CONSIDERING COGNITIVE SKILLS IN FORENSIC PRACTICE

by

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Abstract

Cognitive skills and abilities have been suggested to play a role in two areas of forensic practice, interrogative suggestibility in children and young adult offending. Research regarding the possible link between cognitive skills, in particular language and working memory, and the aforementioned areas of forensic practice is in its infancy. Initial findings are both inconsistent and limited by methodological challenges. The aim of the subsequent research is to increase the evidence base as to whether consideration of these cognitive skills is of practical importance in forensic practice. Study 1 investigated whether cognitive skills were correlated with suggestibility in primary school aged children. Forty children aged between 5- and 12-years completed an assessment battery, including tests of suggestibility, intelligence, working memory and language, including receptive, expressive and narrative language. Multiple regression analysis revealed age and language significantly predict suggestibility, after controlling for intelligence and working memory. Novel to this study, the ability to understand narratives was identified as the strongest of the language predictors. The second study sought to first examine the cognitive functioning of a sample of young adult offenders, and second examine the relationship between cognitive functioning and background variables, including education level, offending history, and substance use. Thirty-five incarcerated male offenders aged between 18- and 21-years were administered tests of intelligence, language and working memory. As a group, average performance on the cognitive tests was lower than the normative mean, with the lowest score observed on the measure of language. Poor intellectual and working memory skills were associated with repeat offending. The relationship between cognitive functioning and the other background variables was less clear. Together the results of both studies provide
support for the inclusion of language and working memory assessments in the ‘toolbox’ of forensic psychologists.
Part I: A Review of the Literature and Introduction of the Empirical Studies

Part I Overview

The aim of this thesis is to examine the role of intelligence, language and working memory in two areas of forensic practice. The first part of this thesis investigates whether the aforementioned skills and abilities are related to suggestibility in children. To date, research has been conducted examining whether individual differences in cognitive abilities are related to suggestibility in children (Bruck & Melnyk, 2004). In part the focus on cognitive abilities is motivated by evidence suggesting that broader demographic variables, such as socioeconomic status, do not consistently explain why some children are more suggestible than others (Hritz et al., 2015). The research presented in this thesis extends on this work by re-examining the role of intelligence and language in suggestibility. Additionally, growing evidence has been presented suggesting that working memory is an important predictor of social (Kofler et al., 2011) and academic (Pickering, 2006) problems, and also retrieving information from long term memory (Unsworth, Brewer, & Spillers, 2013). Given the importance of working memory in these domains, it has been speculated that individual differences in working memory might also be related to suggestibility (Roebers & Schneider, 2005). The research undertaken as part of this thesis tested this claim.

The second part of this thesis examines the status of intelligence, language functioning and working memory in young adult offenders. There has been ongoing interest in the cognitive skills of adolescent (Anderson, Hawes, & Snow, 2016) and young adult (Herrington, 2009) offenders. This is because low levels of cognitive functioning are considered to be a risk factor for offending via negatively impacting on academic achievement, which in turn is a risk factor for social marginalisation and substance abuse (Savolainen et al., 2015). Initially, research focused on
intellectual functioning as a risk factor for young adult offending (Hayes, Shackell, Mottram, & Lancaster, 2007). However, in relatively more recent times, research has been presented looking at the language skills in this group (Snow & Powell, 2011). The research undertaken in this thesis investigated whether working memory, in addition to language and intellectual functioning, might also be poorer in young adult offenders. As noted earlier, research has been presented showing that working memory is related to academic and social outcomes (Kofler et al., 2011; Pickering, 2006). Subsequently, it could be that low working memory is also present in young adult offenders.

The research presented in this thesis aims to provide evidence as to whether basic cognitive skills, specifically language, working memory and intellectual functioning, might be of practical importance in forensic practice. Since these skills and abilities can be reliably assessed in children and young adults, they might be of use in evaluating whether suggestibility is likely, or be used as a risk factor for offending.
Chapter One: Correlates of Suggestibility in Children

Chapter Overview

This chapter examines whether cognitive skills are related to suggestibility in children. Prior to reviewing the relevant literature, an overview of the concept of suggestibility is presented. Suggestibility that occurs in the context of an investigative or police interview is chosen as an area of focus. Common methods used to assess this construct are then outlined. Research which investigates the role of intelligence, language, including expressive, receptive and narrative language, and working memory in accounting for individual differences in suggestibility is presented. Reasons and mechanisms for the possible influence of cognitive variables on children’s suggestibility are also considered.

An Overview of the Concept of Suggestibility

Ceci and Bruck (1993) proposed that at a general level, suggestibility can be defined as the extent the encoding, storage and retrieval of information from memory can be modified via social and psychological factors. Powers, Andriks, and Loftus (1979) proposed that suggestibility describes the likelihood an individual accepts or incorporates new information into their memory of an event after it has happened. Gudjonsson (1984) proposed an applied definition referred to as ‘interrogative suggestibility’, which describes the susceptibility of a child (or adult) to alter an account of an event following the introduction of leading and/or misleading information that occurs during the course of a police interview. According to Ceci and Bruck, a point of difference between conceptualisations of suggestibility is the extent one explicitly or implicitly adopts new information. For example, an individual may unconsciously incorporate new information through the course of a forensic interview in which a leading question is asked (e.g., “Did he touch you over or under your clothes?”, when the child had not previously disclosed being touched).
A memory of a past event might also be modified intentionally by an individual who acquiesces with police questioning in order to provide a socially desirable response. Contemporary suggestibility research (e.g. London, Bruck, & Melnyk, 2008) has also distinguished between ‘misinformation effects’, that is, the tendency to incorporate suggested post-event information into later recall, and the modifications in the recall of an event that may potentially occur during the context of an investigative interview. The work undertaken in this thesis is concerned with suggestibility which occurs under the latter circumstances. For this reason, the correlates of Gudjonsson’s conceptualisation of ‘interrogative suggestibility’ are investigated. One goal in utilising this approach was to be able to provide evidence as to whether the cognitive measures used in this study might be of practical use in the context of an investigative interview.

According to Gudjonsson (1984, 1987a, 1992), suggestibility in an investigative interview (hereafter referred to as suggestibility) has two components or sources. One component of suggestibility arises in response to one or more leading questions. Leading questions are those which indicate to a witness (or examinee) a particular desired response or answer (Loftus & Palmer, 1974). Leading questions can be presented as an inquiry (e.g., “is the sky blue?”) or statement (e.g., “the sky is blue, isn’t it?”) (Greenstock & Pipe, 1996). Furthermore, leading questions can contain misleading or incorrect information (e.g., “is the sky green?” / “the sky is green, isn’t it?”). In the interviewing of paediatric groups, leading questions may indicate a particular response, which in turn can result in the incorporation of new and potentially inaccurate information into the child’s recall of a past event (Westcott, Kynan, & Few, 2006). The second component of suggestibility, according to Gudjonsson (1984, 1987a, 1992), arises when negative feedback is directed to the witness from the interviewer. Negative feedback has been
conceptualised as any form of pressure criticising the witness with respect to a response to a question (Baxter, Charles, Martin, & McGroarty, 2013). The interviewer statement “I don’t think that’s right, you must have forgotten” is an example of negative feedback.

There is evidence to suggest that the two components of suggestibility may operate differently to/independently of each other. Baxter and colleagues (2013) found that presenting leading questions to adults, mainly influenced responses from a standardised test of suggestibility that measured whether participants yielded to the interviewer, but was not significantly related to a change in response. Alternatively, the presence of negative feedback tended to influence the tendency to significantly change a response, but not yield to the interviewer. These findings are consistent with the results of several factor analytic studies examining the internal validity of commonly used standardised tests of suggestibility (Bianco & Curci, 2015; Candel, Merckelbach, & Muris, 2000; Gudjonsson, 1984; Melinder, Scullin, Gunnerød, & Nyborg, 2005). In this research, one factor has been identified that corresponds to responses made following leading questions. This factor typically involves participants yielding or acquiescing to a leading question. Another factor has been found that is made following negative feedback. This factor involves changing a response to a question. If it is the case that suggestibility consists of at least two components, it is possible that language, intelligence and working memory will influence one or both aspects.

