level measures is that language functioning is important in the deployment of social skills, in making a contribution to pragmatics, and in interpreting social cues, all of which are independent of academic achievement. Another interpretation for the correlation between language and
pragmatics is that this correlation seems to reflect the demands of the TOPL-2 on children’s oral language skills in addition to interpreting social cues. On each item of the TOPL-2 children are instructed to listen to social dilemmas before being asked to provide a response. The response children provide on this task is also verbal, thus children with more efficient expressive language skills are likely to do better on this test. Lastly, an inference for the correlation between language and the Internalising behaviour as a measure of the Index Level is that children with language difficulties may be unable to express their social and emotional struggles.

Significant bivariate correlations were also found for the measures of attention and working memory with the Skills Level and Index Levels. Specifically, Table 8 showed significant correlations between divided attention, pragmatics and social skills; and sustained attention was correlated with internalising behaviour. After controlling for achievement, the measures of attention were no longer correlated with any of the measures of social competence, suggesting that academic achievement may be a confounding variable when considering the relationship between attention and social competence. Finally, working memory was mostly found to correlate with the measure of social skills as assessed by the SSIS-RS. Collectively these results show that the measures of language, attention, and working memory are more closely associated with the Skills Level of social competence as opposed to the Index Level, indicating that cognition does not have a uniform association with social competence.

At a general level, the results from the bivariate correlations are consistent with several studies that have shown domain general cognitive difficulties to be associated with social competence. The correlations between language and social competence are consistent with studies which have shown social competence problems in children with SLI (Brinton & Fujiki, 1999; Durkin & Conti-Ramsden, 2007; Fujiki, et al., 1996; Hart, Fujiki, Brinton, & Hart, 2004); while the initial bivariate correlations pertaining to attention are consistent with research which has shown poor social competence in children with ADHD (Gumpel, 2007; Mrug, et al., 2007).
Lastly, the results from working memory can be considered to be consistent with studies that have shown children with low working memory to have difficulties with social competence at the Skills Level (T.P. Alloway, et al., 2005; T. P. Alloway, Gathercole, et al., 2009).

Despite these consistencies, the results of this study do not unambiguously provide evidence concerning the role of language, attention, and working memory in the social competence problems of children with LAA. When partial correlations, which controlled for academic achievement, were computed most of the correlations attenuated. Computing the partial correlations showed that controlling for group membership effectively removed the shared variance between academic achievement and the different measures of cognition, as well as the different measures of social competence. One interpretation of this result is that cognition and social competence problems co-occur in children with below average levels of academic achievement. This suggests that problems with cognition and social competence are not causally related in children who struggle academically. Another interpretation is that there is some causal relationship between social competence and academic achievement; however the partial correlations reported in Table 9 underestimate this relationship. This might be because the variance that is important in the causal relationship between social competence and cognitive functioning might also be important for academic achievement. A related limitation with Study 1 is that comparing two groups over a range of measures did not address one of the research questions of this thesis, which was to consider whether cognitive abilities are directly or indirectly related to social competence. This question was addressed in Study 2, and is presented in the following chapter.
CHAPTER 6: STUDY 2
COGNITION, ACADEMIC ACHIEVEMENT, AND SOCIAL COMPETENCE IN PRIMARY SCHOOL AGED CHILDREN

Introduction

The study presented in this chapter aimed to examine the relationship between cognitive functioning and social competence. Multiple Regression analyses and Path analyses were used to examine whether language, attention, and working memory had a direct effect on the Skills and Index Levels of social competence, or whether these abilities of cognition had an indirect effect on social competence via their effects on academic achievement. These research questions were addressed in Study 2A and Study 2B.

The rationale for Study 2A was based on a proposal forwarded in Chapter 3, that problems with language, attention, and/or working memory may directly affect the Skills and Index Levels of social competence. That is, change in one or more of these cognitive abilities were predicted to have an observable change in children’s social competence. In support of this proposal, both theory and evidence were presented in Chapter 3 describing how problems in these cognitive abilities may have a negative impact on the Skills and Index Levels of social competence. One argument forwarded in support of this proposal was that children who struggle academically are often reported to perform poorly on measures of language, attention, and working memory. Furthermore, an extension of the SAM and social information processing theories would imply that these same cognitive abilities might also be important for social competence.

A concern noted in Chapter 3 when examining the relationship between social competence and academic achievement based on data from different clinical groups, was that children from these populations often presented with a range of different cognitive problems. Subsequently, it was not clear whether a specific aspect of cognitive functioning or multiple
cognitive abilities were related to social competence. In Study 2A Multiple Regression

 techniques were used to examine whether measures of language, attention, and working memory predicted the different measures of social competence. An advantage when using Multiple Regression techniques is that the effects of one independent variable on a dependent variable can be examined whilst holding other independent variables constant. Study 2A thus allowed a more detailed investigation of the contribution of the separate cognitive abilities to different aspects of social competence. In addition, Multiple Regression techniques allow one to examine whether the shared contribution of a set of independent variables explain variance in a dependent variable. Thus, Study 2A sought to examine whether a combination of cognitive variables best accounted for variance in the Skills and Index Levels of social competence.

The rationale for Study 2B was based on a second proposal forwarded in Chapter 3, that language, attention, and working memory may indirectly affect social competence through its effects on academic achievement. Specifically, it was hypothesised that difficulties with language, attention, and working memory affect children’s levels of academic achievement, which in turn increase children’s risk for social competence problems. Path analyses were thus used to attest this hypothesis.

In Study 2A and 2B the relationships between cognitive functioning, academic achievement, and social competence were tested in a large unselected sample of children (N = 104). A larger sample size was necessary in order to conduct the regression and path analyses. These children were presented with the same battery of standardised tests used in Study 1. The decision to recruit an unselected sample was considered necessary to assess the relationship between the measures of cognition, academic achievement, and social competence. In principle, an association between the variables was expected if sufficient variability in children’s scores were observed, indicating that children’s cognitive ability, and not their membership to a
particular clinical group (e.g., LAA) explained these children’s difficulties with social competence and academic achievement.

*Method for Study 2A and 2B*

**Participants**

A total of 104 children (49 male, 55 female) aged between 79 and 115 months participated in this study. All children had English as a first language and were recruited from schools that were randomly selected from an online government register. Each school was located in various demographic locations across Melbourne, Australia.

**Materials**

Participants were presented with the same standardised tests of social competence and cognition as described in Study 1. It should be noted that the children in Study 2 were presented with the WASI, which provides a measure of general intelligence, however these data were not analysed in this study. The decision to not include these data in the analyses follows results from Study 1 which shows that intelligence was not related to the measures of social competence. Moreover, in Chapter 2 it was noted that intellectual problems were not likely to account for social competence problems. This was because a number of clinical groups identified with social competence problems do not have intellectual impairments such as children with SLI (American Psychiatric Association, 2000; World Health Organisation, 1994). The tests used in Study 2A and 2B are summarised in Table 10.

<table>
<thead>
<tr>
<th>Test</th>
<th>Domain Assessed</th>
<th>Brief Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIAT-II-A</td>
<td>Achievement</td>
<td>Reading, spelling &amp; mathematics</td>
</tr>
</tbody>
</table>

*Table 10. Summary of Tasks Administered to Participants*
Cognition, Achievement, & Social Competence in Children

<table>
<thead>
<tr>
<th>Test</th>
<th>Domain</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CELF-4</td>
<td>Language</td>
<td>Expressive &amp; receptive language</td>
</tr>
<tr>
<td>TEA-Ch</td>
<td>Sustained and Divided Attention</td>
<td>Ability to hold &amp; attend to information</td>
</tr>
<tr>
<td>AWMA</td>
<td>Verbal and Spatial Working Memory &amp; Short Term Memory</td>
<td>Ability to hold &amp; manipulate information</td>
</tr>
<tr>
<td>Skills Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOPL-2</td>
<td>Pragmatic Language</td>
<td>Pragmatic language in social situations</td>
</tr>
<tr>
<td>SSIS-RS</td>
<td>Social Skills</td>
<td>Efficacy in social interactions.</td>
</tr>
<tr>
<td>Index Level (Other)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBCL</td>
<td>Behaviour</td>
<td>Internalising &amp; externalising behaviour.</td>
</tr>
<tr>
<td>Index Level (Self)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Procedure**

Prior to testing, ethics approval was obtained from Deakin University Human Research Ethics Committee (see Appendix A), the Department of Education and Early Childhood Development (see Appendix B), and the Catholic Education Office, Melbourne (see Appendix C). Written consent from the Principals of the randomly chosen schools was then obtained before parents could be approached (see Appendix D for the plain language statement and letter of informed consent respectively). Consent forms and plain language statements were then distributed to the parents of each child in Grades 1, 2 and 3 (see Appendix E for the plain language statement and letter of informed consent respectively). Those who returned signed consent forms were eligible to participate in this study.
The same testing procedure in Study 1 was followed for this study. The tasks were individually presented to each child in a quiet room at each school for one 30 - 40 minute session a week over four consecutive weeks. One hundred and sixty-nine children returned consent forms. These children were administered the WASI and the WIAT-II-A in the first session as a screening measure. Only those children \((N = 104)\) who did not have English as a second language were administered the CELF-4 in the second session, the TEA-Ch and the BYI-SCS in the third session, and the TOPL-2 and the AWMA in the fourth session. The order of the tasks within each session was counterbalanced to average differential carry over effects. In addition to this, classroom teachers for each child were asked to fill out the CBCL teacher report form and the teacher report form of the SSIS-RS. Lastly, teachers were kept blind to children’s performance on the WIAT-II-A, WASI, CELF-4, TEA-Ch, BYI-SCS, TOPL-2, and AWMA to avoid bias in results.

**Study 2A: Cognitive Predictors of Social Competence**

Two hypotheses were forwarded in this study. First, it was hypothesised that measures of language, attention, and working memory would predict the measure of academic achievement. This hypothesis was forwarded since it was argued in Chapters 2 and 3 that the same cognitive abilities that underlie social competence are also related to academic achievement. Second, it was hypothesised that measures of language, attention, and working memory would predict measures of the Skills and Index Levels of social competence. This hypothesis was based on research reviewed in Chapter 3, which considered cognitive functioning to directly affect these levels of social competence.

**Data Analysis**

Multiple Regression analysis was the main statistical test used in this study. The first analysis was a standard multiple regression that examined the contribution of the cognitive variables to academic achievement. In this analysis language, attention, and working memory as
measured by the CELF-4, TEA-Ch, and the AWMA respectively were entered in a single step as independent variables. The dependent variable in this analysis was the composite score for academic achievement from the WIAT-II-A. This analysis tested the first hypothesis, which predicted whether the measures of cognitive functioning directly predicted academic achievement.

The next set of standard regression analyses tested the hypothesis that the measures of cognitive functioning would predict measures of the Skills and Index Levels of social competence. Evidence in support of this hypothesis would be found if one or more measures of cognitive functioning significantly predicted the Skills and Index Levels of social competence. The dependent variables tested in these regression analyses were pragmatics (TOPL-2), social skills (SSRI-RS), Internalising behaviour and Externalising behaviour (both from the CBCL), and self-concept (BYI-SCS). Collectively, these variables measure the Skills and Index Levels of Social Competence. The independent variables were the measures of language (CELF-4), attention (TEA-Ch), and working memory (AWMA). These series of standard regression analyses were followed by a hierarchical regression where the composite score of academic achievement as measured by the WIAT-II-A was entered as an independent variable in a subsequent step. The rationale for entering this variable was to compare whether the measures of cognitive functioning or academic achievement best predicted social competence.

All regression models were first evaluated with respect to overall model fit, followed by examining whether the individual independent variables predicted the dependent variable. The unique and shared contribution of each predictor variable across all analyses was also assessed. When using regression analyses, the sample size required to achieve robust results depends upon the effect size that is expected from the predictor variables (Field, 2009). For the current study, a medium effect size was expected based on the literature reviewed in Chapter 2. Miles and Shevlin (2001) recommend that when medium effect sizes are expected, a minimum sample size
of 60 is required with 1 predictor variable. Miles and Shevlin produced these guidelines based on simulated data with random samples. The data was generated to demonstrate the sample size needed to achieve different levels of power for different effect sizes. The current study had up to 8 predictor variables. Following Miles and Shevlin’s guidelines, a minimum sample size of approximately 120 was required to achieve robust results with 6 predictors. Since the sample size in the current study was 104, it was deemed that the unique contributions of the predictor variables needed to be interpreted with caution.

**Results**

The results from this study are presented in three sections. First, a description of the preliminary analyses and data screening is presented. The descriptive statistics are presented in the second section, and the results from each of the multiple regression analyses are presented third.

**Summary Statistics & Preliminary Analyses**

Summary statistics for each of the measures of academic achievement, intelligence, cognitive functioning, and social competence are presented in Table 11. Importantly, for the purposes of this study the SD and range of scores included children who scored at the high and low end of the tests, indicating variability in the scores for this sample.