Assessing Suggestibility in Children

To systematically investigate interrogative suggestibility in children (and adults) several standardised protocols and tests of this construct have been developed. Perhaps, the most widely used in the literature are the Bonn Test of Statement Suggestibility (BTSS; Endres, 1997), Video Suggestibility Scale for
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Children (VSSC; Scullin & Ceci, 2001; Scullin & Hembrooke, 1998) and the Gudjonsson Suggestibility Scales (GSS-1; Gudjonsson, 1984; GSS-2; Gudjonsson, 1987b). All have at least satisfactory reliability and validity (Candel et al., 2000; Merckelbach, Muris, Wessel, & van Koppen, 1998; Scullin & Ceci, 2001). Knowledge of these psychometrics is important in the context of examining the correlates of suggestibility. This is because one potential result is that a measure of suggestibility might not be found to correlate with a measure of cognitive functioning. In the absence of sound psychometric data a null result or non-meaningful effect size could reflect measurement error (Ferguson, 2009).

Common to the BTSS (Endres, 1997), VSSC (Scullin & Ceci, 2001; Scullin & Hembrooke, 1998) and the GSS (Gudjonsson, 1984; Gudjonsson, 1987b) is that a child is presented with an event. On the BTSS and GSS, a short story is auditorily presented to the examinee. On the VSSC, a video showing an event is presented. For example, on the GSS-2 (Gudjonsson, 1987b), which was used in one of the studies presented in this thesis, a short two-minute story is auditorily presented to the examinee. The story is about a boy going down a hill on a bicycle whose accident is averted by a couple. In the first phase of the test, the child is asked several questions about the story. Some of the questions are leading, for example, “Did the boy commonly ride the bicycle to school?” The leading questions encourage a response about an event that did not happen in the story. In the test’s second phase, the same questions are preceded by negative feedback. For example, the child is told, “You have made a number of errors. It is necessary to go through the questions once again”.

On the aforementioned standardised tests of suggestibility, the two phases of questioning are intended to assess the two sources of suggestibility described earlier, one that arises from leading questions and the other from negative feedback.
Responses from the leading questions assess the construct referred to as ‘Yield’. That is, whether the child’s responses are in accordance with the desired responses implied by the leading questions, even if they are not consistent with events that occurred in the story. Responses following negative feedback assess a construct referred to as ‘Shift’. This measures whether the child changes their answer following negative feedback.

Research using the BTSS, GSS and VSSC has revealed considerable individual differences between children. Specifically, not all children have been found to obtain the same score on these instruments (e.g., McFarlane, Powell, & Dudgeon, 2002; Singh & Gudjonsson, 1992). The implication of these findings is that some children are more suggestible than others (Ceci, Bruck, & Battin, 2000).

Research has been undertaken to identify predictor/s of individual differences in suggestibility in children. Bruck and Melnyk (2004) and Hritz et al.’s (2015) reviews of the literature considered the role of exogenous and/or endogenous predictors of suggestibility in children. Research examining exogenous predictors has examined whether demographic factors such as socioeconomic status or gender can account for individual differences in suggestibility. From both reviews, these types of variables do not appear to consistently predict which children are likely to be more suggestible. Indeed, one large scale study found that socioeconomic status and gender only account for a small percentage of variance in children’s suggestibility. McFarlane and colleagues (2002) examined whether gender and socioeconomic status predicted scores from the Yield subtest from the VSSC in a sample of 220 children aged 46- to 47-months. Socioeconomic status was based on household income. Regression analyses revealed that socioeconomic status accounted for 1 percent of the variance in scores from the Yield subtest. Gender accounted for 2 percent, with females reported to be more suggestible than males.
Research has been conducted examining whether endogenous variables might be better able to account for individual differences in children’s suggestibility. In the next section of this chapter the extent age, intelligence, language and working memory predict suggestibility in children is reviewed.

**The Influence of Age on Children’s Suggestibility**

A fairly well replicated finding in the literature is that age correlates with suggestibility, although as presented in more detail below, in some cases the association is positive and others negative. However, when a correlation has been observed the magnitude of the association has often been small (e.g., $r < .3$). At a general level, it seems that children appear to be more suggestible than adults (Ackil & Zaragoza, 1995; Bjorklund et al., 2000; Cassel, Roebers & Bjorklund, 1996; Roebers, 2002; Warren, Hulse-Trotter, & Tubbs, 1991). For example, Cassel and colleagues (1996) compared suggestibility in children aged 10-years and younger and adults aged around 20-years of age. The participants were shown a video in which a boy and girl were arguing over a bike. The dispute ends with the boy taking the bike and the girl being comforted by her mother. Participants were asked questions about the event, including leading questions about an incident that did not occur in the video. For example, “The mother owned the bike didn’t she?”. The youngest children, who were in kindergarten and around 6-years of age, were more likely to agree with the incorrect leading questions compared to the adults. In this study, younger children were more suggestible than adults with respect to yielding to leading questions. Evidence of this nature suggests that age might be able to explain individual differences in suggestibility.

Research has also been conducted examining whether age correlates with suggestibility within the childhood years. A number of studies have shown that suggestibility decreases during childhood (e.g., Bettenay, Ridley, Henry, & Crane,
suggestibility for a distressing personally experienced event in 91 children aged 3- to 6-years. The distressing event the children experienced was receiving inoculations. Suggestibility was assessed by asking children about the event using leading questions. Some of the leading questions encouraged children to endorse an event that did not happen, such as “That nurse who gave you the shot wasn’t wearing any clothes was she?” Suggestibility was operationalised as endorsing a leading question. A significant negative correlation was observed between age and the tendency to yield or agree with a leading question. That is, older children were less likely to be influenced by a leading question compared to younger children.

It is important to note that the idea that children become less suggestible with age has not been universally replicated. Indeed, some studies have shown the opposite trend; older children are more suggestible than younger children (Ceci, Papierno, & Kulkofsky, 2007; Fazio & Marsh, 2008; Goswick, Mullet, & Marsh, 2013; Otgaar, Howe, Peters, Sauerland, & Raymaekers, 2013). For example, in their study Goswick et al. (2013) presented 24 5-year-olds and 24 7-year-olds with two short stories. One story was about the Eiffel tower and the other farm animals. Each story involved the presentation of still pictures and an auditorily presented narrative. After the stories were presented children were presented a range of question types including leading questions. On some items, the leading questions aimed to encourage children to endorse information that was incorrect, for example, “Autumn, that’s another word for spring”. Surprisingly, the older children were more likely to yield to the leading question than the younger children. In accounting for this result,
it was suggested that the older children’s superior cognitive capacity might have made it easier to integrate information in the leading questions with story information.

**Why Might Age and Children’s Suggestibility be Correlated?**

To date, the associations observed between age and suggestibility have been explained with respect to developmental changes in cognitive development. Specifically, through improvements in memory that co-occur with development, rather than the general social, cognitive and perceptual advances that are obtained as children become older. Brainerd and Reyna (1998; 2012) argue that associations between age and suggestibility can be explained with reference to the tenets of Fuzzy Trace Theory (FTT; Brainerd & Reyna, 2005; Reyna & Brainerd, 1995). According to their position, susceptibility to suggestion is related to the relative strength of memory traces for original event information and post-event misinformation. That is, the extent the child was able to encode or memorise an event and the presence of misleading information (e.g., leading questions, negative feedback) present during the retrieval. FTT posits that adults and children form two types of mental representations about an event; verbatim and gist traces. Verbatim traces capture surface details and are precise representations of an experience that can be quickly and accurately recalled. Gist traces are more enduring fuzzy representations that capture the patterns and meanings extracted from an experience.

Brainerd and Reyna (1998) suggested that decreases in suggestibility with age are due to the strength verbatim and gist traces are created. Improvements in memory trace strength with age are thought to support memory for original event information, thereby reducing susceptibility to post event suggestion. FTT further posits that younger children are more reliant on verbatim traces than older children. Verbatim traces are thought to decay rapidly compared to gist traces. Thus, greater
reliance on verbatim traces renders younger children more vulnerable to difficulty distinguishing between original and introduced event information. This is thought to be a particular concern when the time between exposure to the original event and participation in the post-event interview increases. Several studies show that children with weaker memories of the original event are more vulnerable to suggestion (e.g., Brainerd & Reyna, 1996; Milne, Clare, & Bull, 2002).

Although seemingly counterintuitive, the tenet that gist memory improves with age also plays a central role in the theories explanation for increases in suggestibility with age. Gist traces are representations of an event’s features rather than its exact details. When a suggestion or misinformation contained within a leading question possesses analogous semantic features to an original event item, reliance on gist traces may increase acceptance of the misinformation (Brainerd & Reyna, 2012).

There are a number of criticisms with relying on FTT and age in general to explain developmental changes in suggestibility. First, during development, a number of other cognitive skills and abilities improve and these may better explain why some children are more suggestible than others. Relevant to the current thesis is the large volume of work showing that as children become older, intelligence (Kail, 2000), language (Hoff, 2013) and working memory (Siegel & Ryan, 1989) also improves. For example, intelligence undergoes significant change during early childhood (Shaw et al., 2006). In terms of language development, children master basic skills during early childhood, refining and integrating their skills in order to use language in an increasingly complex range of tasks across middle childhood and into adolescence (Brandone, Salkind, Golinkoff, & Hirsh-Pasek, 2006). The basic structural components of working memory are present from early childhood, with each component undergoing sizable expansion in functional capacity throughout
middle childhood and into early adulthood (Gathercole, Pickering, Ambridge, & Wearing, 2004). In the next sections, research is reviewed examining whether intelligence, language and working memory might better explain individual differences in suggestibility.

**The Influence of Intelligence on Children’s Suggestibility**

Individual differences in suggestibility have also been examined with respect to intelligence (IQ). Intelligence can be defined as the broad ability to reason, plan, solve problems, think abstractly, form concepts, and learn using unfamiliar information or from experience (Gottfredson, 1994). One reason for suspecting that IQ might be an important predictor emerges from studies showing that children with intellectual disabilities are more suggestible than typically developing children of comparable age (Bruck & Melnyk, 2004). This finding has been observed in studies assessing suggestibility with the GSS-2. Both Henry and Gudjonsson (1999) as well as Henry and Gudjonsson (2003) compared suggestibility in children with and without intellectual impairments. The overall result found was that the intellectually impaired children were more suggestible than children in an age-matched control group on measures of Yield and Shift on the GSS-2. Thus at a general level, children with lower intelligence appear to be more likely to be influenced by leading questions and negative feedback.

However, closer inspection of one study comparing children with and without an intellectual disability potentially suggests that intelligence might be closely related to the tendency to acquiesce with leading questions. The study undertaken by Henry and Gudjonsson (1999) included an additional control comprising typically developing children who were of comparable mental age to the intellectually disabled children. Further analyses revealed these two groups were comparable on the Yield measure. On the shift measure, the mental age control group were less
likely to change their answer following negative feedback. Based on these findings it seems that intelligence is related to suggestibility arising from leading questions irrespective of age.

Interestingly, within samples of typically developing children, the correlation between suggestibility and intelligence is not often found to be significant. In Bruck and Melnyk’s (2004) review of the literature, nine out of 15 studies failed to find a significant association between intelligence and suggestibility. Following on from the findings of Henry and Gudjonsson (1999), one possibility is that intelligence is correlated more strongly with the extent a child yields to a leading question than other types of suggestibility. This proposal is consistent with at least one study. Roma, Sabatello, Verrastro, and Ferracuti (2011) examined the association between suggestibility and intelligence in 84 typically developing children aged between 8- and 10-years. Suggestibility was assessed using the GSS-2 and the BTSS. The items administered from both tests allowed for the calculation of Yield and Shift. Intelligence was assessed using the Raven’s Coloured Progressive Matrices Test (RCPM; Raven, Raven, & Court, 1998) and subtests from the Wechsler Intelligence Scale for Children-Revised (Wechsler, 1974). The Yield measure from both the GSS-2 and BTSS was negatively correlated with both the RCPM and WISC-R subtests. Thus, children with higher levels of intelligence were less likely to acquiesce with leading questions. However, the Shift measure was not correlated with either intelligence test.

A similar result was also found by McFarlane and colleagues (2002). In this study, the association between IQ and the Yield subtest from the VSSC was examined. Participants in that study were 220 typically developing children aged between 4- and 6-years of age. Intelligence was assessed using the Information subtest from the Wechsler Preschool and Primary Scale of Intelligence-Revised
A significant negative correlation was found between Yield and intelligence. That is, children with higher intelligence were less likely to be influenced by leading questions.

An outstanding question in the field is why some studies report a significant association between intelligence and suggestibility. Gignac and Powell (2006) suggested that observing a significant association between these variables depends on the range of intelligence investigated in a given study. In support of this claim, Gignac and Powell examined the association between suggestibility and intelligence in 158 typically developing children aged between 5- and 13-years. Suggestibility was assessed using the Yield component from the GSS-2. Intelligence was assessed using the Matrix Reasoning and Vocabulary subtests from the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999). Regression analyses revealed that the association between the measure of suggestibility and intelligence was best described using a quadratic model. Specifically, a linear association between intelligence and suggestibility appears to be present for IQ scores up to 105. At IQ levels higher than 105, this construct does not appear to be able to account for individual differences in suggestibility.

Mechanisms Which May Explain an Association between Intelligence and Children’s Suggestibility

One of the challenges in understanding why intelligence might correlate with suggestibility is that the association is not robust. As noted above, some studies have reported a significant association, but this result is not always replicated (Bruck & Melnyk, 2004). Gignac and Powell (2006) presented evidence suggesting the association exists, but only between low to average levels of intellectual functioning. Gudjonsson (1988) proposed that people with low intelligence are more likely to become confused and uncertain when asked leading questions. As a consequence,
they are more likely to agree with a leading question. This proposal would predict an association between intelligence and suggestibility, but only at the lower end of the distribution. Presumably, children with average to high levels of intelligence do not become confused and are less likely to be influenced by leading questions.

Another proposal, forwarded by Chae and Ceci (2005), is that intelligence might also affect children’s capabilities to adopt an effective memory strategy. Indeed, measures of intelligence have been found to correlate with measures of meta-memory in children (Borkowski, Ryan, Kurtz, & Reid, 1983). Meta-memory describes the insight into one’s ability to remember information and also the ability to utilise different strategies to learn and store information. The superior meta-memory capacities of children with higher levels of intelligence may mean they are more certain about their knowledge of past events. One outcome is such children are less likely to be influenced by leading questions or negative feedback. The opposite might hold for children with low intelligence.

A final explanation for the data is there are variables other than intelligence that have a closer relationship with suggestibility. The evidence presented in this section indicates that an association between intelligence and suggestibility is most robust in children with below average to average intelligence (Gignac & Powell, 2006). However, children with low levels of intelligence also have other problems as well. This includes poorer language skills (Abbeduto, Short-Meyerson, Benson, & Dolish, 2004) and inferior working memory (Schuchardt, Gebhardt, & Mäehler, 2010). Furthermore, both of these skills have been proposed to account for individual differences in suggestibility in children (Bruck & Melnyk, 2004; Hritz et al., 2015; Roebers & Schneider, 2005). In the next two sections the extent language, and then working memory, can explain individual differences in suggestibility is examined.
The Influence of Language on Children’s Suggestibility

This section examines the influence of language skills on children’s suggestibility. The possibility that individual differences in suggestibility might be explained to some extent by children’s language skills was apparent in Bruck and Melnyk’s (2004) review of the literature. In that review, it was noted that a significant correlation was more likely to be observed on some language tests than others. Studies that used a vocabulary test to assess language were not likely to observe an association between language and suggestibility (Bruck, Ceci, Francoeur, & Barr, 1995). Vocabulary tests assess whether children can understand individual words (e.g., Dunn & Dunn, 2007). However, studies that assessed children’s ability to understand and produce multiword utterances or sentences were likely to observe an association between suggestibility and language (Clarke-Stewart, Malloy, & Allhusen, 2004; Roebers & Schneider, 2005). It seems that some aspects of language are more closely related to suggestibility than others.