<table>
<thead>
<tr>
<th>Measure</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Academic Achievement</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WIAT-II-A-Composite</td>
<td>97.5</td>
<td>14.1</td>
<td>74 - 142</td>
</tr>
<tr>
<td><strong>Cognitive Functioning</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS</td>
<td>95.1</td>
<td>12.3</td>
<td>59 - 121</td>
</tr>
</tbody>
</table>
### Cognition, Achievement, & Social Competence in Children

<table>
<thead>
<tr>
<th>Task</th>
<th>Score</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score! (Sustained Attention)</td>
<td>8.3</td>
<td>3.1</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Walk Don't Walk (Sustained Attention)</td>
<td>8.7</td>
<td>3.1</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>Creature Counting (Divided Attention)</td>
<td>9.7</td>
<td>3.9</td>
<td>2</td>
<td>15</td>
</tr>
</tbody>
</table>

#### Working Memory

<table>
<thead>
<tr>
<th>Task</th>
<th>Score</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonword Recall (Short-Term Verbal Memory)</td>
<td>95.5</td>
<td>19.6</td>
<td>62</td>
<td>148</td>
</tr>
<tr>
<td>Backward Digit Span (Verbal Working Memory)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dot Matrix (Short-Term Visuo-Spatial Memory)</td>
<td>101.3</td>
<td>13.4</td>
<td>74</td>
<td>129</td>
</tr>
<tr>
<td>Spatial Span (Visuo-Spatial Working Memory)</td>
<td>45.6</td>
<td>8.6</td>
<td>32</td>
<td>64</td>
</tr>
</tbody>
</table>

#### Social Competence

<table>
<thead>
<tr>
<th>Skills Level</th>
<th>Score</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOPL-S (Pragmatics)</td>
<td>94.4</td>
<td>9.5</td>
<td>75</td>
<td>117</td>
</tr>
<tr>
<td>SSIS-RS (Social Skills)</td>
<td>100.8</td>
<td>13.6</td>
<td>74</td>
<td>129</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Index Level</th>
<th>Score</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBCL (Internalising Behaviour)</td>
<td>45.6</td>
<td>9.2</td>
<td>37</td>
<td>75</td>
</tr>
<tr>
<td>CBCL (Externalising Behaviour)</td>
<td>48.9</td>
<td>8.0</td>
<td>41</td>
<td>74</td>
</tr>
<tr>
<td>BYI-SCS (Self-Concept)</td>
<td>41.5</td>
<td>7.0</td>
<td>26</td>
<td>60</td>
</tr>
</tbody>
</table>

The first preliminary analysis examined correlations between the measure of academic achievement and the different measures of the Skills and Index Levels of social competence. The purpose of this analysis was to replicate the results from Study 1. That is, to establish that academic achievement and social competence are correlated. Bivariate correlations between the WIAT-II-A composite score (which is a general measure of academic achievement) and the measures of the Skills and Index Levels of social competence are presented in Table 12. This table shows statistically significant correlations between academic achievement and all measures of social competence except for the BYI-SCS.
Table 12. *Bivariate Correlations between Measures of Social Competence and Academic Achievement*

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. WIAT-II-A-Composite (Academic Achievement)</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. TOPL-S (Pragmatics)</td>
<td>.376**</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. SSIS-RS (Social Skills)</td>
<td>.360**</td>
<td>.201</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. CBCL (Internalising Behaviour)*</td>
<td>-.219*</td>
<td>-.240*</td>
<td>-.444**</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. CBCL (Externalising Behaviour)*</td>
<td>-.264**</td>
<td>-.075</td>
<td>-.328**</td>
<td>.297**</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>6. BYI-SCS (Self-Concept)</td>
<td>.039</td>
<td>.039</td>
<td>.275**</td>
<td>-.120</td>
<td>-.168</td>
<td>-</td>
</tr>
</tbody>
</table>

*Notes:* *Higher scores indicate problem behaviour; *p* < .05, **p* < .001

The independent variables, which were the measures of language, attention and working memory, were then examined to assess for multi-collinearity and singularity. This was achieved by computing bivariate correlations between variables. These correlations are presented in Table 13. Table 13 shows that the correlations ranged from -.035 to .365. Field (2009) suggests correlations greater than .8 indicate multi-collinearity and singularity amongst independent variables. Given this, there does not seem to be evidence to suggest that the different measures of cognitive functioning were measuring the same construct.
Table 13. *Bivariate Correlations between Predictor Variables that Measured Cognitive Functioning*

<table>
<thead>
<tr>
<th>Measure</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7.</th>
<th>8.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CLS (Language)</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Score! (Sustained Attention)</td>
<td>-.035</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Walk Don't Walk (Sustained Attention)</td>
<td>.333**</td>
<td>.137</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Creature Counting (Divided Attention)</td>
<td>.331**</td>
<td>-.003</td>
<td>.304*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Nonword Recall (Short Term Verbal Memory)</td>
<td>.253*</td>
<td>.258*</td>
<td>.090</td>
<td>.070</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Backward Digit Span (Verbal Working Memory)</td>
<td>.311*</td>
<td>.086</td>
<td>.359*</td>
<td>.200*</td>
<td>.219*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Dot Matrix (Short Term Visuo-Spatial Memory)</td>
<td>.093</td>
<td>.215*</td>
<td>.322*</td>
<td>.180</td>
<td>.148</td>
<td>.166</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Spatial Span (Visuo-Spatial Working Memory)</td>
<td>.320*</td>
<td>.120</td>
<td>.365***</td>
<td>.113</td>
<td>.172</td>
<td>.222*</td>
<td>.313**</td>
<td></td>
</tr>
</tbody>
</table>

*p < .05; **p < .001
Results from the Regression Analyses Examining the contribution of Cognitive Functioning and Academic Achievement to Social Competence.

The results from the standard regression analyses examining the contribution of the measures of cognition to academic achievement are presented first. The results for the standard and hierarchical regression analyses examining the contribution of cognition and academic achievement to the Skills Level of social competence are presented second, and the analyses examining the Index Level measures are presented third.

The Contribution of Cognitive Functioning to Academic Achievement. Each measure of cognition was examined as an individual predictor of academic achievement to establish if known associations between the two exist in the current sample of children. The dependent variable in this analysis was the WIAT-II-A composite score. As a reminder, WIAT-II-A composite scores represent the overall measure of academic ability comprising performance in reading, spelling, and mathematics. The independent variables in these analyses were the measures of language, attention, and working memory.

The results showed that the measures of cognition significantly predicted scores in academic achievement: $F(8, 103) = 12.76, p < .001$. The combined independent variables accounted for 51.8% of the variance in academic achievement scores. The individual contribution of each measure of cognition to academic achievement was also examined. Summary statistics for these variables are presented in Table 14.

Table 14. Summary Statistics for Variables Entered for Academic Achievement

<table>
<thead>
<tr>
<th>Variable</th>
<th>SE</th>
<th>B</th>
<th>β</th>
<th>t-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS (Language)</td>
<td></td>
<td>.364</td>
<td>.099</td>
<td>3.964</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Attention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score! (Sustained Attention)</td>
<td>1.105</td>
<td>.352</td>
<td>.244</td>
<td>3.143</td>
<td>.002</td>
</tr>
</tbody>
</table>
Table 14 shows that academic achievement was significantly predicted by language, attention, and working memory. Of the measures of attention, the Score! subtest was found to be a significant predictor of academic achievement, while the Creature Counting subtest fell short of statistical significance. With respect to the different measures of working memory, only the Backward Digit Span and Spatial Span subtests were found to be significant predictors of academic achievement.

The contribution of the independent variables was also examined by computing the amount of shared and unique variance accounted for by each measure of cognition in the academic achievement composite score. The unique contribution of each predictor variable was obtained by squaring the part correlation value. To assist in interpretation, the squared part correlation values were summed for the respective measures of attention and working memory. This allowed for the computation of the amount of unique variance for language, attention, and working memory. The difference between the sum of squared part correlation coefficients and $R^2$ represent the amount of shared variance between each of the independent variables accounted for in children’s academic achievement. The unexplained variance is obtained by finding the difference between 1 and $R^2$. These results for academic achievement are summarised in Figure 4.

<table>
<thead>
<tr>
<th>Cognition Measure</th>
<th>Part Correlation</th>
<th>Part Correlation</th>
<th>Part Correlation</th>
<th>Part Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk Don't Walk (Sustained Attention)</td>
<td>-.252</td>
<td>.351</td>
<td>-.056</td>
<td>-.718</td>
</tr>
<tr>
<td>Creature Counting (Divided Attention)</td>
<td>.558</td>
<td>.304</td>
<td>.157</td>
<td>1.832</td>
</tr>
<tr>
<td><strong>Working Memory</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonword Recall (Short Term Verbal Memory)</td>
<td>.063</td>
<td>.074</td>
<td>.067</td>
<td>.847</td>
</tr>
<tr>
<td>Backward Digit Span (Verbal Working Memory)</td>
<td>.240</td>
<td>.078</td>
<td>.246</td>
<td>3.084</td>
</tr>
<tr>
<td>Dot Matrix (Short Term Visuo-Spatial Memory)</td>
<td>.077</td>
<td>.066</td>
<td>.095</td>
<td>1.181</td>
</tr>
<tr>
<td>Spatial Span (Visuo-Spatial Working Memory)</td>
<td>.119</td>
<td>.060</td>
<td>.164</td>
<td>2.006</td>
</tr>
</tbody>
</table>
Figure 4 shows that the unique contribution of language, attention, and working memory was about equal, contributing approximately 7% of the unique variance. The shared variance between each of these aspects of cognition accounted for 30% of the variance in academic achievement. Thus this analysis suggests that the combined contribution of language, attention, and working memory accounted for the largest amount of variation in children’s academic achievement scores.

The Contribution of Cognitive Functioning to Measures of the Skills Level of Social Competence. The next set of regression analyses examined the contribution of the measures of cognitive functioning to the measures of the Skills Level of Social Competence. In the first of these regression analyses the TOPL-2 PLU Index was the dependent variable. The independent variables were the measures of language, attention, and working memory.

The results showed an $R^2$ value of .317, and the overall model was found to be a significant predictor of children’s TOPL-2 scores: $F(8, 103) = 5.511, p < .001$. The contribution of individual predictors to the model is summarised in Table 15. In this table it can be seen that after all of the variables were entered into the equation, language was the only significant predictor of children’s TOPL-2 scores.
Table 15. *Summary Statistics for Predictor Variables of TOPL-2 Scores.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS (Language)</td>
<td>.448</td>
<td>.077</td>
<td>.582</td>
<td>5.843</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Attention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score! (Sustained Attention)</td>
<td>.337</td>
<td>.274</td>
<td>.114</td>
<td>1.232</td>
<td>.221</td>
</tr>
<tr>
<td>Walk Don't Walk (Sustained Attention)</td>
<td>-.017</td>
<td>.273</td>
<td>-.006</td>
<td>-.061</td>
<td>.952</td>
</tr>
<tr>
<td>Creature Counting (Divided Attention)</td>
<td>-.129</td>
<td>.237</td>
<td>-.055</td>
<td>-.544</td>
<td>.588</td>
</tr>
<tr>
<td>Working Memory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonword Recall (Short Term Verbal Memory)</td>
<td>-.058</td>
<td>.058</td>
<td>-.095</td>
<td>-1.010</td>
<td>.315</td>
</tr>
<tr>
<td>Backward Digit Span (Verbal Working Memory)</td>
<td>.047</td>
<td>.060</td>
<td>.074</td>
<td>.778</td>
<td>.439</td>
</tr>
<tr>
<td>Dot Matrix (Short Term Visuo-Spatial Memory)</td>
<td>-.009</td>
<td>.051</td>
<td>-.016</td>
<td>-.167</td>
<td>.868</td>
</tr>
<tr>
<td>Spatial Span (Visuo-Spatial Working Memory)</td>
<td>-.039</td>
<td>.046</td>
<td>-.082</td>
<td>-.845</td>
<td>.400</td>
</tr>
</tbody>
</table>

The unique and shared contribution of the independent variables was also examined. The results from this analysis are represented in Figure 5. This figure re-affirms the results shown in Table 15 concerning the importance of language in accounting for TOPL-2 scores. In particular, it can be seen that the unique variance associated with language accounted for the most variance in TOPL-2 scores.

*Figure 5.* Unique, shared, and unexplained variance for predictors of TOPL-2 scores.
Hierarchical Regression analysis examining the predictors of TOPL-2 scores was also undertaken with academic achievement included as a predictor variable in a subsequent step. This was done to evaluate which were the best predictors of this aspect of social competence, whilst controlling for academic achievement. The $R^2$ value for this analysis was found to be .330. Overall, the independent variables were found to be significant predictors of TOPL-2 scores: $F (9, 103) = 5.235, p < .001$. The contributions of the individual predictors are summarised in Table 16. This table shows that when all of the cognitive variables were entered into the model, only language was found to be a significant predictor of TOPL-2 scores.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>$t$-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WIAT-II-A-Composite (Academic Achievement)</td>
<td>.155</td>
<td>.086</td>
<td>.217</td>
<td>1.799</td>
<td>.075</td>
</tr>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS (Language)</td>
<td>.448</td>
<td>.077</td>
<td>.582</td>
<td>5.843</td>
<td>.000</td>
</tr>
<tr>
<td>Attention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score! (Sustained Attention)</td>
<td>.337</td>
<td>.274</td>
<td>.114</td>
<td>1.232</td>
<td>.221</td>
</tr>
<tr>
<td>Walk Don’t Walk (Sustained Attention)</td>
<td>-.017</td>
<td>.273</td>
<td>-.006</td>
<td>-.061</td>
<td>.952</td>
</tr>
<tr>
<td>Creature Counting (Divided Attention)</td>
<td>-.129</td>
<td>.237</td>
<td>-.055</td>
<td>-.544</td>
<td>.588</td>
</tr>
<tr>
<td>Working Memory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonword Recall (Short Term Verbal Memory)</td>
<td>-.058</td>
<td>.058</td>
<td>-.095</td>
<td>-1.010</td>
<td>.315</td>
</tr>
<tr>
<td>Backward Digit Span (Verbal Working Memory)</td>
<td>.047</td>
<td>.060</td>
<td>.074</td>
<td>.778</td>
<td>.439</td>
</tr>
<tr>
<td>Dot Matrix (Short Term Visuo-Spatial Memory)</td>
<td>-.009</td>
<td>.051</td>
<td>-.016</td>
<td>-.167</td>
<td>.868</td>
</tr>
<tr>
<td>Spatial Span (Visuo-Spatial Working Memory)</td>
<td>-.039</td>
<td>.046</td>
<td>-.082</td>
<td>-.845</td>
<td>.400</td>
</tr>
</tbody>
</table>

The next regression analysis was conducted using scores from the SSIS-RS as the dependent variable, and the measures of cognition as the independent variables. The $R^2$ value for this model was found to be .264. Overall, the model was found to significantly predict
SSIS-RS scores: $F(8, 103) = 4.119, p < .001$. Summary statistics for each variable entered into the equation are presented in Table 17. This table shows that the CLS (i.e., language) and scores from the Backward Digit Span subtest (i.e., verbal working memory) were significant predictors of children’s SSI-RS scores. The Score! subtest fell short of statistical significant.