This section considers the role of children’s general expressive and receptive language skills as well as narrative language skills with respect to suggestibility. Expressive language skills refer to how well one is able to produce language to express their thoughts and ideas (Hoff, 2013). For example, combining words to create a sentence that can be readily understood by others. Receptive language skills refer to how well an individual can understand sentences or utterances spoken by another (Hoff, 2013). Both expressive and receptive language skills minimally draw on children’s knowledge and ability to use grammar and syntax (Bishop, 1997). That is, the ability to combine individual words along with the use of function words (e.g., ‘is’, ‘be’). Narrative language refers to the ability to use language to either understand or produce a structured ‘story’ (Britton & Pellegrini, 2014). This includes describing characters and their actions in an ordered linear manner in which
there is a beginning and ending to an event. This section continues by first reviewing research that has examined the relationship between suggestibility and expressive as well as receptive language.

**The Influence of Expressive and Receptive Language on Children’s Suggestibility**

**Suggestibility**

Only a small number of studies have examined the relationship between general expressive/receptive language skills and suggestibility. This number drops further after excluding studies that did not use standardised assessments of language functioning with known reliability and validity. One study that did use a standardised language test to examine suggestibility was undertaken by Clarke-Stewart and colleagues (2004). In that study the relationship between suggestibility and language was examined in 70 children aged 5-years. Language was assessed using two standardised tests. The Preschool Language Scale, Revised (PLS-R; Zimmerman, Steiner, & Pond, 1979) and the Adaptive Language Inventory (ALI; Feagans, Fendt, & Farran, 1995). The PLS-R is an individually administered test. Receptive language is assessed by testing how well children can understand spoken sentences. Expressive language is assessed by testing the extent to which the child is able to produce grammatically and semantically correct sentences. The ALI is an 18-item checklist that is completed by a teacher. Items measure how well a child is able to comprehend and produce language in a classroom setting. A leading question procedure was used to measure suggestibility. This involved presenting children with a number of activities such as recording their height and weight and engaging them in carnival games (e.g., bowling and piñata) for 10 minutes. Suggestibility was assessed in an interview that took place approximately nine months after the activities. During the interview, children were presented with a series of leading questions.
Clarke-Stewart et al. (2004) examined the relationship between the measures of suggestibility and language. In the analysis undertaken with the PLS scores from the expressive and receptive language subtests were combined to create a single composite. A significant negative correlation was found between children’s suggestibility for leading questions and scores from both the PLS-R and the ALI. Thus, the study demonstrated that children with better language skills are less likely to be suggestible. These results were largely replicated by Roebers and Schneider (2005). In their study, a standardised language test assessing expressive and receptive language skills along with a test of suggestibility was presented to 67 children aged around 4-years. In the analyses, a composite language score was used that combined expressive and receptive skills. Suggestibility was measured by presenting children with an event and probing their knowledge via leading questions, which in some cases encouraged an incorrect response. A significant negative correlation was observed between language skills and suggestibility; better language skills were associated with lower levels of suggestibility.

One limitation with the studies by Clarke-Stewart et al. (2004) and Roebers and Schneider (2005) arises from combining expressive and receptive language measures. Specifically, the relationship between language and suggestibility might primarily be driven by expressive or receptive language skills. As to be pointed out below a case can be made that expressive and receptive language might make separate contributions to suggestibility. The relative importance of expressive and receptive language skills is examined in Study 1 in this thesis.

It should be noted that not all studies find unequivocal support for an association between language and suggestibility when assessing expressive and receptive skills. Young, Powell, and Dudgeon (2003) examined suggestibility and language in children. Language skills were measured using the Communication
subscale of the Vineland Adaptive Behaviour Scales, Classroom Edition (VABS-CE; Sparrow, Balla, & Cicchetti, 1984). This is a checklist and was completed by the child’s teacher. Suggestibility was measured using the Yield items (i.e., tendency to acquiesce to leading questions) from the GSS-2. In one analysis, language skills were negatively correlated with suggestibility. However, after controlling for the effects of age, the measure of language was no longer found to be associated with suggestibility. Thus, there are aspects of the association between language and suggestibility that are better accounted for by one or more variables that covaries with age.

**Mechanisms Which May Explain an Association between Receptive and Expressive Language and Children’s Suggestibility**

Several proposals might explain why some studies observe an association between general expressive/receptive language skills and suggestibility. In relation to expressive language Hritz et al. (2015) suggest that children with better expressive language skills may have a better ability to talk about memories of past events. This might protect against the effects of undue influence related to leading questions or negative feedback. An argument can be formulated that receptive language skills play an important role in suggestibility. Difficulty understanding language may compromise a child’s ability to understand the requirements of an investigative interview and what is being asked of them (Agnew & Powell, 2004; Gudjonsson, 1988). For example, if a child were to incorrectly interpret the false suggestion “Matthew was arguing, wasn’t he?” as a fact, they might be more likely to accept the suggestion, than had they correctly interpreted it as a question. The research of Imhoff and Baker-Ward (1999) provides some support for this proposal. In that study suggestibility was reduced when questions were asked in a manner that children could readily understand.
Another possibility is that the relationship between language and suggestibility might reflect the influence of another variable such as memory or another aspect of language. The idea that memory might be involved in suggestibility is forwarded on the grounds that there is a very close relationship between language skills and memory functioning in children (Baddeley, 2003a). Furthermore, children with impaired language skills almost always have memory problems (Archibald & Gathercole, 2006; Lum & Conti-Ramsden, 2013). The possibility that working memory might explain individual differences in suggestibility is considered later in this chapter. In the next section, evidence is presented which implicates another aspect of language in children’s suggestibility, narrative language.

**The Influence of Narrative Language on Children’s Suggestibility**

As noted earlier, narrative language refers to how well language can be used to convey a set of related events, which maintains the causal, time-related, and thematic connections between events (Brown & Schopflocher, 1998). Narrative language can be assessed in the expressive or receptive domain. The receptive domain of narrative language deals with how well a child can answer questions about a story or event. The expressive domain of narrative language concerns how well a child can use language to describe or recount a story or event.

To the author’s knowledge, only two published studies have examined the relationship between narrative language and suggestibility (Clarke-Stewart et al., 2004; Kulkofsky & Klemfuss, 2008). This research has examined whether expressive narrative language skills are correlated with suggestibility. Results to date have been inconsistent. Kulkofsky and Klemfuss (2008; Study 1) examined narrative language skills and suggestibility in children aged 3- to 6-years. Suggestibility was assessed using a leading questions task. Children were first presented with a story. Suggestibility was assessed by asking children about the story using leading
questions that contained incorrect information about the story. Expressive narrative 
language skills were examined by asking children to recall everything about the 
story. Children’s narrative responses were coded according to volume, complexity, 
descriptive texture, and cohesion.

Kulkofsky and Klemfuss (2008; Study 1) found a significant negative 
association between narrative language skills and suggestibility. This indicated that 
children with better expressive narrative language skills were less suggestible 
compared with children with poorer expressive narrative skills. Furthermore, unlike 
Young et al. (2003), after controlling for age, the measure of narrative language 
remained correlated with suggestibility. There is evidence to suggest that the 
association between narrative language and suggestibility does not reflect the 
influence of general expressive and receptive language skills (comparable to the kind 
discussed earlier). In another experiment Kulkofsky and Klemfuss (2008; Study 2) 
found an association between narrative language skills and suggestibility even after 
controlling for age and general receptive and expressive language.

Clarke-Stewart et al. (2004) also found a significant association between 
narrative language skills and suggestibility. Children’s narrative language ability was 
measured by presenting a five minute video segment from a children’s movie, and 
then asking them to retell the story. The narratives children produced in response to 
the task were coded for complexity. Complexity was indexed by the number of 
actions or events of the story the child correctly included. Examples of story actions 
and events included, “the girl was walking in the woods”, “the sound of shots was 
heard”, “the father was going shopping”, “he yelled at the girl”, “the deer was 
injured”, and “the father went to the back of the truck”. A leading question 
procedure was used to measure suggestibility. However, in contrast to the findings of 
Kulkofsky and Klemfuss (2008), a significant positive association between overall
suggestibility and children’s narrative language was found. Children who performed better on the measure of narrative language agreed with a higher number of false suggestions presented in interviewer questions. Unlike Kulkofsky and Klemfuss (2008), Clarke-Stewart et al. (2004) did not control for the influence of potentially confounding variables on the association between narrative language and suggestibility. The reasons for the discrepant findings are not clear.