Table 17. Summary Statistics for Predictor Variables of SSIS-RS Scores.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Language</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS (Language)</td>
<td>.362</td>
<td>.116</td>
<td>.326</td>
<td>3.129</td>
<td>.002</td>
</tr>
<tr>
<td><strong>Attention</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score! (Sustained Attention)</td>
<td>.787</td>
<td>.410</td>
<td>-.187</td>
<td>1.919</td>
<td>.058</td>
</tr>
<tr>
<td>Walk Don’t Walk (Sustained Attention)</td>
<td>-.274</td>
<td>.413</td>
<td>-.064</td>
<td>-.663</td>
<td>.509</td>
</tr>
<tr>
<td>Creature Counting (Divided Attention)</td>
<td>.051</td>
<td>.360</td>
<td>.015</td>
<td>.142</td>
<td>.888</td>
</tr>
<tr>
<td><strong>Working Memory</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonword Recall (Short Term Verbal Memory)</td>
<td>-.045</td>
<td>.086</td>
<td>-.052</td>
<td>-.526</td>
<td>.600</td>
</tr>
<tr>
<td>Backward Digit Span (Verbal Working Memory)</td>
<td>.200</td>
<td>.092</td>
<td>.216</td>
<td>2.166</td>
<td>.033</td>
</tr>
<tr>
<td>Dot Matrix (Short Term Visuo-Spatial Memory)</td>
<td>.080</td>
<td>.078</td>
<td>.102</td>
<td>1.018</td>
<td>.312</td>
</tr>
<tr>
<td>Spatial Span (Visuo-Spatial Working Memory)</td>
<td>.084</td>
<td>.070</td>
<td>.122</td>
<td>1.206</td>
<td>.231</td>
</tr>
</tbody>
</table>

The unique and shared contribution of language, attention, and working memory is presented in Figure 6. This figure shows that language and working memory made the largest unique contribution to SSIS-RS scores. The shared variance between the independent variables accounted for the most amount of variance in SSIS-RS scores.
Figure 6. Unique, shared, and unexplained variance for predictors of SSIS-RS scores.

The next regression analysis included the WIAT-II-A composite scores as an additional independent variable in examining the cognitive predictors of SSIS-RS scores. The $R^2$ model for this analysis was found to be .279. The overall model was found to significantly predict SSIS-RS scores: $F(9, 103) = 3.910, p < .001$, however, inspection of the individual predictors, as summarised in Table 18 indicate that after Step 2 with WIAT-II-A scores in the model, only the CLS and scores from the Score! subtests were found to be significant predictors of SSIS-RS scores. Academic achievement was not found to be a significant predictor of SSIS-RS scores.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>$\beta$</th>
<th>$t$-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WIAT-II-A-Composite (Academic Achievement)</td>
<td>.176</td>
<td>.128</td>
<td>.173</td>
<td>1.382</td>
<td>.170</td>
</tr>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS (Language)</td>
<td>.304</td>
<td>.122</td>
<td>.274</td>
<td>2.484</td>
<td>.015</td>
</tr>
<tr>
<td>Attention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score! (Sustained Attention)</td>
<td>-.991</td>
<td>.434</td>
<td>-.235</td>
<td>-2.284</td>
<td>.025</td>
</tr>
</tbody>
</table>
The Contribution of Cognitive Functioning to Measures of the Index Level of Social Competence. The next set of regression analyses examined the cognitive predictors of the measures of the Index Level of social competence. The first set of analyses in this section examines predictors of the Internalising and Externalising behaviour scales from the CBCL, which measured the Other-Domain of the Index Level.

In the regression analysis examining the cognitive predictors of the Internalising Scale from the CBCL, the observed $R^2$ was .145, indicating that the model was not found to be significant: $F(8, 103) = 1.838, p = .053$. While the overall model was not found to predict Internalising behaviour scores, three independent variables were found to be significant predictors. These results are summarised in Table 19. This table shows that the measure of language, verbal working memory, and visuo-spatial working memory were all found to be significant predictors of Internalising behaviour scores.

Table 19. *Summary Statistics for Predictor Variables of CBCL Internalising Behaviour Scores.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>$\beta$</th>
<th>$t$-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS (Language)</td>
<td>-.184</td>
<td>.089</td>
<td>-.242</td>
<td>-2.079</td>
<td>.041</td>
</tr>
<tr>
<td>Attention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score! (Sustained Attention)</td>
<td>-.011</td>
<td>.316</td>
<td>-.004</td>
<td>-0.35</td>
<td>.972</td>
</tr>
</tbody>
</table>
The unique and shared contribution of the predictors are summarised in Figure 7. This figure shows that while working memory and language accounted for the largest amount of unique variance, 86% of the variance remained unexplained.

Figure 7. Unique, shared, and unexplained variance for predictors of CBCL Internalising Behaviour scores.

The regression analysis was repeated as a hierarchical regression with WIAT-II-A scores entered as the additional independent variable in a subsequent step. After the WIAT-II-A measure was included into the model, the $R^2$ value was shown to be .156, and the model was
still not found to significantly predict Internalising behaviour score: $F(9, 103) = 1.771, p = .057$. The individual predictors in this analysis are summarised in Table 20.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WIAT-II-A-Composite (Academic Achievement)</td>
<td>-.114</td>
<td>.104</td>
<td>-.151</td>
<td>-1.095</td>
<td>.276</td>
</tr>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS (Language)</td>
<td>-.148</td>
<td>.095</td>
<td>-.194</td>
<td>-1.562</td>
<td>.122</td>
</tr>
<tr>
<td>Attention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score! (Sustained Attention)</td>
<td>.123</td>
<td>.338</td>
<td>.042</td>
<td>.363</td>
<td>.718</td>
</tr>
<tr>
<td>Walk Don't Walk (Sustained Attention)</td>
<td>-.031</td>
<td>.315</td>
<td>-.010</td>
<td>-.098</td>
<td>.922</td>
</tr>
<tr>
<td>Creature Counting (Divided Attention)</td>
<td>-.053</td>
<td>.279</td>
<td>-.022</td>
<td>-.189</td>
<td>.850</td>
</tr>
<tr>
<td>Working Memory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonword Recall (Short Term Verbal Memory)</td>
<td>.014</td>
<td>.067</td>
<td>.022</td>
<td>.205</td>
<td>.838</td>
</tr>
<tr>
<td>Backward Digit Span (Verbal Working Memory)</td>
<td>-.126</td>
<td>.074</td>
<td>-.194</td>
<td>-1.694</td>
<td>.094</td>
</tr>
<tr>
<td>Dot Matrix (Short Term Visuo-Spatial Memory)</td>
<td>-.031</td>
<td>.060</td>
<td>-.058</td>
<td>-.522</td>
<td>.603</td>
</tr>
<tr>
<td>Spatial Span (Visuo-Spatial Working Memory)</td>
<td>.124</td>
<td>.055</td>
<td>.259</td>
<td>2.254</td>
<td>.027</td>
</tr>
</tbody>
</table>

This table shows that after the WIAT-II-A variable was included, the Spatial Span task was found to significantly predict Internalising behaviour scores. However, this result needs to be interpreted in light of the previous results showing that overall, the inclusion of academic achievement still did not account for a significant amount of variance in children’s Internalising behaviour scores.

The next regression analysis examined whether the cognitive variables predicted Externalising behaviour scores from the CBCL. The $R^2$ value was found to be .177. Overall, the model significantly predicted Externalising behaviour scores: $F(8, 103) = 2.339, p = .014$. 

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Table 2 shows summary statistics for the cognitive variables included in the model. This table shows that the Score!, Backward Digit Span, and the Dot Matrix subtests were significant predictors of Externalising behaviour scores.

Table 2. Summary Statistics for Predictor Variables of CBCL Externalising Behaviour Scores.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS (Language)</td>
<td>-.101</td>
<td>.076</td>
<td>-.153</td>
<td>-1.338</td>
<td>.184</td>
</tr>
<tr>
<td>Attention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score! (Sustained Attention)</td>
<td>.594</td>
<td>.270</td>
<td>.231</td>
<td>2.203</td>
<td>.030</td>
</tr>
<tr>
<td>Walk Don't Walk (Sustained Attention)</td>
<td>-.227</td>
<td>.268</td>
<td>-.089</td>
<td>-2.067</td>
<td>.399</td>
</tr>
<tr>
<td>Creature Counting (Divided Attention)</td>
<td>.206</td>
<td>.236</td>
<td>.101</td>
<td>.870</td>
<td>.387</td>
</tr>
<tr>
<td>Working Memory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonword Recall (Short Term Verbal Memory)</td>
<td>.004</td>
<td>.058</td>
<td>.008</td>
<td>.074</td>
<td>.941</td>
</tr>
<tr>
<td>Backward Digit Span (Verbal Working Memory)</td>
<td>-.137</td>
<td>.061</td>
<td>-.243</td>
<td>-2.266</td>
<td>.026</td>
</tr>
<tr>
<td>Dot Matrix (Short Term Visuo-Spatial Memory)</td>
<td>-.105</td>
<td>.051</td>
<td>-.224</td>
<td>-2.060</td>
<td>.042</td>
</tr>
<tr>
<td>Spatial Span (Visuo-Spatial Working Memory)</td>
<td>.049</td>
<td>.046</td>
<td>.118</td>
<td>1.078</td>
<td>.284</td>
</tr>
</tbody>
</table>

Figure 8 shows the unique and shared contribution of each component of working memory. It is clear from this figure that much of the variance in Externalising behaviour scores was not explained. However, within the variance that was accounted for, the unique variance associated with working memory accounted for the most variance, while the unique variance associated with attention accounted for the second most amount of variance for Externalising behaviour scores.
As above, the analysis examining the predictors of Externalising behaviour scores was re-run as a hierarchical regression with the WIAT-II-A composite scores included as the additional independent variable. In this analysis $R^2$ was shown to be .216, and the overall model was found to predict a significant amount of variance in Externalising behaviour scores: $F (9, 95) = 3.248, p = .002$. Summary statistics for the individual predictors in this multiple regression analysis are summarised in Table 22. In this analysis the WIAT-II-A was also found to be a significant predictor of Externalising behaviour scores, as were the Score! and Dot Matrix subtest scores.

Table 22. Summary Statistics for Predictor Variables of CBCL Externalising Behaviour Scores including WIAT-II-A.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t-value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WIAT-II-A-Composite (Academic Achievement)</td>
<td>-.254</td>
<td>.085</td>
<td>-.386</td>
<td>-2.972</td>
<td>.004</td>
</tr>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS (Language)</td>
<td>-.020</td>
<td>.078</td>
<td>-.030</td>
<td>-.259</td>
<td>.796</td>
</tr>
<tr>
<td>Attention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score! (Sustained Attention)</td>
<td>.892</td>
<td>.277</td>
<td>.347</td>
<td>3.218</td>
<td>.002</td>
</tr>
</tbody>
</table>
The final set of analyses examined the Self-Domain of the Index Level of social competence. The dependent variable in this analysis was scores from the BYI-SCS. When the measures of cognitive functioning were used to predict BYI-SCS scores, the $R^2$ value was found to be .056. The model was not found to be a significant predictor of BYI-SCS scores: $F(9, 103) = .707, p = .685$. A summary of the individual predictors in the model is presented in Table 23. This table shows that the independent variables did not significantly predict BYI-SCS scores. Given the non-significant results for the overall model and individual predictors, the unique and shared contribution of each variable was not calculated.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>$\beta$</th>
<th>$t$-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS (Language)</td>
<td>-.010</td>
<td>.068</td>
<td>-.016</td>
<td>-.140</td>
<td>.889</td>
</tr>
<tr>
<td>Attention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score! (Sustained Attention)</td>
<td>.035</td>
<td>.242</td>
<td>.016</td>
<td>.144</td>
<td>.885</td>
</tr>
<tr>
<td>Walk Don't Walk (Sustained Attention)</td>
<td>.260</td>
<td>.241</td>
<td>.118</td>
<td>1.080</td>
<td>.283</td>
</tr>
<tr>
<td>Creature Counting (Divided Attention)</td>
<td>-.382</td>
<td>.209</td>
<td>-.219</td>
<td>-1.828</td>
<td>.071</td>
</tr>
<tr>
<td>Working Memory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonword Recall (Short Term Verbal Memory)</td>
<td>-.013</td>
<td>.051</td>
<td>-.028</td>
<td>-.253</td>
<td>.801</td>
</tr>
<tr>
<td>Backward Digit Span (Verbal Working Memory)</td>
<td>.050</td>
<td>.053</td>
<td>.104</td>
<td>.935</td>
<td>.352</td>
</tr>
</tbody>
</table>

Table 23. *Summary Statistics for Predictor Variables of BYI-SCS Scores.*
As before, these analyses were followed with a hierarchical regression where WIAT-II-A scores were included in the model. With WIAT-II-A composite scores included in the model, $R^2$ was found to be .056. The model was still not found to significantly predict BYI-SCS scores: $F(9, 103) = .622, p = .775$. Summary statistics for the individual predictors in this analysis are summarised in Table 24. Given the non-significant results for the overall model and individual predictors, the unique and shared contribution of each variable was not calculated.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>$t$-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WIAT-II-A-Composite (Academic Achievement)</td>
<td>.005</td>
<td>.071</td>
<td>.100</td>
<td>.068</td>
<td>.946</td>
</tr>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS (Language)</td>
<td>-.011</td>
<td>.073</td>
<td>-.019</td>
<td>-.155</td>
<td>.877</td>
</tr>
<tr>
<td>Attention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score! (Sustained Attention)</td>
<td>.030</td>
<td>.255</td>
<td>.131</td>
<td>.116</td>
<td>.908</td>
</tr>
<tr>
<td>Walk Don't Walk (Sustained Attention)</td>
<td>.262</td>
<td>.243</td>
<td>.119</td>
<td>1.077</td>
<td>.284</td>
</tr>
<tr>
<td>Creature Counting (Divided Attention)</td>
<td>-.385</td>
<td>.214</td>
<td>-.221</td>
<td>-1.799</td>
<td>.075</td>
</tr>
<tr>
<td>Working Memory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonword Recall (Short Term Verbal Memory)</td>
<td>-.013</td>
<td>.052</td>
<td>-.029</td>
<td>-.256</td>
<td>.798</td>
</tr>
<tr>
<td>Backward Digit Span (Verbal Working Memory)</td>
<td>.049</td>
<td>.056</td>
<td>.102</td>
<td>.866</td>
<td>.389</td>
</tr>
<tr>
<td>Dot Matrix (Short Term Visuo-Spatial Memory)</td>
<td>-.022</td>
<td>.046</td>
<td>-.055</td>
<td>-.484</td>
<td>.629</td>
</tr>
<tr>
<td>Spatial Span (Visuo-Spatial Working Memory)</td>
<td>.056</td>
<td>.042</td>
<td>.157</td>
<td>1.343</td>
<td>.183</td>
</tr>
</tbody>
</table>
Summary of Results

Together the results for Study 2A showed that academic achievement and the Skills Level measures of social competence were not associated. In relation to the Index Level, there was only an association between academic achievement and Externalising behaviour as one measure of the Other-Domain of the Index Level. Although there were direct associations between visuo-spatial working memory and Internalising behaviour, the result did not account for a significant amount of variance. The results also showed that after controlling for academic achievement, measures of language and attention were shown to be the only significant predictors of social competence difficulties at the Skills Level. At the Other-Domain of the Index Level, visuo-spatial working memory was still shown to be the only significant predictor of Internalising Behaviour scores; and academic achievement, sustained attention, and visuo-spatial short-term memory significantly predicted Externalising behaviour. Despite these predictions, a limited amount of variance was accounted for across the measures of social competence. There were no significant predictors of BYI-SCS scores, which measured the Self-Domain of the Index Level. Collectively these results suggest that cognition and academic achievement do not have a uniform effect on social competence at both the Skills and Index Levels.

Study 2B: Examining Indirect Effects between Cognitive Abilities and Social Competence

Study 2B aimed to examine whether cognitive functioning shared an indirect association with social competence. Specifically, it was hypothesised that the measures of language, attention, and working memory would be found to have an indirect effect on the measures of the Skills and Index Levels of social competence through its associations with academic achievement.
Path analysis was used to test the hypothesis that domain general cognitive abilities indirectly affect the Skills and Index Levels of social competence. The overall model tested in Study 2B is represented in Figure 9. In this model there are three observed variables. These were the measures of cognition (i.e., language, attention, and working memory), academic achievement, and social competence.

The general framework for evaluating indirect effects was described by Baron and Kenny (1986). In Figure 9, the effect of cognitive abilities on social competence can be decomposed into three separate effects: direct, indirect, and total effects. Direct effects describe the effect of one variable on another variable without the interference of any other variables. Indirect effects describe the influence of one variable on another but only through an association with a third variable; and total effects describe the sum of both the direct and indirect effects.
One direct effect that can be seen in Figure 9 is depicted in path ‘c’. This path predicts that cognition influences social competence in its own right. Computationally, the value of this direct effect is the standardised regression coefficient (or β weight) computed between the measure of cognition and social competence, whilst controlling for the effects of academic achievement. In Figure 9, additional direct effects can be estimated. One is between cognitive functioning and academic achievement. This is shown as path ‘a’ in Figure 9. The value of this direct effect is the standardised regression coefficient between the cognitive abilities and academic achievement. A final direct effect can be predicted between the measure of academic achievement and social competence. This is shown as path ‘b’ in the figure. The value of this effect is the standardised regression coefficient between academic achievement and social competence whilst controlling for cognition.

In this study the interest is whether a measure of cognitive functioning effects academic achievement, which in turn affects social competence. This is referred to as an indirect effect because the measures of cognition are predicted to effect social competence through its association with academic achievement. An indirect effect is derived by firstly multiplying the direct effect between cognitive abilities and academic achievement, and then by multiplying the direct effect between academic achievement and social competence. It is important to note that when this value is being computed it is also necessary to control for the direct effect of cognitive abilities on social competence (i.e., path ‘c’). Thus in Figure 9, the indirect effect of the measures of cognition on social competence is equal to the product of paths ‘a’ and ‘b’ whilst controlling for path ‘c’.

A third effect, which can be computed in the path analysis, is referred to as the total effect. In Figure 9, the total effect is the sum of the direct effect between cognitive abilities and social competence (path ‘c’) and the indirect effect between cognitive abilities and social competence (i.e., the product of paths ‘a’ and ‘c’). Computationally, this value is equal to the
standardised regression coefficient between cognitive abilities and social competence without controlling for the influence of academic achievement. This is analogous to conducting a multiple regression analysis. As a result, an advantage of using path analysis is that the total effect (which can be obtained using multiple regression) can be broken down into smaller paths.

The test for indirect effects also involves evaluating whether the value derived for the indirect path (i.e., the effect of paths ‘a’ and ‘b’ whilst controlling for path ‘c’) is statistically significant. In this study the indirect effect of cognition on social competence, via academic achievement was tested with respect to the different measures of the Skills and Index Levels of social competence. When testing indirect effects, a range of alternative outcomes may also be observed. One alternative outcome is that the indirect effect is found to be non-significant and either the direct effect of cognitive abilities on social competence or the total effect is found to be statistically significant. In this scenario, it can be concluded that academic achievement does not play an observable role in the relationship between cognitive abilities and social competence. A second outcome is that the indirect and direct effects of cognitive abilities on social competence are found to be statistically significant. In this scenario, it can be concluded that cognitive abilities (a) impact on social competence via the effects of academic achievement, and (b) impact on social competence in their own right.

Before presenting additional details of the analysis and results, it is important to briefly discuss differences and similarities between an indirect effect and a mediated effect in order to assist with the interpretation of the results. A mediated effect is said to occur when an independent variable (e.g., cognitive abilities), causes change in a proposed mediator variable (e.g., academic achievement) that in turn causes change in another dependent variable (e.g., social competence). This aspect of a mediated effect is identical to an indirect effect. However, differences between an indirect effect and a mediated effect emerge from a necessary
precondition of a mediated effect. Specifically, in the original formulation of a mediated effect it was proposed that a significant total effect needed to be observed first, such that the additional mediator analysis attempted to further illuminate the association between an independent and dependent variable (Baron & Kenny, 1986). However, debate in the literature exists concerning whether a significant total effect must first be established in order to demonstrate mediation (Shrout & Bolger, 2002). For the purposes of this study an indirect effect will be considered when the product of the paths that link (a) cognitive functioning with academic achievement and (b) academic achievement with social competence is found to be statistically significant. A mediated effect will be considered if in addition to a significant indirect effect, a total effect is also found to be statistically significant.

It should be noted that one key assumption of testing indirect effects is that the independent variable causes changes in the mediator variable. In the context of Study 2B it is assumed that language, attention, and working memory are causally related to children’s academic achievement. Because this study was not longitudinal, this assumption was inferred from the research described in Chapter 3 showing that children with language, attention, and working memory problems typically have lower levels of academic achievement. This research is applicable to the children in the current study since all were in the early years of primary school. However, it is acknowledged that later in development it is plausible for academic achievement to influence children’s cognitive abilities. Thus one limitation that is placed on the modelling in this study is that it may only be applicable to children in the early stages of schooling.

 Separate path analyses were undertaken for the different measures of the Skills and Index Levels of social competence. This was done to test whether cognitive abilities indirectly influence social competence. The dependent variables in these analyses were scores from the SSIS-RS, TOPL-2, Externalising and Internalising subscales from the CBCL, and scores from
the BYI-SCS. The variable that was proposed to indirectly influence social competence was the composite score of children’s academic achievement as measured by the WIAT-II-A. The independent variable in these analyses was a composite measure of children’s cognitive abilities. A composite variable rather than the specific measures of language, attention, and working memory was used to preserve statistical power. Moreover, in Study 2A it was shown that the CLS (which measures language), the Score! subtest (which measures sustained attention), Backward Digit Span scores (which measures verbal working memory), and Spatial Span scores (which measures visuo-spatial Working Memory) were all found to be significant predictors of academic achievement. Furthermore, the regression analyses from Study 2A indicated that the shared contribution of language, attention, and working memory made the largest contribution to children’s academic achievement. In order to preserve this aspect in the path analyses it was decided to create a composite variable representing these variables. This was achieved by converting the aforementioned variables into z-scores and then collapsing them. Converting each variable to a z-score ensured that each of the measures of language, attention, and working memory were given an equal weighting when summed.

Estimates of direct, indirect, and total effects were computed in AMOS (Arbuckle, 2008) using ordinary least squares. Tests of statistical significance for these effects were obtained using a bootstrapping method described by Shrout and Bolger (2002). Bootstrapping is a non-parametric re-sampling technique where the current sample is set as the representative of the broader population from which that sample was derived – thus generating multiple re-samples of the data set and allowing a statistic of interest to be re-calculated across each re-sample (Preacher & Hayes, 2004; Preacher, Rucker, & Hayes, 2007). This approach to testing indirect effects has been found to be more powerful than earlier tests of indirect effects such as the Sobel Test (Sobel, 1982). For all analyses examining direct, indirect, and total effects the number of bootstrap samples was set at 2000 (cf. Preacher & Hayes, 2004).
Results

The results for this study are presented in three sections. Preliminary analyses are presented first. Second, the direct, indirect, and total effects for the measures of the Skills Level of social competence are presented; while the direct, indirect, and total effects for the measures of the Index Level are presented third.

Preliminary Analyses

Prior to the presentation of results it is important to consider if all assumptions of univariate and multivariate normality, outliers, homoscedasticity, and multicollinerarity were met. Since this study is an extension of Study 2A and used the same sample of children, it is deemed that all assumptions were met accordingly based on the preliminary analyses from that study.

Total, Direct, and Indirect Effects for the measures of the Skills Level of Social Competence

The first set of analyses examined whether the relationship between the composite measure of cognition and scores from the TOPL-2 (which measured pragmatics) and the SSIS-RS (which measured social skills) was mediated by academic achievement. The results from the analyses are presented in Figures 10 and 11 respectively.

The total effect of the composite score for cognition on TOPL-2 scores was found to be .387, which was statistically significant ($p < .001; \text{two-tailed}$). That is, every one $SD$ change in the composite score for cognition is associated with a .387 $SD$ change in TOPL-2 scores. This change represents the sum of the direct and indirect effects. Additionally, this result indicates that 14.98% of the variance in TOPL-2 scores is explained by the composite score of cognition and academic achievement.
The direct effect of the composite score for cognition on academic achievement was .686, which was statistically significant ($p < .001$; two-tailed). It should be noted that in all analyses, this path from the composite score for cognition and the WIAT-II-A scores comprises the same variables and therefore the same amount of variance. Consequently, the initial path will be identical in all analyses. The direct effect of WIAT-II-A scores on TOPL-2 scores as shown in Figure 10 was not statistically significant ($p > .05$; two-tailed). Despite this, the direct effect of the composite score for cognition on TOPL-2 scores was .281 and was found to be statistically significant ($p < .05$; two-tailed). The indirect effect of the composite score for cognition on TOPL-2 scores was found to be .251. This was not found to be statistically significant ($p > .05$; two-tailed). Collectively, these results indicate that the association between the composite score for cognition and TOPL-2 scores can be better understood as a direct effect. There does not appear to be any additional explanatory power of including WIAT-II-A scores in explaining this relationship.

The next analysis examined the relationship between cognitive functioning and SSIS-RS scores. Figure 11 shows that the total effect of the composite score for cognition on SSIS-
RS scores was found to be .464 ($p < .001$; two-tailed). This means that 21.53% of the variance in SSIS-RS scores is explained by the composite score for cognition and academic achievement. The direct effect of WIAT-II-A scores on scores from the SSIS-RS was .155. This was not found to be statistically significant. The direct effect of the composite score for cognition on SSIS-RS scores was .356, which was statistically significant ($p < .05$; two-tailed). Finally, the indirect effect between the composite score for cognition and SSIS-RS scores was .108. This result was not statistically significant ($p > .05$; two-tailed). These results suggest that the relationship between the composite score for cognition and SSIS-RS also appears to be better understood as a direct effect rather than an indirect effect.

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

*Figure 11. Path analysis results for SSIS-RS scores.*
Total, Direct, and Indirect Effects for the measures of the Index Level of Social Competence.

The next set of analyses examined whether cognitive abilities indirectly affect the Other- and Self-Domain of the Index Level. The results from the analyses examining Internalising and Externalising behaviour are examined first and presented in Figures 12 and 13 respectively.

For the path analyses examining the relationship between internalising behaviour, the total effect of the cognitive composite variable on the Internalising Behaviour scores from the CBCL was found to be -.185. This result was not statistically significant ($p > .05$; two-tailed). Note that higher scores on the CBCL indicate problem behaviour; therefore negative values indicate lower scores on the composite score for cognition and are associated with more problem behaviour. The only significant direct effect observed for Internalising Behaviour was between the composite score for cognition and the WIAT-II-A composite score. The indirect effect of the composite score for cognition on Internalising Behaviour scores was found to be -.120. This was not statistically significant ($p > .05$; two-tailed). In this analysis there was little
evidence to suggest that the composite score for cognition directly or indirectly influenced Internalising Behaviour scores as measured by the CBCL. This means that the results for Internalising Behaviour as measured by the CBCL are not robust across the same parent population.

The path analyses examining the relationship between Externalising Behaviour revealed a total effect of -.105, which was not statistically significant ($p > .05$; two-tailed). The direct effect of the cognitive composite on the Externalising Behaviour measure was not statistically significant. However, the paths from the cognitive composite, to WIAT-II-A scores, and from the WIAT-II-A to Externalising Behaviour were statistically significant. Furthermore, the indirect effect of the cognitive composite variable on Externalising Behaviour from the CBCL was found to be -.223, which was statistically significant ($p < .05$; two-tailed). Thus for Externalising Behaviour, there is evidence indicating an indirect effect of cognitive functioning via academic achievement on this aspect of social competence.