Mechanisms Which May Explain an Association between Narrative Language and Children’s Suggestibility

In the study by Kulkofsky and Klemfuss (2008), children with better narrative language skills were less likely to be suggestible. In accounting for their findings, it was suggested that narrative language skills reflect the strength an event was encoded and stored. It was speculated that children who have stronger memory traces for an event might be more capable of producing a narrative for that event than children with weak memory traces. It was also suggested that the act of producing a better narrative might strengthen event memory traces. From this perspective, narrative language skill might reflect how well an event was encoded and retrieved. This can be contrasted with the position that narrative language is a skill that independently influences suggestibility. This possibility was tested in Study 1 by assessing narrative language skills and suggestibility using different tasks.

Clarke-Stewart et al. (2004) suggest that narrative language competency may increase suggestibility. They suggested that children with proficient expressive narrative language skills enjoy the opportunity to “tell a good story”. This presumably includes the opportunity to embellish or modify a pre-existing event with new information. Kulkofsky and Klemfuss (2008) suggest that narrative language skills may increase suggestibility if children perceive the act of producing or re-telling an event or story as a socially mediated process. From this perspective, the
child might perceive leading questions as an opportunity to tell a better story by integrating both their own and interviewer contributions. This contention is supported by previous research, which indicates narrative skill develops through conversations with adults in which recollections of past personal experiences are constructed jointly (Fivush, Haden, & Reese, 2006).

An additional process that might also explain the association between narrative language and suggestibility is working memory. Working memory has been shown to be related to the ability to comprehend and produce a narrative (Kemper, Rash, Kynette, & Norman, 1990; Montgomery, Polunenko, & Marinellie, 2009). The role of working memory in suggestibility is examined in the next section.

**The Influence of Working Memory on Children’s Suggestibility**

A small number of studies have investigated the relationship between working memory and suggestibility. Working memory supports the ability to both temporarily store and manipulate (or process) information (Baddeley, 1992; Daneman & Carpenter, 1980; D'Esposito et al., 1995). According to Baddeley (Baddeley, 2000, 2003b), working memory comprises modality specific slave systems that are responsible for the short-term storage of either phonological or visuo-spatial information. A central executive underpins the ability to manipulate temporarily stored phonological or visuo-spatial information. Tasks which engage the working memory system have both a short-term storage and processing/manipulation element (Gathercole & Alloway, 2006).

To date at least two published studies have examined the relationship between working memory and children’s suggestibility. Roebers and Schneider (2005; Study 2) examined working memory and suggestibility in 65 children with a mean age of approximately four and a half years. Working memory was assessed using subtests from the Working Memory Test Battery for Children (WMTBC;
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Pickering & Gathercole, 2001) and the Kaufman Assessment Battery for Children (KABC; Kaufman & Kaufman, 1983). The tasks administered to the children only required the short-term storage of visual or phonological information. For example, the children were administered the forward digit span task in which they are asked to repeat back increasingly longer string of digits. Suggestibility was assessed by showing children a short video and a week later asking questions about what they had seen. Suggestibility was assessed through the use of leading questions that aimed to encourage children to endorse an event that did not happen in the video. For example, one leading question asked children “Was the duck wearing a hat on her head?” even though this event did not occur.

Roebers and Schneider (2005; Study 2) used correlation analysis to explore the relationship between performance on the subtests from the WMTBC and suggestibility. The tasks assessing the short-term storage of visuo-spatial and phonological information were not found to be correlated with the measure of suggestibility. In accounting for their results, it was suggested that the young age of the children may have contributed to the null results. It was suggested that individual differences in working memory might become more apparent with age. An increase in variance with increasing age may make it easier to detect whether working memory covaries with suggestibility in samples of older children. However, Roebers and Schneider also found that the measure assessing the short-term storage of phonological information correlated with children’s language skills. It was suggested that working memory might indirectly influence suggestibility via its influence on language.

One criticism of Roebers and Schneider’s (2005; Study 2) study was that the working memory tasks did not require the processing and/or manipulation of information. It can therefore be argued that the tasks presented to the children did not
assess working memory. However, in one study a non-significant relationship was found between suggestibility and a relatively more valid task of working memory. Lee (2004) examined the relationship between suggestibility and performance on a Backward Digit Span task. On a backward digit span task children are auditorily presented with a string of digits. Their task is to repeat the numbers back in reverse order. The backward digit span task has a short-term storage and processing/manipulation component. This is because children are required to store the numbers before reversing the order. Participants in this study were 65 children and adolescents aged 8- to 18-years. Suggestibility was measured using the Yield and Shift subtests from the GSS-2 (Gudjonsson, 1987b). The correlation between performance on the backward digit span task and GSS-2 Shift was significant and negatively correlated. That is, children with better working memory were less likely to change their response following negative feedback. The correlation between performance on the backward digit span task and the Yield subtest was negative but not significant. Once concern with the study is that the large age range may have masked potential results. There was little variance in the adolescents suggestibility scores. Future research could overcome this problem by examining the relationship between working memory and suggestibility in a sample comprising only children.

**Mechanisms Which May Explain an Association between Working Memory and Children’s Suggestibility**

More research is required to examine whether there is a relationship between working memory and suggestibility in children. At a conceptual level, there are grounds for suspecting a relationship between these variables. Working memory processes include keeping track of stored information whilst inhibiting irrelevant information (Conway & Engle, 1996). As a consequence, it is reasonable to expect that children and adults with high working memory capacity may have more efficient
means of controlling what information is processed into working memory (Bottoms, Quas, Davis, 2007). In the context of an investigate interview, such individuals when faced with leading questions would be expected to be better at maintaining event information whilst inhibiting incongruent interviewer suggestions. In contrast, individuals with low working memory capacity might be more vulnerable to incorporating misinformation into working memory.

Another possibility is that working memory may indirectly influence suggestibility via its role in language processing. In an earlier section studies were presented showing that language was correlated with suggestibility (e.g., Bruck & Melnyk, 2004; Clarke-Stewart et al., 2004). Working memory has been proposed to support both the production and comprehension of language (Baddeley, 2003a). For instance, to successfully comprehend a sentence, working memory might be required to temporarily store the sentence and then process the information to determine its semantic content (Montgomery, Magimairaj, & Finney, 2010). Thus, working memory might influence suggestibility via its effects on language processing (Roebers & Schneider, 2005).

**Gaps in the Literature and Chapter Summary**

This chapter examined potential cognitive correlates of suggestibility in children. The review was undertaken to identify variables that might explain why some children are more suggestible than others. The first point to emerge from this review was that there are problems with relying on what might be considered more ‘traditional’ predictors of suggestibility, such as demographic variables, age and intelligence. These variables do not appear to be reliably associated with suggestibility (Bruck & Melnyk, 2004; Roebers & Schneider, 2005). However, preliminary evidence potentially suggests a role for some aspects of language. Nonetheless, more work is required to investigate the role of language skills in
relation to suggestibility. As noted earlier, too few studies have been undertaken that have systematically examined the role of expressive language, receptive language and narrative language on children’s suggestibility. For example, most studies have assessed language using composite measures that combine expressive and receptive language skills. One way to advance knowledge about the factors that influence suggestibility is avoid treating language skills as a unidimensional construct. This criticism of the literature provides motivation for Study 1, in which measures of expressive, receptive and narrative language were administered along with a standardised test of suggestibility. Using this approach, the contribution of different aspects of language to suggestibility could be evaluated. Previous factor analytic research confirming language is a multidimensional construct (e.g. Foorman, Koon, Petscher, Mitchell, & Truckenmiller, 2015; Lonigan & Milburn, 2017) provides further support for this approach.

The role of working memory in accounting for individual differences in children’s suggestibility is still in its infancy. As noted earlier, research undertaken so far has clear methodological limitations. It is suggested that very little is known about the role of working memory in suggestibility. However, as noted in the previous section, there are conceptual reasons for expecting an association between suggestibility and working memory. To address this gap in the literature Study 1 also examined the association between working memory and suggestibility using methods that overcome problems identified with past research.