![Path analysis results for CBCL Externalising Behaviour scores.](image)

*Figure 13. Path analysis results for CBCL Externalising Behaviour scores.*

The final path analyses examined the relationship between the cognitive composite variable and self-concept and self-esteem as measured by the total score for the BYI-SCS. The
results for this analysis are presented in Figure 14. The total effect for this analysis was found to be .046 ($p > .05$, two-tailed). With the exception of the direct effect of the cognitive composite on WIAT-II-A scores, all other paths were not significant. Thus, in this analysis there was no evidence to suggest an association between cognitive functioning and self-concept and/or self-esteem as measured by the BYI-SCS. This means that the results for the BYI-SCS are not robust across the same parent population.

![Path analysis results for BYI-SCS scores.](image)

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

**Figure 14.** Path analysis results for BYI-SCS scores.

**Summary of Results**

The results showed that the measures of cognition had a direct effect on both social skills and pragmatics at the Skills Level of social competence. Additionally, there was an indirect effect between cognition and Externalising behaviour as a measure of the Other-Domain of the Index Level through its association with academic achievement. These results
further support the findings from the Multiple Regression analyses, and show that cognitive difficulties do not uniformly affect social competence.

**Discussion: Study 2A and 2B**

The aim of Study 2 was to examine the relationship between the different aspects of social competence and language, attention, and working memory. Two hypotheses were forwarded in this study. The first hypothesis was based on a model of social competence, which predicted that different cognitive abilities might directly influence social competence. In Chapter 4 this model was labelled as Hypothesis 4 and was described as the direct effect model of social competence. Based on this model it was predicted that the measures of language, attention, and working memory would have a direct association with measures of social competence at both the Skills and Index Levels. The second hypothesis was based on a model that considered language, attention, and working memory to have an indirect effect on the Skills and Index Levels of social competence through their effects on academic achievement. In Chapter 4 this model was presented as Hypothesis 5 and was described as the indirect effect model of social competence. Overall, a mixed pattern of associations between cognitive functioning, academic achievement, and social competence was observed. The results in relation to these hypotheses and previous research will be discussed in turn.

*Do language, attention, and working memory directly affect social competence?*

Study 2A and 2B tested the hypothesis that language, attention, and working memory would have a direct effect on the Skills and Index Levels of social competence. There was mixed support for this hypothesis. In Study 2A, the measures of cognition were found to have a direct association with the Skills Level measures. Specifically, language predicted scores on the measure of pragmatics (as measured by the TOPL-2) and social skills (as measured by the SSIS-RS) even after controlling for academic achievement. Only sustained attention was found
to predict social skills after controlling for academic achievement. In Study 2B, the composite measure of cognitive functioning was found to directly affect pragmatics and social skills after controlling for the indirect effect. Collectively, this provides some evidence that problems with cognitive functioning may correspond to problems with the Skills Levels of social competence independent of problems with academic achievement.

There was less support for the proposal that the cognitive abilities evaluated in Study 2A and 2B have a direct influence on the Other- and Self-Domains of the Index Level of social competence. In relation to Internalising behaviour, Study 2A showed that language, verbal working memory, and visuo-spatial working memory were significant predictors. After academic achievement was entered into the equation only visuo-spatial working memory was found to be statistically significant. Despite this, the path analysis in Study 2B showed that the composite score for cognition did not have a direct effect on Internalising behaviour after controlling for the indirect path. In relation to Externalising behaviour, the results showed that sustained attention, verbal working memory, and visuo-spatial working memory were found to be significant predictors initially. The effects of verbal working memory attenuated after controlling for academic achievement because only sustained attention and short-term visuo-spatial working memory were found to be significant predictors. While these results may suggest a direct effect between cognition and Externalising behaviour, Study 2B failed to show a significant path. Specifically, the direct effect between the composite score for cognition and Externalising behaviour was not significant after controlling for the indirect effect. In relation to the Self-Domain, Study 2A showed that the cognitive variables did not significantly predict the measure of self-concept and self-esteem. Study 2B supported these results as shown by the non-significant direct and indirect effects between the measure for self-concept and self-esteem and the composite score for cognition.
The finding, that language predicted scores on the measures of the Skills Level is consistent with past research reviewed. In Chapter 3 it was noted that children with SLI appear to exhibit a range of social skills difficulties with empathy, (Fujiki, et al., 2002), perspective taking (Farrant, et al., 2006), emotion regulation (Fujiki, et al., 2004), and social information processing (Bauminger, et al., 2005; Farmer, 2000; Farrant, et al., 2006; K. Marton, et al., 2004; Zadeh, et al., 2007). Most relevant to the current study were the findings reported by, Fujiki, Brinton, and Todd (1996) who demonstrated that children with SLI obtained a significantly lower score than TD children on the SSRS, which was a previous version of the social skills measure used in the current study. The SAM attempts to account for the association between language and the Skills Level of social competence. Within the SAM, language impaired children attempt to compensate for their language problems, which in turn leads to poorer social skills (Redmond & Rice, 1998). Based on this study it seems that children with language problems who do not necessarily meet the criteria for SLI may also have problems with social skills. Moreover, these results suggest that problems in this area may not necessarily be related to academic achievement.

The results of the current study also suggest that language is important to pragmatics. The association observed between language and the measure of pragmatics highlights the importance of language in interpreting social cues. In the current study, one measure of the Skills Level of social competence was an individually administered test of pragmatics, which required children to respond to a series of social dilemmas (i.e., the TOPL-2). After controlling for children’s learning, language was still found to be a significant predictor of TOPL-2 scores. Additionally, results from Study 1 indicated that performance on this test places considerable demand on children’s expressive and receptive language abilities in order to comprehend the social dilemmas that were presented and then to provide a verbal response. Since the TOPL-2 has been shown to discriminate between children with and without Autism and Asperger’s
syndrome (who also have deficits with social pragmatics and in interpreting social dilemmas; Phelps-Terasaki & Phelps-Gunn, 1992), then it seems plausible to suggest that poor performances on this test can be directly attributable to the demands placed on children’s verbal language skills.

These results pertaining to language and the Skills Level of social competence build on previous research in two ways. In the first instance, the association between language and the Skills Level was observed in an unselected group of children. This provides some evidence that the association between language and the Skills Level measures is not restricted to children with SLI. Second, the measure of language was found to predict the Skills Level measures in a model that also included other cognitive abilities such as attention and working memory (see Table 15 and 17), as well as academic achievement (see Table 16 and 18). This result indicates that even after holding other measures of cognitive functioning and academic achievement constant, language appears to be an important factor that is directly associated to the Skills Level measures of social competence.

There was little evidence to suggest the importance of language and the measures of social competence at the Index Level after controlling for other cognitive variables and academic achievement. This finding is inconsistent with some past research that has examined the relationship between language and the Other-Domain of social competence in children with SLI. This research has shown that children with SLI have fewer and poorer quality friendships (e.g., Botting & Conti-Ramsden, 2000; Brinton & Fujiki, 1999), are less confident with others (e.g., van Agt, et al., 2005), and are generally less popular with others (e.g., Brinton & Fujiki, 1999). There are two primary explanations that may account for the discrepant findings. The first is that the CBCL, which provided measures of externalising and internalising behaviour, and the BYI-SCS, which provided a measure of self-concept and self-esteem, assesses aspects of social competence that are different to those in other studies. However, this appears unlikely
given research showing associations between the CBCL and friendship in children (Crick & Nelson, 2002; Frankell & Myat, 1996).

Another explanation is that language problems may not be the sole cause of problems of social competence at the Other- and Self-Domains of the Index Level. Evidence supporting this proposal for the Other-Domain can be found in Table 19 where language was first found to be a significant predictor of internalising behaviour scores. However, once academic achievement was held constant, language was no longer found to be a significant predictor (see Table 20). Thus controlling for more variables reduced the importance of language. In the studies examining friendship in SLI, additional variables such as language and academic achievement are not included as covariates in the analyses. Associations observed between language status and social competence may be better explained with reference to other variables such as academic achievement that have not been measured or are present in all children with language problems. This interpretation might explain past findings that not all children with language problems experience social competence problems at this level (Fujiki, et al., 1999). In relation to the Self-Domain of the Index Level, past research had shown that children with SLI did not seem to report lower levels of self-esteem compared to controls (Jerome, et al., 2002). The current results were consistent with this research examining language and self-esteem since language did not predict scores on the BYI-SCS that also measured self-esteem. Taken together, these results suggest that language does not directly affect functional outcomes of children’s social competence at the Index Level.

The results from the regression analyses also revealed that sustained attention but not divided attention were related to the Skills Level of social competence. Specifically, only social skills as measured by the SSIS-RS were associated with sustained attention. It is important to note that this association was found only after academic achievement was included in the analysis. Thus it seems that to observe a relationship between sustained attention and
social skills it is necessary to control for other variables. In broad terms this result is consistent with the research showing that children with ADHD perform poorly on a range of social skills measures including the SSIS-RS (Van der Oord, et al., 2005). Furthermore, since the SSIS-RS also measures skills such as empathy and emotion regulation, these results can be deemed to be consistent with studies which have also shown that children with ADHD experience difficulties in these areas (I. Marton, et al., 2008). The results from Study 2A concerning sustained attention support the claims of Andrade et al. (2009) who suggested that sustained attention was necessary for rule-based social interactions such as those found in a classroom as well as interpreting social cues. Study 2 thus provides further support for this proposal by demonstrating an association between sustained attention and social competence even after controlling for extraneous variables such as language, working memory, and academic achievement.

The finding that sustained and divided attention was not related to pragmatics as measured by the TOPL-2 can be considered to be inconsistent with studies which have found that children with ADHD experience difficulties with social cognition (Uekermann, et al., 2010). At a broader level the finding is more generally inconsistent with the claims from social information processing theory forwarded by Crick and Dodge (1994). Indeed, within social information processing theory, attention was argued to be an important factor in one’s ability to select and ignore bits of social information. In Chapter 3 it was noted that previous research examining associations between attention and social competence in children with ADHD did not consider the role of co-occurring cognitive and learning problems in this group. Moreover, the presence of co-occurring problems in ADHD may better explain the relationship between attention and pragmatics, at least in this group. The results from Study 2A suggest that language functioning is a significant predictor of pragmatics, and Cohen et al. (2000) notes that children with language impairments are commonly diagnosed with ADHD in psychiatric
settings. Thus past research examining associations between attention and social cognition in ADHD groups may be confounded by language. In order to resolve this discrepancy, it would be prudent for future research to include additional covariates to control for extraneous variables when assessing attention and social cognition.

In relation to attention and the Index Level, sustained attention was found to be a significant predictor of Externalising behaviour (n.b., externalising behaviour is considered to be one measure of the Other-Domain of the Index Level). In general terms this finding is broadly consistent with the ADHD literature which has shown that children with ADHD display less acceptable and anti-social behaviours compared to TD children (Thorell & Rydell, 2008). More specifically, the association between sustained attention and externalising behaviour provides further weight to Andrade et al.’s (2009) proposal concerning the importance of sustained attention for rule-based social interactions such as those found in a classroom. Andrade et al. specifically point out that failure to maintain attention to rules in the classroom may lead to rule breaking and disruptive behaviour. The results of Study 2A provide considerable weight to this claim considering that the association between sustained attention and Externalising behaviour was observed after controlling for language, divided attention, working memory, and academic achievement.

The results did not indicate an association between attention and Internalising behaviour (which was another measure of the Other-Domain) and the measure of the Self-Domain of the Index Level. The null finding between attention, Internalising behaviour, and the measure of the Self-Domain of the Index Level of social competence is inconsistent with past research. It is important to note that much of the research examining attention and social competence has been undertaken with children with ADHD. For example, previous research had shown that some younger children with ADHD reported both lower levels of self-esteem (Ek, et al., 2008) and poorer levels of self-concept (Houck, et al., in press) compared to TD children.
Discrepancies in findings may again reflect that the previous association observed between attention, the measure of the Self-Domain, and Internalising behaviour in children with ADHD might be related to other problems found in this group. This potential confound highlights the dilemma with inferring associations between one aspect of cognition and social competence in clinical groups whom often present with multiple cognitive and social problems.

The importance of working memory and the Skills and Index Levels of social competence appear less clear. Initially, working memory was found to predict scores from the SSIS-RS as a measure of the Skills Level. However, the contribution of this variable was no longer found to be significant after controlling for academic achievement. To the author’s knowledge very few studies have been undertaken specifically examining the relationship between working memory functioning and the Skills Level of social competence. In Chapter 3, evidence from an experimental task undertaken with undergraduate students (Phillips, et al., 2007) and from a genetic disorder (Kiley-Brabeck & Sobin, 2006) was presented in order to support a direct association between working memory and the Skills Level of social competence. More closely related to the current study was another study which found some associations between working memory and social skills in an unselected paediatric sample (T.P. Alloway, et al., 2005). Collectively, these studies provided support to a broader theoretical claim that working memory might be important in order to process different social cues (Phillips, et al., 2007).

The results did not show a relationship between working memory the Skills Level of social competence. This can be explained when comparisons are made between the current methodology of this study and that of past research. In the study by Phillips et al. (2007) an experimental task was used to examine the relationship between working memory and interpreting social cues. They found an association between these two variables on a working memory task that was longer in duration but not on a short task. This suggests their results
might have been related to the demands with completing their social cue task. It can be argued that the SSIS-RS task and the pragmatics task used in this study can be considered to have better ecological validity since children are being rated on behaviours displayed during social interactions. Future research can investigate this issue by comparing performance on the SSIS-RS and experimental tasks developed by Phillips et al.

The results pertaining to working memory and the Index Level of social competence showed a mixed pattern. The regression analyses examining the measures of cognition and internalising behaviour showed that verbal working memory and visuo-spatial working memory were both significant predictors of internalising behaviour. Interestingly, higher verbal working memory scores were associated with lower levels of internalising behaviour problems; while higher scores for visuo-spatial working memory were associated with higher levels of internalising behaviour problems. After controlling for academic achievement, verbal working memory was no longer found to significantly predict internalising behaviour, but visuo-spatial working memory retained its significance. This same pattern of results was also observed for the measure of Externalising behaviour problems. After controlling for academic achievement, visuo-spatial short-term memory was found to be a significant predictor of externalising behaviour, while visuo-spatial working memory was not found to be a significant predictor despite the fact that the observed probability value fell short of statistical significance ($p = .068$).