Whilst ‘traditional’ predictors of suggestibility such as demographic variables, age and intelligence do not appear to reliably predict suggestibility in children (Hritz et al., 2015), language and possibly working memory might play a role. Determining this is important at a practical level. For example, the extent a child might be influenced by leading questions could be determined by assessing
language skills. Thus, understanding whether cognitive variables are related to suggestibility might be important in the context of undertaking investigative interviews.
Chapter Two: Cognitive Skills in Young Adult Offenders

Chapter Overview

The assessment of intelligence, language and working memory might also play an important role in the work undertaken with young adult offenders. Specifically, the aforementioned variables might be useful in understanding the ontogenesis of offending behaviour and also in supporting rehabilitation. This chapter reviews research investigating the status of intelligence, language functioning and working memory in adolescent and young adult offenders. Early school leaving is identified and examined as a potential pathway for explaining an association between cognitive skills and criminal behaviour.

Introduction

A young adult offender is defined here as a person in the age range of 18- to 24-years who has committed an illegal act. It has been suggested that young adult offenders should be considered as qualitatively different from adult offenders (e.g., Farrington, Loeber, & Howell, 2012). This is because at the socio-emotional, cognitive and life experience level they are more similar to adolescent offenders (Farrington et al., 2012).

In Australia, as in other parts of the world (Farrington et al., 2012), offender rates increase in adolescence and then begin to decrease from the early 20’s. For example, data from the Australian Bureau of Statistics (2016) show that the offender rate per 100,000 individuals is at its highest in the 15- to 19-year-old group (rate 4,883) and decreases linearly from the early 20’s to 30’s. For example, the offending rate per 100,000 in the 20- to 24-year-old group is 4,717, whilst in the 25- to 29-year-old group the rate decreases to 3,452 (Australian Bureau of Statistics, 2016). Based on these statistics, in order to reduce the overall offending rate in a population
work is required to reduce the rate in young adults. One way this can be achieved is to understand the antecedents of offending behaviour in this demographic.

**Examining Academic Difficulties as an Antecedent of Offending Behaviour**

One well known risk factor associated with offending in young adults is academic failure and leaving school prior to the completion of secondary education (e.g., Anderson, 2014; Christie, Jolivette, & Nelson, 2005; Smale & Gounko, 2012). Academic withdrawal as a risk factor for offending behaviour is demonstrated in a large scale study undertaken by Maynard, Salas-Wright, and Vaughn (2015). In this study offending behaviour was examined in a sample of 19,312 young adults aged 18- to 25-years. Within this sample 2,105 did not complete high school and 17,199 did complete. Analyses revealed that young adults who did not complete high school were more than twice as likely to be arrested for theft compared to those who did complete high school (Odds Ratio = 2.11), more than three times more likely to be arrested for assault (Odds Ratio = 3.37) and just over two times more likely to be arrested for a drug related crime (Odds Ratio = 2.13).

Other evidence that implicates early school leaving as a predictor of young offending can be seen via changes made to minimum education requirements. Anderson (2014) examined the effects of increasing the earliest age students could leave school using data collected in the United States. In this study it was found that increasing the minimum age students could leave high school to 18-years of age decreased arrest rates by around 17 percent. This reduction has been reported in other countries as well. For example, raising the school leaving age in a state in Australia from 15-years to 17-years was associated with a 19 percent reduction in property crime over a five-year period (Jha, 2015). Vandalism, graffiti, theft and unlawful entry offences also dropped by at least 20 percent.

The reasons why extending minimum education requirements reduces crime
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rates is unclear. One suggestion is that for some young people continued engagement in education may play a role in delaying the onset of offending. This is important because it may break the association between early onset offending and chronic offending in that individual. Indeed, the younger an individual is when they first offend the greater risk they are at of repeat and chronic offending (Jha, 2015; Moffit, 1993; Thomas, Thomas, Burgason, & Wichinsky, 2014). During a 12-month period ranging 2014 to 2015, the proportion of young Victorians whom reoffended, as indicated by charges on more than one occasion, was approximately 25 percent for offenders aged 15- to 19-years, and 23 percent for offenders aged 20- to 24-years (Australian Bureau of Statistics, 2016).

The relationship between academic problems and offending was examined by Katsiyannis, Ryan, Zhang, and Spann (2008) in their review of the literature. One trend in the data noted by these researchers is that it is not just early school leaving that correlates with offending. Rather, failure to master basic academic skills correlates with criminal activity committed by adolescents and young adults. Furthermore, this association can be observed in the early years of schooling. For example, Meltzer, Levine, Karniski, Palfrey, and Clarke (1984) examined the academic histories of adolescents with and without criminal records. Results obtained from the second grade showed that 45 percent of the adolescents with criminal records experienced delays in reading and 36 percent experienced delays in handwriting.

The finding that young offenders have often struggled in academic settings opens up the possibility that one or more cognitive skills might be contributing to this problem. Indeed, there is considerable research demonstrating a relationship between intellectual functioning and academic achievement (Carver, 1990; Furnham & Monsen, 2009). It is also now known that language skills are an important
predictor of academic skills as well. For example, children with language problems have repeatedly been shown to have poor academic outcomes even when their intellectual functioning is in the average range (Conti-Ramsden, Durkin, Simkin, & Knox, 2009; Young et al., 2002). Working memory is another cognitive ability important for academic outcomes (Alloway & Alloway, 2010; Gathercole & Alloway, 2006; Gathercole & Pickering, 2000). In the next section the role of each of these cognitive abilities in relation to young adult offending is considered. It is suggested that at least one of these variables might be useful to better understand why poor academic achievement is associated with young adult offending. The relationship between intelligence and offending is examined first.

**Intellectual Functioning in Young Offenders**

Young adult offenders are typically found to perform poorer on tests of intellectual functioning compared to comparison groups and normative data for general populations (e.g., Chitsabesan et al., 2007; Fougere, Thomas, & Daffern, 2013; Herrington, 2009). For example, Fougere et al. (2013) examined intelligence in 64 offenders aged 16- to 30-years. Offenders were recruited from a Victorian youth service responsible for providing support to young offenders exiting the justice system who are at moderate or high risk of reoffending. Intelligence was measured using the WASI (Wechsler, 1999). Sixteen percent of offenders were identified as having an intellectual impairment. This proportion is substantially higher compared to what is observed in the general population. In the general population only two percent of individuals have an intellectual impairment (Wechsler, 1999). The largest proportion of offenders, 28 percent, had an intelligence score in the borderline range. The prevalence of borderline intelligence in the general population is estimated to be approximately eight percent (Wechsler, 1999). Twenty-six percent performed in the low average range, and 27 percent performed in the average range. Three percent
scored in the high average range. Thus, young offenders appear to score lower on intelligence tests.

Within the young adult offender population, individual differences in intellectual functioning appear to predict recidivism as well. Fougere, Daffern, and Thomas (2015) assessed intellectual functioning in 75 young offenders. The recidivism rates of this group were assessed 12-months later. Intelligence was found to be a significant predictor of recidivism. Specifically, lower levels of intelligence were associated with a greater likelihood of reoffending.

One confound that can be identified with pre-existing literature examining intellectual functioning in young adult offenders is the absence of assessing other cognitive abilities. Relevant to the current thesis is research showing that intelligence also correlates with general language skills (Moore, 1968) and working memory (Engle, Tuholski, Laughlin, & Conway, 1999). Thus, it could be that in young adult offenders, poor language and/or working memory problems are also present. Furthermore, it could be that these skills and abilities are more strongly associated with criminal behaviour. Study 2 examines this issue in detail by assessing intelligence, language and working memory in a group of young adult offenders. In the next section the status of language functioning in young adult offenders is examined.

**Language Skills in Young Offenders**

It has become apparent that young adult offenders have language problems (e.g., Blanton & Dagenais, 2007; Bryan, 2004; Bryan, Freer, & Furlong, 2007; Rucklidge, McLean, & Bateup, 2013; Snow & Powell, 2008; 2011). For example, Snow and Powell (2011) examined the language skills of 100 male offenders aged 17- to 21-years serving custodial sentences at a youth detention centre. Expressive and receptive language skills were assessed using the Clinical Evaluation of
Language Fundamentals, Fourth Edition, Australian Standardised Edition (CELF-4 Australian; Semel, Wiig, & Secord, 2003). Results showed that 50 percent of the sample met the criterion for language impairment. Additional analyses compared the language scores between the male offenders and a control group. The male offenders obtained significantly lower scores than the control group on subtests assessing expressive and receptive language.

Bryan (2004) also assessed language difficulties in a sample of young adult offenders. Thirty offenders aged 18- to 21-years were assessed. Receptive and expressive language skills were measured using the grammatical competency subtest from the Fullerton Language Test for Adolescents, Second Edition (Thorum, 1986), and a comprehension test. The grammatical competency subtest involved the participant listening to 20 verbally presented sentences and indicating whether or not there was a grammatical error in each sentence. The comprehension test involved the participant viewing grids containing different arrangements of coloured circles and rectangles. Participants were provided verbal instructions to point to and move certain shapes. Seventy-three percent of the sample scored significantly below age expected levels on the grammatical competency subtest. Twenty-three percent of the sample scored below age expected levels on the comprehension test. Interestingly, school-leaving age did not correlate with performance on the language tests. Thus, in this sample, the relationship between poor language skills and criminal behaviour does not appear to be mediated through educational attainment. This study potentially indicates that language skills might increase the risk of criminal behaviour via a pathway independent of early school leaving.

To the author’s knowledge no data exists with respect to the relationship between language skills and recidivism. It was suggested earlier that the relationship between intelligence and criminal behaviour might reflect the influence of language.
This was suggested given that language skills and intellectual functioning tend to be correlated (Moore, 1968). Since intelligence and recidivism have previously been found to correlate (Fougere et al., 2013), the expectation would be that a similar relationship also exists with respect to language. The relationship between reoffending and language skills was examined in Study 2. Finally, one further limitation associated with past research examining language functioning in young adult offenders, is that few control for the influence of working memory or intellectual functioning. Given working memory is understood to be implicated in language development it is important to examine these cognitive skills alongside each other (Gathercole & Baddeley, 1993).

**Working Memory Skills in Young Offenders**

Working memory has been shown to be related to academic achievement independently of intelligence (Alloway & Alloway, 2010). Subsequently, it may also explain why some young offending adults leave school early. If this were the case this group would be expected to perform poorly on working memory tests. Working memory functioning has been investigated in a number of studies (e.g., Cauffman, Steinberg, & Piquero, 2005; Hoaken, Allaby, & Earle, 2007; Syngelaki, Moore, Savage, Fairchild, & Van-Goozen, 2009; Zou et al., 2013). The typical finding is that young offenders have poor working memory. Cauffman et al. (2005) examined working memory in 105 incarcerated youth offenders and a comparison group comprising 78 high school students. The age of the participants ranged from 14- to 19-years, with approximately equal number of females and males. Working memory was assessed using the Spatial Working Memory subtest of the Cambridge Neuropsychological Test Automated Battery (CANTAB; Robbins et al., 1998; Sahakian et al., 1988). This test requires the short term storage and manipulation of non-verbal or spatial information. Comparisons of performance on this subtest
between the incarcerated youth offenders and the comparison group were undertaken whilst controlling for age and parental education. Results showed the offenders performed more poorly than the non-offenders on the measure of working memory.

In another study, Syngelaki et al. (2009) also administered the Spatial Working Memory subtest of the CANTAB (Robbins et al., 1998; Sahakian et al., 1988). The sample in this study comprised 38 male offenders aged 12- to 18-years whom were recruited via a Community Youth Offending Service. Only participants with average intelligence were included in the study. On the working memory task the offenders made more errors than controls. Importantly, intellectual functioning does not appear to account for the differences between groups. As noted earlier both groups were matched on intelligence.

Whilst the previously presented research has revealed poorer working memory in general offending populations, irrespective of offence type, there is some research that indicates that poorer working memory is only characteristic of specific subsets of offenders (e.g., Becerra-Garcia & Egan, 2014; Zou et al., 2013). For example, Zou et al. (2013) administered the Spatial Working Memory task of the CANTAB to 214 youth offenders and a control sample of 107 non-offenders in China. The sample of offenders comprised 107 violent and 107 non-violent offenders. The mean age of all groups was 16-years. Non-violent offenders did not perform significantly differently to non-offenders on the measure of working memory. However, violent offenders performed more poorly than non-offenders on the measure of spatial working memory. These results were maintained after controlling for intelligence and education level. In explaining the finding Zou et al. (2013) suggested that higher levels of childhood trauma reported by the violent offenders might have contributed to higher levels of working memory impairment in this group.
Research has most often assessed working memory function in samples of juvenile offenders. There appears to be no studies that examine working memory in young adult offenders exclusively. Given research which finds that working memory continues to develop during young adulthood (Park & Payer, 2006), examining working memory in this subset of offenders is important. It is also important to note that the literature examining working memory in young offenders has examined this aspect of memory in the non-verbal domain. There is evidence to suggest that verbal and visuospatial memory are interdependent constructs (Alloway, Gathercole, & Pickering, 2006). Thus, it is possible that visuo-spatial and verbal working memory will be differentially affected in this group. The extent poor visuo-spatial and verbal working memory relate to criminal behaviour has yet to be examined.

**Mechanisms Which May Explain an Association between Cognitive Skills and Offending Behaviour**

One pathway intelligence, language and working memory may contribute to criminal behaviour in young adults is via influence on academic attainment. Problems with language, working memory and low intelligence are all associated with poor academic performance (e.g., Bull, Espy, Wiebe, 2008; Dockrell, Lindsay, & Palikara, 2011; Dodonova & Dodonov, 2012; Lehto, 1995). Additionally, poor academic performance has been shown to be a strong predictor of early school leaving (e.g., Markussen, Froseth, & Sandberg, 2011; Rumberger & Lim, 2008). Thus, from this perspective poor cognitive skills may be a risk factor for early school leaving and in turn for subsequent crime.

General Strain Theory (Agnew 1985; 1992; 2001) provides one explanation to explain why poor cognitive functioning might lead to offending via influence on academic achievement. According to the theory individuals engage in crime as a means of coping with ‘strains’. Strains are situations or stressors that are perceived as
upsetting. Strains are categorised into three categories. The first is when something valued is lost. This can include intangible items such as relationships, but also emotional states such as self-esteem. The second is exposure to negative influences, for example, time in the company of anti-social peers. The third refers to situations when people are unable to achieve their goals. This can include failure to attain good academic standing. Young people who have poor cognitive skills and fail to achieve academic goals may engage in offending behaviour to reduce distress and achieve goals via antisocial means. In engaging in crime young people are likely to be exposed to negative influences, such as offending peers, which may act to promote further engagement in crime. If young person’s leave school early they may also lose positive social connections that serve as protective factors against engagement in crime. Consistent with this position, Curtis and McMillian (2008) found that around half of young people who leave school early are likely to be disengaged from any form of education, training or work in the following year. Thus, poor cognitive skills may also impact vocational attainment and achievement, whereby promoting a trajectory of repeat offending (e.g., Greenwood, Model, Rydell, & Chiesa, 1996; Welsh et al., 2008).

Poor language skills independently might contribute to criminal behaviour in young adults. As Snow and Powell (2011) point out, proficient language skills are necessary to maintain interpersonal relationships and also for psychosocial wellbeing (Clegg, Hollis, Mawhood, & Rutter, 2005). Subsequently, poor language skills might lead to the isolation of an individual. Social isolation has been shown to increase the risk of involvement in crime (e.g., Johnson, Pagano, Lee, & Post, 2015). Furthermore, poor language skills might create further problems for an individual who comes into contact with the criminal justice system. As noted earlier, he or she might be more suggestible or respond ‘don’t know’ to questions because of a lack of
comprehension skills. Such behaviour might be interpreted as unwilling to cooperate in an investigation and create further problems. Thus, the cognitive skills reviewed in this chapter may directly or indirectly contribute to a young adult being charged with a criminal offence.