An outstanding question to be addressed is why higher visuo-spatial short-term memory and working memory might be associated with internalising and externalising behaviour problems. Potential confounds such as academic achievement, language, attention, and verbal working memory can be ruled out since these were all controlled in the analyses. It seems unlikely that the results indicate that children with better visuo-spatial working memory abilities are at risk for behavioural problems and academic achievement problems. To the
author’s knowledge, no study has shown evidence to support this. A more plausible explanation of the findings is that internalising and externalising behaviour problems can occur in the presence of at least average visuo-spatial working memory skills. This proposal can be somewhat consistent with the findings of Alloway, Rajendran, and Archibald (2009) who found average visuo-spatial memory functioning in Asperger’s Syndrome, despite impairments being present in verbal working memory. Children with Asperger’s Syndrome commonly present with externalising and internalising behaviour problems (Kim, Szatmari, Bryson, Streiner, & Wilson, 2000). However, it is noted that this proposal is necessarily tentative in the absence of other research undertaken that has examined the relationship between working memory and behavioural problems in an unselected sample of children.

Lastly, the results showed children’s self-reports of their self-concept and self-esteem was not uniquely predicted by verbal working memory or visuo-spatial working memory. To date, very little research has been presented examining associations between working memory and self-concept and self-esteem. One study undertaken by Alloway et al. (2009) showed that teachers rated some children with poor working memory as having normal levels of self-esteem. Thus poor working memory is not necessarily associated with low self-esteem or self-concept. Collectively, the results from Study 2A along with Alloway et al.’s findings suggest that working memory may not be related to the Self-Domain of social competence.

Overall, the results from Study 2A showed that the measures of cognition seem only to be directly associated to the Skills Level of social competence. The results did not support a direct association between cognitive abilities and social competence at the Index Level. This suggests that an association between cognitive abilities and problems at the Index Level of social competence may involve a different pathway that is not captured in regression.
Do language, attention and working memory indirectly affect social competence?

Study 2B tested the hypothesis that language, attention, and working memory may indirectly affect social competence through academic achievement. The results of the path analyses provided mixed support for this hypothesis. First, path analyses undertaken with the measures of the Skills Level of social competence and a composite variable comprising the different measure of cognitive abilities did not indicate a significant indirect effect. Second, non-significant indirect effects were also observed for the measures of self-concept and internalising behaviour. However, a significant indirect effect was observed between the composite measure of cognitive functioning and externalising behaviour. Thus indirect effects appear to only hold for one of the aspects of social competence measured.

Before considering in detail the results from the path analyses on self-concept, internalising behaviour, and externalising behaviour, the non-significant indirect effects concerning the Skills Levels measures are considered first. The path analyses undertaken with the SISS-RS and the composite measure of cognitive functioning revealed a significant total effect and direct effect between these variables. The indirect effect involving academic achievement was not found to be statistically significant. This null result is potentially interesting because it suggests that social skills as measured by the SSIS-RS might be more closely related to domain general cognitive abilities than academic achievement. That is, in order to understand the relationship between social competence and cognitive abilities, one does not need to include academic achievement, at least in younger children. This result provides limited evidence to suggest that cognitive functioning and social skills problems may occur independently of academic achievement problems. However, longitudinal research will be required to evaluate the causal nature of the relationship between these two variables.

The only significant indirect effect observed was between the composite score of cognition and externalising behaviour. This result can be interpreted to suggest that cognitive
abilities that disrupt academic achievement may in turn lead to problems with externalising behaviour. It is acknowledged that this proposal is only one interpretation of the results and establishing causality will require longitudinal research. However, the aforementioned interpretation of the data can be considered within two sets of findings reviewed in Chapters 2 and 3. The first concerns a hypothesis proposed in Chapter 2 that considered academic achievement problems to cause disruptive behaviour. Evidence presented to support this hypothesis was from an intervention study that showed how improving academic skills could also have a positive impact on disruptive behaviour in the classroom (Coie & Krehbiel, 1984). The second relates to the literature reviewed in Chapter 3 showing an association between academic problems and language, attention, and working memory (e.g., T. P. Alloway, Gathercole, et al., 2009; Catts, 1993). That is, these measures of cognition were shown to be instrumental in poor academic achievement, which in turn was argued to be associated with behavioural problems (Coie & Krehbiel, 1984).

The first part of the indirect effects tested in Study 2B was that cognitive abilities would directly affect academic achievement. In Chapter 3 a case was made that separate impairments in language, attention and working memory may contribute to problems with academic achievement. The regression analyses reported in Study 2A supported this view. The measures of language, attention and working memory were all found to be significant predictors of academic achievement. However, not to be overlooked are the results summarised in Figure 6, which showed that the combined influence of all the cognitive variables accounted for the most amount of variance in children’s academic achievement skills. Thus, when considering the indirect effect of different cognitive abilities on social competence, this study does not suggest that one particular cognitive variable explains more variance than another. Based on this study it seems that language, attention, and working memory together compound the effect on
children’s difficulties with academic achievement, which in turn affects the Other-Domain of the Index Level.

The path analysis in Study 2B also showed that only a limited amount of variance was accounted for in social competence by academic achievement and domain general cognitive abilities including language, attention, and working memory. These results reflect one of two things. First, the limited amount of variance explained could indicate measurement error, or second, it could indicate that there are other factors that account for social competence difficulties in children. The path analysis conducted in Study 2B was able to examine whether the limited amount of variance explained in social competence was due to measurement error. This analysis could address this question because it had the capacity to account for measurement error that remains unexplained by traditional multiple regression analytic techniques (Byrne, 2001). For this reason, it can be said that the unexplained variance is not a result of measurement error. Second, other factors such as environmental factors may have an influence on the relationship between these variables (Gumpel, 2007). Kouros et al. (2010) and Shinohara et al. (2010) have shown that children exposed to detrimental environmental factors such as witnessing parental conflict or experiencing poor quality interactions with their primary caregiver, are prone to experiencing poor social competence. Children may begin to develop negative social schemas before they reach primary school if they are exposed to a conflictual and negative environment (Denham, 2007; Kouros et al., 2010). These negative environmental influences, compounded by domain general cognitive difficulties, as well learning difficulties may provide a comprehensive explanation of social competence difficulties at both the Skills and Index Levels in children. This interpretation is an empirical question that can be addressed in future research.
Cognitive abilities may not be related to all aspects of social competence.

The results from Study 2A and 2B did not indicate that cognitive functioning was related to the measure of self-concept and self-esteem or internalising behaviour problems. The initial interest in including these variables in this thesis followed results from a meta-analysis which showed that internalising behaviour problems and poor levels of self-concept were present in children with below average levels of academic achievement (Kavale & Forness, 1996). The discrepancy in findings for self-esteem and self-concept may relate to the children’s age. In Study 1 it was noted that problems with self-concept and self-esteem as it relates to academic achievement appear to be more prevalent when children become older (Eccles et al., 1983; Jerome et al., 2002). Given this, it would not be feasible to discount an association between self-concept, cognitive functioning, and academic achievement based on the results of this study. Rather, the association between self-concept and these other variables may be mediated by age. That is, as children become older the magnitude of the association between these variables may also increase. This can be tested in future research by including children with greater variability in age.

Additional support for the above inference can be found in relation to the types of relationships children have with their parents and peers as this can also influence their self-concept and/or self-esteem. Earlier it was noted that children who are exposed to hostile environments are prone to experiencing poor social competence (Kouros, et al., 2010; Shinohara et al., 2010b). If such environments disrupt the development of social competence in children, then it can be argued that a positive influence such as consistency and/or unconditional positive regard can boast the development of children’s self-concept and self-esteem, regardless of their cognitive ability and academic achievement. That is, if younger children experience positive interactions with their parents, then they may consider themselves to have adequate levels of social competence, irrespective of feedback they may receive from
teachers and/or peers. Evidence for this inference can be found in research which has shown that younger children look to the praises of their parents and caregivers more so than their peers (Oosterwegel & Oppenheimer, 1993). Since the children in this study were younger primary school aged children, then this explanation may apply. With this in mind it is important to note that as children get older there appears to be a shift in the preference of relationships from parents and caregivers to peers (Livesly & Bromley, 1973), indicating that negative feedback from peers may lead to a decrease in self-esteem and self-concept. Taken together these explanations highlight the importance of age as a possible mediating factor in children’s self-reports of their self-concept and self-esteem. However it is acknowledged that this inference is necessarily tentative and needs to be considered in future research.

There is less evidence supporting the idea that internalising behaviour problems might be related to age. A recent study into the prevalence of internalising behavioural problems found no difference across Grades 2 to 4 (Siu, 2008). Failure to find an association between this aspect of social competence and cognitive functioning might reflect a problem with reporting internalising behaviour in children since research has shown that internalising behaviour problems are difficult to detect (Kauffman, 2001). To improve the reliability of detecting internalising behaviour problems, future research could utilise information obtained from multiple informants.

Another explanation that could explain why cognition and academic achievement were not related to internalising behaviour relates to the importance of this aspect of social competence. It might be that internalising behaviour problems may not be related to academic achievement or cognitive functioning to the same extent as the other types of social competence. As noted in Chapter 2, the mean standardised difference between children with and without leaning problems for hyperactivity and distractibility in Kavale and Forness’ (1996) meta-analysis was found to be approximately .82. However for internalising behaviour
problems the mean standardised difference was reported to be .32. This result might also suggest that not all aspects of social competence are related to academic achievement. Subsequently, models which aim to better understand the relationship between these two variables not only need to take into account the multidimensional nature of social competence but they also need to consider that some components of this construct may not be as equally important.

**Concluding Comments**

In sum, the results from this study extended past research by demonstrating that domain general cognitive abilities do not share a uniform association with social competence. The cognitive abilities examined in this study were found to have a direct effect on the Skills Level, with language and attention accounting for a statistically significant amount of unique variance. In relation to the Index Level, the results suggest a less robust association. More specifically, it seems that cognitive functioning contributes indirectly to externalising behaviour problems. However, no associations between the measures of cognition and the measure of self-concept and self-esteem and internalising behaviour were found. Based on these results it seems that the association between cognitive functioning and social competence appears to vary depending on which aspect of social competence is being investigated.
CHAPTER 7: GENERAL DISCUSSION

UNDERSTANDING THE RELATIONSHIP BETWEEN COGNITION, ACADEMIC ACHIEVEMENT, AND SOCIAL COMPETENCE: COMPARISONS OF EARLY HYPOTHESES ACROSS STUDIES.

The aim of this thesis was to investigate the role of cognition in the relationship between academic achievement and social competence in children. This question was considered because children with poor academic achievement have been shown to experience poor social competence (Kavale & Forness, 1996; Nowicki, 2003; H. L. Swanson & Malone, 1992), and poor cognitive functioning in areas of language (Conti-Ramsden, et al., 2009; Pennington & Bishop, 2009), attention (Biederman, et al., 2004; Mattison & Dickerson-Mayes, in press), and working memory (S. E. Gathercole, Lamont, et al., 2006; H. L. Swanson & Jerman, 2007; H. L. Swanson, et al., 2008). Two studies were conducted to investigate this aim. The key results to emerge from Study 1 were that children with below average levels of academic achievement performed poorly on a battery of tests assessing cognitive functioning. Also, this group obtained significantly lower scores on tests assessing the Skills Level of social competence. In relation to the Other-Domain of the Index Level, significant differences were reported for externalising behaviour problems but not internalising behaviour; while there were no differences found for self-esteem and self-concept at the Self-Domain. The results of Study 2 indicated that poor cognitive functioning is directly associated with measures of the Skills Level of social competence. In addition, these cognitive abilities were shown to indirectly affect externalising behaviour problems as a measure of the Other-Domain of the Index Level through academic achievement. There were no direct or indirect associations between the measures of cognition and internalising behaviour or self-esteem and self-concept.

The purpose of this chapter is to discuss these results with respect to the early hypotheses presented in Chapter 2 and 4 that attempted to explain the relationship between
academic achievement and social competence. The argument to be made in this chapter is that there appears to be different mechanisms through which academic achievement and social competence may be associated. In some circumstances, cognitive abilities appear to play a role in the association and in others they do not. Subsequently, a single hypothesis that specifies one mechanism may not be adequate to explain the relationship between social competence and academic achievement. Rather, in order to explain the relationship between social competence and academic achievement, hypotheses which take into account the multidimensional nature of social competence is required.

Reconsideration of Early Hypotheses presented in Chapters 2 and 4.

Hypotheses 1 and 2: A causal relationship between academic achievement and social competence.

In Chapter 2 there were two hypotheses forwarded by Gresham (1992; Gresham & Elliot, 1989) which considered a causal relationship between academic achievement and social competence. According to Hypothesis 1, low levels of academic achievement caused problems with social competence. The key evidence cited to support this claim was evidence that interventions aimed at improving academic skills also led to an improvement in social competence (Coie & Krehbiel, 1984). On the other hand, Hypothesis 2 proposed that problems with social competence caused low academic achievement. Evidence in support for this position stemmed from teacher reports suggesting that social competence problems were disrupting children’s capacity to learn (Cartledge & Milburn, 1978; Milsom & Glanville, 2010; Wentzel, 1991b; Wight & Chapparo, 2008).

The results from the studies undertaken in this thesis along with previous research noted above can provide some insight into the causal relationship between academic achievement and social competence. Before considering such issues it is acknowledged that the research designs used in Study 1 and 2 were largely correlational. Thus, there are clear limits about the extent to
which causality can be inferred between academic achievement and social competence in this thesis. Nevertheless, a point raised by Gresham (1992) when commenting on whether there was a causal relationship between social competence and academic achievement was that at a minimum, if such a relationship existed one would expect a high correlation between these variables. This is because if academic achievement problems cause social competence problems, then low scores in one domain should always correspond to problems in the other (and vice versa). Another version of this proposal might be that a causal relationship between academic achievement and social competence only exists in a subgroup of children. From this perspective the magnitude of the correlation between these two variables might be lower than Gresham proposed. Given this, another approach to applying Gresham’s criterion is that if a causal relationship between academic achievement and social competence exists, the correlation coefficient should not be zero.

Using Gresham’s (1992) aforementioned criterion as a basis for suspecting that a causal relationship between academic achievement and social competence might exist, it is argued that the results from Study 1 were mixed. The results from Study 1 could be used to convert the observed multivariate effect size for social competence to a point biserial correlation ($r_{pb}$). Doing this produced an $r_{pb}$ value of .828. One the one hand this result suggests that a deficit in academic achievement almost always corresponds to problems with social competence. However, inspection of the point biserial correlations for the different measures of social competence indicates considerable variability. The highest correlation coefficient was between the SSIS-RS, which measured the Skills Level of social competence, and academic achievement ($r_{pb} = .734$). This can be considered a high correlation considering that the tests of academic achievement and social skills were measuring separate constructs. Furthermore, the teachers were not informed which children would be in the LAA group and which children would be in the control group. Thus, in principle it seems that there might be a causal
relationship between this aspect of social competence and academic achievement. However for
the other measures of social competence, the correlations ranged between .007 and .440 (see
Table 4; n.b. absolute values presented here). This suggests that although academic
achievement is highly associated with social skills, it may not play such an influential role in
some of the other measures of social competence.

The results of Study 1 and 2 do not completely rule out a potential causal relationship
between academic achievement and the other measures of social competence. In Study 1
significant differences were observed between the LAA and TD children on the measure of
pragmatics that also assessed the Skills Level, and on the measure of externalising behaviour,
which was one measure of the Other-Domain of the Index Level. These results were replicated
in Study 2, which showed that social skills, pragmatics, and externalising behaviour
significantly predicted academic achievement. Based on these results a causal relationship may
exist between academic achievement and the Skills Level of social competence, as well as with
certain aspects of the Index Level measures.

Despite these results, additional regression analyses in Study 2A questioned whether a
causal relationship between academic achievement and these Skills and Index Level measures
exists. Specifically, after controlling for the measures of cognition, the measure of academic
achievement was not found to be a significant predictor of pragmatics or social skills. This
result might suggest that the relationship between the measures of the Skills Level of social
competence might be better explained with reference to cognitive functioning and not academic
achievement. Interestingly, these additional regression analyses did show a direct association
between academic achievement and externalising behaviour as a measure of the Index Level,
suggesting that a direct association may exist between academic achievement and some aspects
of the Index Level of social competence.
Overall, the results from this thesis only provide limited support for the hypothesis that a causal relationship between academic achievement and social competence exists. The strongest evidence observed in this thesis suggests that a causal relationship may exist between externalising behaviour and academic achievement. This proposal supports previous claims that children who are performing poorly at school might become disruptive (Coie & Krehbiel, 1984) or disruptive behaviour makes it difficult for children to learn (Wight & Chapparo, 2008). The results observed in Study 1 and 2 did not provide support to the proposal that a causal relationship between academic achievement internalising behaviour, self-concept, or the Skills Level measures of social competence may exist.

_Hypothesis 3: Academic achievement and social competence problems co-occur but are not causally related._

Another hypothesis reviewed in Chapter 2 was that problems with social competence and academic achievement co-occur and are thus not causally related (Gresham, 1992; Gresham & Elliot, 1989). Hypothesis 3 can be considered difficult to evaluate with the data obtained from this thesis. This is because in principle this hypothesis can be considered to predict correlations of a large and small magnitude between academic achievement and social competence. For instance, if the association between academic achievement and social competence approached 1.0, then it could still be plausible that the two variables were not causally related. Alternatively, if the correlation between these two variables were zero, this could also be considered to reflect a non-causal relationship between the two variables. However, in the latter case the prevalence of children with both poor academic achievement and social competence would be minimal given that the correlation coefficient would be low.

Despite the limitations noted above, the results of this thesis highlight a potential mechanism whereby problems with social competence and academic achievement can co-occur but may not be causally related. For example, in Study 1, children with LAA were found to
perform significantly poorer on a measure of social skills and pragmatics. However, in Study 2A, the same measures of social skills and pragmatics were not found to be predicted by academic achievement after controlling for language, attention, and working memory (see Tables 16 and 18). Furthermore, path analyses in Study 2B showed that the association between academic achievement and social skills and pragmatic language were not significant after controlling for the direct path between the composite score for cognition and social skills (see Figures 10 and 11). Collectively, these results can be interpreted to suggest that poor social skills, pragmatics, and academic achievement can be correlated in children struggling in school. However, this initial association appears to be better accounted for with reference to domain general cognitive abilities. Consequently, a non-causal relationship between these variables cannot be entirely discounted.

**Hypotheses 4 & 5: Direct and Indirect effects of cognition and social competence.**

One of the challenges associated with the different hypotheses forwarded by Gresham (1992) was that they did not appear to explicitly take into account that children who struggle academically also experience difficulties with cognition. One revised hypothesis forwarded in Chapter 4 predicted that measures of language, attention, and working memory have a direct association with the Skills and Index Levels of social competence. This hypothesis, referred to as Hypothesis 4 assumed that the effect of these cognitive variables on social competence was independent to that of academic achievement. In another hypothesis, referred to as Hypothesis 5, the measures of language, attention, and working memory were considered to affect the Skills and Index Level measures of social competence via their effects on academic achievement. These hypotheses were partially supported from the results in Study 2B. In Study 2B it was shown that the composite score for the measures of cognition were directly associated with only the Skills Level measures of social competence. At the same time, the results from Study 2B showed that the composite score for cognition had an indirect effect on
externalising behaviour (which was one measure of the Other-Domain of the Index Level) via its effects on academic achievement.

The results of Study 2B suggest that variables in addition to academic achievement may influence social competence in children. It is interesting to note that in the learning disability literature, the role of domain general cognitive abilities on social competence has received little attention. Specifically, in a number of reviews examining social competence in children with below average levels of academic achievement, the potential influence of cognitive abilities only received cursory attention (e.g., Kavale & Forness, 1996; Nowicki, 2003; Ochoa & Olivarez, 1995; H. L. Swanson & Malone, 1992). A key point forwarded in this thesis is that incorporating domain general cognitive abilities in models that aim to account for the relationship between academic achievement and social competence may provide additional information about the association between these constructs.

In the first instance, including domain general cognitive abilities in such models seem useful in explaining why children might initially struggle in school settings. In Study 2A language, attention, and working memory were all found to predict academic achievement scores. Furthermore, in the case of externalising behaviour, the results from Study 2B showed that through disrupting academic achievement, there are plausible grounds to suspect that this may have a cascading effect resulting in behaviour problems. In this case, cognitive abilities appear to indirectly influence one aspect of social competence. Second, understanding the relationship between cognitive functioning, academic achievement, and social competence may also explain why programs aimed at improving academic achievement only have a limited effect on social competence. As reviewed in Chapter 2, Coie and Krehbiel (1984) found that improving the academic skills of children led to less disruptive behaviour but did not improve social skills. This result can be explained with reference to the results in Study 2 since it was shown that (a) cognitive abilities and not academic achievement directly influenced social
skills, and (b) academic achievement and not cognitive abilities directly influenced externalising behaviour. According to this pattern of results, improving academic achievement is more likely to have an observable effect on externalising behaviour because the two are more closely related in comparison to social skills. Moreover, based on the results of this study, improving social skills in children may require programs that target specific difficulties with social skills, since gains are not expected to arise from improving academic achievement (Coie & Krehbiel, 1984).

*Social Competence: More than just a Uni-Dimensional Construct.*

The results of this thesis also highlight the importance of treating social competence as a multi-dimensional construct. In Chapter 2 it was highlighted that the focus of past social competence research could be divided into one of four areas: social skills, socio-metric status, friendship quality, and direct functional outcomes (Rose-Krasnor, 1997). To overcome these limitations, Rose-Krasnor’s (1997) model of social competence was adopted which considers this construct to comprise Skills and Index Levels. One justification for adopting a multidimensional model of social competence was not because different definitions were identified, but that empirically, the correlations between the different dimensions have been reported to be low to moderate (Parker & Asher, 1987). As noted earlier, from an assessment perspective this may mean that evaluating one component of social competence may not necessarily reflect other components.

The results from Study 1 and 2 supported the conceptualisation of social competence as a multi-dimensional construct. This is because the data from these studies revealed variable results across the different domains of social competence. Bivariate and partial correlations from Study 1 showed moderate correlations between the various measures of social competence, indicating that different aspects of the construct were being measured. For example, as noted above, the correlations between the different components of social
Cognition, Achievement, & Social Competence in Children

Competence ranged from .007 to .440 (see Table 4; n.b. absolute values are presented here). Additionally, Study 2 showed different patterns of associations between cognition and academic achievement. Generally it was shown that difficulties at the Skills Level did not necessarily support difficulties at the Index Level. Additionally, as noted earlier, the measures of cognition were found to have a direct association with the Skills Level measures, but not with all aspects of the Index Level measures. If social competence was a uni-dimensional construct then the measures of cognition and academic achievement would be uniformly associated with each measure of social competence. These results suggest that both Skills and Index Level measures are important to understanding social competence in children.

Collectively, the research undertaken in this thesis re-affirms Rose-Krasnor’s (1997) model that social competence might be better understood as a multidimensional construct. The results reported extend this model by suggesting that measures of cognition and academic achievement influence the different components of social competence in unique ways. For example, academic achievement was only found to have a direct association with externalising behaviour as a measure of the Index Level, while there were no associations with the Skills Level, internalising behaviour, or the Self-Domain measure. Therefore, the results from Study 1 and 2 in concordance with Rose-Krasnor’s (1997) model highlight the importance of conceptualising and operationalising social competence as a multi-dimensional construct.

Limitations and Future Directions

While the relative merits of this thesis have been reviewed it is also important to note some limitations and consider directions for future research. One limitation and an important avenue for future research is the need for longitudinal studies. Since developmental psychologists aim to track the progression of areas of development such as social competence, it may be useful to assess whether the results from these studies are robust across time. The results from Study 2 in particular showed that cognitive abilities may directly and indirectly
influence different aspects of social competence. Such findings provide preliminary evidence that there might be different casual pathways between difficulties in cognitive functioning, academic achievement, and social competence. Longitudinal research in this area could make an important contribution to this area by mapping the direction of the influence between the different measures of cognition, academic achievement, and social competence.

Another limitation to consider is the need to measure other factors that may also explain social competence difficulties in children. This is raised as a limitation since the measures of cognition and academic achievement only explained a limited amount of variance in social competence. One such factor may be more specific measures of social information processing instead of the use of pragmatic language. Although pragmatic language relies on social information processing, more specific measures may yield a different pattern of results.

Another factor to consider would be the environment children are raised in. In the introductory chapters of this thesis and in Chapter 6 it was argued that environmental factors might also affect social competence in children. This argument was forwarded since children begin to engage in social interactions and consequently develop social schemas before they reach school. It is suggested that the types of relationships younger children have with their parents and caregiver’s may also give insight into the nature of social competence problems since the quality of interactions children have with their parents have been shown to affect social competence in children (Gumpel, 2007; Kouros et al., 2010). For this reason, examining the association between the quality of the relationship between a parent and child and the Skills and Index Levels of social competence may be worthy for future research to consider.

Concluding Comments

Overall, the results from this thesis showed that the combined effects of academic achievement and domain general cognitive abilities including language, attention, and working memory affect the Skills Level of social competence in children. It was also shown that there
was an indirect relationship between the measures of cognition and externalising behaviour, which measured the Other-Domain of the Index Level, via academic achievement. These results extend past research by providing insights into the relationship between domain general cognitive abilities, academic achievement, and social competence in early primary school aged children. The results of this thesis also re-affirm the need to assess social competence as a multi-dimensional construct. This is because measures of cognition and academic achievement did not have a uniform effect on the Skills and Index Level measures of social competence.

In addition to providing new insights into the relationship between social competence and academic achievement, these results may be applicable to clinical settings. From an assessment perspective, children with attention, language, and working memory problems might also be at risk for developing difficulties with social skills, pragmatics, externalising behaviour, and academic achievement. From an intervention perspective the results of this thesis provide some evidence that different types of remediation programs may be required to improve different aspects of social competence. Specifically, it seems that improving academic achievement may reduce externalising behaviour problems, whereas social skills deficits and poor pragmatics may require more direct intervention. This thesis therefore has advanced the field by beginning to develop a theoretically consistent understanding of the relationship between domain general cognitive abilities, academic achievement, and social competence in early primary school aged children.
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APPENDIX A: ETHICS APPROVAL FROM DEAKIN UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE

Research Services
Office of the Deputy Vice-Chancellor (Research) (Melbourne Campus)

MEMORANDUM

TO: Dr Jarrad Lum
School of Psychology, Geelong Waterfront

FROM: Deakin University Human Research Ethics Committee (DU-HREC)

DATE: 24 September 2008

SUBJECT: Project EC 119-2008 (Please quote this project number in future communication.)
Social behaviour in children

The modification to this project was ratified at the DU-HREC meeting held on 15 September 2008.

Approval has been given for Celin Gelgec under the supervision of Dr Jarrad Lum, School of Psychology, to continue this project as modified to 12 August 2011.

The approval given by the Deakin University Human Research Ethics Committee is given only for the project and for the period as stated in the approval. It is your responsibility to contact the Executive Officer immediately should any of the following occur:

• Serious or unexpected adverse effects on the participants
• Any proposed changes in the protocol, including extensions of time.
• Any events which might affect the continuing ethical acceptability of the project.
• The project is discontinued before the expected date of completion.
• Modifications are requested by other HREC’s.

In addition you will be required to report on the progress of your project at least once every year and at the conclusion of the project. Failure to report as required will result in suspension of your approval to proceed with the project.

DU-HREC may need to audit this project as part of the requirements for monitoring set out in the National Statement on Ethical Conduct in Human Research (2007)

Signature Redacted by Library

Vicky Bates, Secretary
On behalf of DU-HREC
03 9251 7052
APPENDIX B: ETHICS APPROVAL FROM THE DEPARTMENT OF EDUCATION AND EARLY CHILDHOOD DEVELOPMENT

Ms Celin Gelgec
School of Psychology
Deakin University
221 Burwood Highway
BURWOOD 3125

Dear Ms Gelgec

Thank you for your application of 29 September 2008 in which you request permission to conduct a research study in government schools titled: Social behaviours in children.

I am pleased to advise that on the basis of the information you have provided your research proposal is approved in principle subject to the conditions detailed below.

1. Should your institution’s ethics committee require changes or you decide to make changes, these changes must be submitted to the Department of Education and Early Childhood Development for its consideration before you proceed.

2. You obtain approval for the research to be conducted in each school directly from the principal. Details of your research, copies of this letter of approval and the letter of approval from the relevant ethics committee are to be provided to the principal. The final decision as to whether or not your research can proceed in a school rests with the principal.

3. No student is to participate in this research study unless they are willing to do so and parental permission is received. Sufficient information must be provided to enable parents to make an informed decision and their consent must be obtained in writing.

4. As a matter of courtesy, you should advise the relevant Regional Director of the schools you intend to approach. An outline of your research and a copy of this letter should be provided to the Regional Director.

5. Any extensions or variations to the research proposal, additional research involving use of the data collected, or publication of the data beyond that normally associated with academic studies will require a further research approval submission.

6. At the conclusion of your study, a copy or summary of the research findings should be forwarded to Education Policy and Research Division, Department of Education and Early Childhood Development, Level 2, 33 St Andrews Place, GPO Box 4367, Melbourne, 3001.
I wish you well with your research study. Should you have further enquiries on this matter, please contact Chris Warne, Senior Policy and Research Officer, Education Policy and Research, by telephone on (03) 9637 2272 or by email at <warne.christine.p@edumail.vic.gov.au>.

Yours sincerely

Signature Redacted by Library

Dr Elizabeth Hartnell-Young
Group Manager
Education Policy and Research

6/11/2008

cnc
APPENDIX C: ETHICS APPROVAL FROM THE CATHOLIC EDUCATION OFFICE
MELBOURNE

In reply please quote:

GE08/0009
1428
1 October 2008

Ms C. Gelgec
Doctorate candidate
School of Psychology
Deakin University
221 Burwood Highway
BURWOOD VIC 3125

Dear Ms Gelgec,

I am writing with regard to your research application of 29 September 2008 concerning your forthcoming project titled Social behaviour in children. You have asked approval to approach Catholic schools in the Archdiocese of Melbourne, as you wish to involve students in Years 1–3.

I am pleased to advise that your research proposal is approved in principle subject to the nine standard conditions outlined below. Additionally, I ask that you forward to this Office a copy of the notification of approval from the University’s Ethics Committee when it becomes available.

1. The decision as to whether or not research can proceed in a school rests with the school’s principal. So you will need to obtain approval directly from the principal of each school that you wish to involve.

2. You should provide each principal with an outline of your research proposal and indicate what will be asked of the school. A copy of this letter of approval, and a copy of notification of approval from the university’s Ethics Committee, should also be provided.

3. A Working with Children (WWC) check – or registration with the Victorian Institute of Teaching (VIT) – is necessary for all researchers visiting schools. Appropriate documentation must be shown to the principal before starting the research in each school. Details about applying for a WWC check may be obtained from the link in the Department of Justice website <www.justice.vic.gov.au/workingwithchildren>.

4. No student is to participate in the research study unless s/he is willing to do so and informed consent is given in writing by a parent/guardian.

5. You should provide the names of schools which agree to participate in the research project to the Knowledge Management Unit of this Office.
6. Any substantial modifications to the research proposal, or additional research involving use of the data collected, will require a further research approval submission to this Office.

7. Data relating to individuals or schools are to remain confidential.

8. Since participating schools have an interest in research findings, you should consider ways in which the results of the study could be made available for the benefit of the school communities.

9. At the conclusion of the study, a copy or summary of the research findings should be forwarded to this Office. It would be appreciated if you could submit your report in an electronic format using the email address provided below.

I wish you well with your research study. If you have any queries concerning this matter, please contact Mr Mark McCarthy of this Office.

The email address is <km@ceo.melb.catholic.edu.au>.

Yours sincerely

Signature Redacted by Library

Stephen Elder
DIRECTOR OF CATHOLIC EDUCATION
Dear [name of principal here],

My name is Ms Celin Gelgec and I am undertaking research for my doctoral degree in clinical psychology examining social skills in children with and without learning disorders. I am writing to you to ask your permission to conduct part of the research at your school. This project will begin in [insert date here] of this year and is being supervised by Dr Jarrad Lum who is a lecturer in psychology at Deakin University.

The study involves presenting children in grades 1, 2 and 3 with a number of interesting tasks designed to assess language, memory, attention, and problem solving. These tasks would be presented by me as I have considerable experience working with children in a research environment. The tasks would be presented to children over four 30 minute sessions, on school grounds, in an open room which is clearly visible and accessible to staff (e.g., library, staffroom), and carried out at a time which is convenient for teachers and yourself. As with all my research, the tasks are presented in the context of a game and children are given constant positive feedback. Written parental consent is required before a child can participate.

The types of tasks children are presented with include:

**Language Tests:** Children will be presented with a standardised language tests which assess production and comprehension skills.

**Memory Tasks:** Children will be presented a number of verbal and visual tasks which examine assess short term memory.

**Attention Tasks:** Children will be presented with a number of visual and auditory tasks which examine different types of attention.

**Problem Solving Tasks:** Children’s social problem solving will be assessed using a standardised test. For example, children will be given a short story about a social situation (such as a group of friends playing a game). Children will then have to explain what they would do if they were in that situation.

This study has received ethical approval from the Deakin University Human Research Ethics Committee and the [choose Catholic Education Office for non-government funded schools OR Department of Education and Early Childhood Development for government funded schools]. In this correspondence I have also enclosed copies of the information letters and consent forms that we are using in this project.

I very much hope you would be interested in taking part and I would be delighted to discuss the project and tasks with you in more detail. I will contact you shortly to discuss the application with you further. Alternatively, feel free to contact me on the details listed in the letter head.

Yours sincerely,

Ms Celin Gelgec
Organisational Consent Form

Date:
Project Title: Social behaviour in Children.

I …………………………………. of [insert name of school here] have read and understand the attached Plain Language Statement.

I give my permission for consenting parent/guardians and students of [insert name of school here] to participate in this project in 2009 according to the conditions in the Plain Language Statement.

I have been given a copy of Plain Language Statement and Consent Form to keep.

The researchers have agreed not to reveal the participants’ identities and personal details if information about this project is published or presented in any public form.

I acknowledge

1. That the aims, methods, and anticipated benefits, and possible risks/hazards of the research study have been explained to me.

2. That I voluntarily and freely give my consent for the institution/organisation to participate in the above research study.

3. That I am free to withdraw my consent at any time during the study, in which event participation in the research study will immediately cease and any information obtained through this institution/organisation will not be used if I so request.

I agree that

4. The institution/organisation will not be named in research publications or other publicity without prior agreement.

5. We will receive a copy of the research findings or publications.

Name of person giving consent (printed) ………………………………………………………………

Signature ……………………………………………………… Date ………………………
APPENDIX E: PLAIN LANGUAGE STATEMENT AND CONSENT FORM FOR PARENTS

TO: Parents/Guardians

Plain Language Statement

Date:

Full Project Title: Social Behaviour in Children.

Principal Researcher: Dr Jarrad Lum

Student Researcher: Ms Celin Gelgec

Dear Parent/Guardian

My name is Ms Celin Gelgec and I am a doctoral student at Deakin University. I am writing to invite you and your child to participate in a Doctoral Research Project in Clinical Psychology I am conducting examining social skills in children.

What we are researching in this study:
Some children are able to form friendships and relationships, and act in a socially acceptable way in a seemingly natural manner. However, some children experience difficulty in this area, and may need extra help. At present, researchers are trying to work out why and how some children have difficulties acting in a socially acceptable manner. As a result some children may have difficulties with forming friendships and relationships. In this research project we are examining whether underlying memory, language, attention, and problem solving skills may play a role. By understanding this issue we hope to be able to provide better methods for helping children who have difficulties acting in a socially acceptable manner. As a result we hope these children will have less difficulty with forming friendships and relationships. To undertake this research we would like to see as many children as possible irrespective of whether they have difficulties in this area.

Why have we come to your school?
Your child’s school has been selected on the grounds that it is located in Melbourne. Prior to coming to your child’s school, permission was obtained from the Deakin University Human Research Ethics Committee and also from [insert relevant ethics committee here] to carry out the research. I also have met with and received permission from [insert name of principal here] to carry out this research. During this meeting the aims of the study and tasks were discussed and presented.
Why has my child received this letter?
When we visit a school we hope that a large number of children in each year level participate, irrespective of their learning skills. This is because in order for this research to be carried out effectively we need to see those children who are obtaining assistance for a learning problem as well as those who are not receiving assistance. Because of this, we have asked teachers to distribute this letter out to all children in Grades 1, 2, and 3 at your child’s school.

What will my child be asked to do?
Children participating in the research will be presented with a number of different interesting task and activities which are presented at your child’s school during school hours. As with all our work, the tasks and activities are presented in the context of a fun game. These activities will be presented to your child at a time that is most convenient for teachers. These activities will be presented over four 30 minute sessions spaced over four weeks. These activities will be presented by me, as I have extensive experience in working with children. All of these tasks have been developed and used with children all over the world and are safe to use.

A brief description of the tasks & activities:
Language Test: In order to measure language skills in children we will be using a standardised language test. This test allows us to measure children’s understanding of language (i.e., how well a child can comprehend language) and also how well children can produce language (e.g., repeat a sentence). For example, parts of the test which measure understanding involve children being asked to point to a picture which matches a sentence spoken aloud. In parts which measure how well children can produce language, children are asked to repeat back sentences or one word of a sentence.

Memory Tasks: Several tasks will be presented which examine short term memory. Short term memory is involved in remembering things for a short period of time (e.g., a new phone number). In this research project we will be presenting activities which require the short term storage of auditory and visual information. For example, on one task we see how many numbers children can hold in their memory and in another a number of made-up words are presented (e.g., ‘ballop’, and ‘blonterstaping’) and the child is asked to repeat them back. In order to keep these activities interesting and fun, funny characters and sounds are used on the computer programs.

Attention Tasks: Attention is a process that allows us to concentrate on one aspect of the environment such as listening to people during a conversation. In this research project we will be presenting a standardised test of attention which includes activities which require children to maintain attention. For example, children are asked to listen to a sound and to count the amount of times they hear the sound. In order to keep these activities interesting and fun, funny characters and sounds are used on the computer programs.

Problem Solving Tasks: Children’s social problem solving will be assessed using a standardised test. For example, children will be given a short story about a social situation (such as a group of friends playing a game). Children will then have to explain what they would do if they were in that situation.

Important Note: The language tests used in this study may sometimes be used by speech pathologists to assist in working out whether a child is experiencing difficulties with language. Please note that because the tests are being administered as part of a research project I am not able to provide any clinical interpretation of test scores. However, I can provide you with some broad feedback as to whether your child should have an additional assessment and also who to contact. Please note you should contact a qualified clinician if you have any concerns about the language development of your child.

Does my child have to take part?
Your child does **not** have to take part in this study. Also if you decide to take part and then later change your mind, you child can withdraw from (leave) the study. This can be before your child starts the study, during it or afterwards.

**Will my child’s data be confidential?**

All the information collected will be confidential (not told to anyone else, including teachers at your child’s school). We will **not** write your child’s name or school on the recording sheet or on the computer database. Your child will be given a number instead. Your child’s name will not appear in any publication of the results arising from this study.

**Will I have access to the results of the study?**

When the study has been completed we will produce a hand-out for teachers and parents outlining the findings of the study. These results can be given to you by mail, e-mail or through a letter that will be given to your child to take home. If you would like a copy of the main findings of the study complete the form titled “Request for results from study”. Please note that your child does not have to participate in the study in order for you to receive this hand-out.

**If you would like your child to participate:**

If you would like your child to participate in this research please complete the attached consent form and place it in the envelope and have your child return it to school. Alternatively, you can place the envelope in the mail and it will be sent to my office at Deakin University.

**Where can I obtain more information?**

If you have any questions, comments or require further clarification about this research project please contact me on the details listed on the first page of this letter.

Yours Sincerely,

Ms Celin Gelgec

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Should you have any concerns or complaints about the conduct of this research project (reference number: EC 119-2008), please contact:

The Executive Officer, Human Research Ethics Committee, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: (03) 9251 7123, Facsimile: (03) 9244 6581; e-mail: research-ethics@deakin.edu.au.
TO: Parents/Guardians

Date:

Full Project Title: Social Behaviour in Children

I have read, and I understand the attached Plain Language Statement.

I give my permission for ……………………………………………………. (name of participant) to participate in this project according to the conditions in the Plain Language Statement.

I have been given a copy of Plain Language Statement and Consent Form to keep.

The researchers have agreed not to reveal my and my child’s identity and personal details, including where information about this project is published, or presented in any public form.

Participant's/Child's Name (printed) ……………………………………………………..

Date of Birth ……………………………………………………..

School (printed) …………………………………………………………………………..

Name of Person giving Consent (printed) ……………………………………………………..

Relationship to Participant: ……………………………………………………..

Signature ………………………………………………………………………….. Date…………………………
TO: Parent/Guardian

Revocation of Consent Form

Date:

Full Project Title: Social Behaviour in Children

I hereby wish to WITHDRAW my consent for my child to participate in the above research project and understand that such withdrawal WILL NOT jeopardise my relationship with Deakin University.

Participant's/Child's Name (printed) ……………………………………………………
Date of Birth……………………………………………………………………
School (printed)…………………………………………………………………………
Name of Person withdrawing Consent (printed) ………………………………………
Relationship to Participant: ………………………………………………………

Signature …………………………………………………………… Date…………………………

Please mail or fax this form to:

Ms Celin Gelgec
School of Psychology
221 Burwood Highway
Burwood, Victoria 3125 Australia
Facsimile: +61 3 9244 6858