**Gaps in the Literature and Chapter Summary**

In this chapter it was suggested that leaving school prior to the completion of secondary education is a risk factor for offending in young adults. Poor intelligence, language and working memory skills may contribute to academic difficulties for this group, and in turn early school leaving. A main criticism of research undertaken to date examining cognitive functioning in young adult offenders is the narrow focus of assessment. Studies have typically utilised single measures of cognitive function, rather than concurrently assessing multiple skills. A broad approach is necessary in order to examine the relationship between different aspects of cognitive functioning in this group. To the authors knowledge no studies have examined whether intelligence, language and working memory impairments co-occur in young adult offenders. To address this gap in the literature Study 2 examines language, intelligence and working memory in a group of young adult offenders. This review provides support for expecting young adult offenders to be disproportionately affected by impairments in intelligence, language and working memory. The association of intelligence, language and working memory with early school leaving and recidivism remains largely unclear.
Part II: Empirical Studies

Part II Overview

The next part of this thesis presents results from two studies examining the role of language, working memory and intelligence with respect to two areas of forensic practice. The general aim of this work is to increase the evidence base concerning the value of adding language and working memory assessments to the ‘toolbox’ of forensic psychologists. If the empirical work presented in this thesis finds that language and/or working memory is related to suggestibility (investigated in Study 1) or disproportionately affected in young adult offenders (investigated in Study 2), then it might be useful for forensic psychologists to better understand these abilities and skills. Indeed, in the assessment of cognitive functioning, minimum standards in Australia are vague and only appear to require that forensic psychologists are trained to administer an intelligence test (Kendall, Jenkinson, de Lemos, & Clancey, 1997; Psychology Board of Australia, 2011). However, if it is the case that working memory and language functioning are implicated in multiple aspects of forensic practice, training in a broader assessment of cognitive functioning might be required.

A summary of each study is now presented. Study 1 investigated whether intelligence, language, working memory and age was related to individual differences in children’s suggestibility. Unlike past research, multiple domains of language and working memory were assessed. Study 1 also identified which of these variables best accounted for individual differences in children’s suggestibility. In Study 2 attention is turned to intelligence, language, and working memory in young adult offenders. Using a similar approach adopted in the first study, a comprehensive assessment of intelligence, language and working memory functioning was administered to this group. In this study which of these abilities and skills were at
age appropriate levels and also their relationship to early school leaving and recidivism was examined.
Chapter Three: Study 1 - Correlates of Suggestibility in Children

Introduction

The aim of Study 1 was to investigate whether age, intelligence, language and working memory were correlated with suggestibility in primary school aged children. This study aimed to address two limitations noted with past research that were raised in the literature review (Chapter 1). First, past studies (e.g., Clarke-Stewart et al., 2004; Roebers & Schneider, 2005) that have examined the role of language skills have implicitly or explicitly treated this as a unidimensional construct. For example, a measure of language functioning was indexed by creating a composite score collapsing expressive and receptive language skills (e.g., Clarke-Stewart et al., 2004; Roebers & Schneider, 2005). As noted earlier, this approach is problematic since expressive and receptive skills measure two different aspects of language. In the current study, language was treated as a multidimensional construct. Specifically, Study 1 examined whether suggestibility was correlated with expressive language, receptive language and narrative language. Second, most studies examining the relationship between suggestibility and one or more abilities/skills did not control for the influence of other variables. For example, in past studies examining the relationship between intelligence and suggestibility (e.g., Henry & Gudjonsson, 1999; McFarlane et al., 2002), the influence of language was not controlled. This is a potential concern since language and intellectual function can be correlated (Moore, 1968). In Study 1 the extent a range of variables (i.e., age, intelligence, language and working memory) correlate with suggestibility was examined. Using this approach, the influence of one variable could be examined whilst controlling for the effects of another. Based on the findings of the literature review presented in Chapter 1, with respect to cognitive skills, it was hypothesised that language would be a significant predictor of children’s suggestibility. Specifically, children with poorer language
skills were expected to be more suggestible. Predictions regarding associations between suggestibility and IQ, and suggestibility and working memory, were not made given the effects observed in existing research are not that robust.
Method

Participants

Forty children (19 females and 21 males) participated in the study. The ages of the children ranged from 5; 0 (years; months) to 11; 12. The mean age of the sample was 8; 7 (SD = 2; 2). The children were recruited for the study using two methods. Thirty of the children were recruited from a primary school located in Melbourne, Australia. The remaining children were referred to the study from acquaintances of the investigator. Prior to participating in the study, each child’s parent was required to sign a consent form. A copy of the plain language statement and consent form used in the study is presented in Appendix A. Children with a visual or hearing impairment were excluded from the study, as the measures employed were not suitable for testing children with these impairments.

Materials

In this study children were presented with a battery of tasks that assessed suggestibility, intelligence, language and working memory. A summary of each test used is now provided.

Measure of Suggestibility. The Gudjonsson Suggestibility Scale 2 (GSS-2; Gudjonsson, 1987b) was used to measure suggestibility. The GSS-2 is an individually administered test. To administer this task the child was first presented with a two-minute story that was auditorily presented by the test administrator. The story was about a boy named ‘William’ who lost control of his bicycle. William was riding down a steep slope and calling for help. His neighbours, Anna and John, heard him and helped bring his bicycle to a halt. An excerpt of the story is presented in Appendix B. For the purposes of assessing suggestibility, the story is divided into 40 ‘items’ of ‘information’. For example, one sentence presented to the children is ‘They lived in a small bungalow which had a swimming pool in the garden’. This
sentence is divided into three items of information; ‘They lived in a small bungalow’, ‘which had a swimming pool’ and ‘in the garden’. Children’s knowledge of each item is assessed as part of the task.

Immediately after the story was presented, the test administrator asked the child to “tell me everything you remember about the story”. This prompt to recall the story acted to focus children’s minds on producing story information from memory without alerting them to the purpose of the test. Recall responses were not scored.

The next part of the GSS-2 involves assessing children’s suggestibility. Children were asked 20 questions about the story. Fifteen of these questions were leading in that they asked about information that was not mentioned in the story. For example, one leading question asked “Was the weather wet or dry when the incident happened?”. In the story no information about the weather is provided. An incorrect response on the leading questions would be to endorse or acquiesce to the question. For example, responding that the weather was ‘wet’. The remaining five questions presented were foils and did not contain misinformation. For example, one of the foil items was “Were the couple called Anna and John?”. These questions aim to reduce children’s awareness of the intent of the leading questions.

Suggestibility on the GSS-2 is determined by summing responses to the 15 leading questions. Responses to the five foil items were not scored. On the leading questions a score of one is allocated each time the child endorses misinformation. For example, responding that the weather was ‘wet’ when in fact no information about the weather is provided in the story. Scores approaching 15 indicate increased levels of suggestibility.

Performance on the 15 leading questions is referred to as the Yield Score. For the purposes of this study only the ‘Yield’ component of the scale was administered. The GSS-2 also includes a ‘Shift’ component that measures suggestibility following
negative feedback. This scale was not administered because it has previously been found to have low internal consistency reliability (Gignac & Powell, 2009). Thus, failure to find an association between this aspect of suggestibility and the other variables could more parsimoniously be explained with respect to measurement error. In contrast, the yield measure has been shown to have strong reliability (Gignac & Powell, 2009; Gudjonsson, 1987b). Research investigating the internal consistency of the yield measure indicates Cronbach’s alpha is between 0.70 and 1.00 (Reed, 2000). The yield measure also has high test-retest reliability and inter-scorer reliability. Correlations measuring these aspects of reliability range between 0.84 and 0.99 (Gudjonsson, 1987b). Finally, the yield measure has been demonstrated to be valid. The yield measure from the GSS-2 has been shown to be correlated with the corresponding index from another standardised test of suggestibility, the BTSS (Endres, 1997). Pearson’s analyses between the scales showed a significant positive correlation, \( r = .71; p < .001 \) (Roma et al., 2011).

**Measure of Intelligence.** Intelligence was assessed using the Raven’s Coloured Progressive Matrices (RCPM; Raven et al., 1998). The RCPM provides a measure of non-verbal reasoning ability. This is the ability to logically solve novel problems independent of acquired knowledge (Feldman, 2013). The test consists of 36 items. Each item involves the child being presented with a picture of a non-verbalisable pattern that has a missing segment. See Appendix C for an example of a test item. The child is asked to identify the missing segment from one of six possible alternatives. For each item the child selects the correct segment a score of one is awarded. The maximum raw score for this test is 36, with scores ranging 0 to 36.

\(^1\) Within Study 1 and study 2 of the present thesis, scores from the Raven’s Coloured Progressive Matrices and the Kaufman Brief Intelligence Test Matrices subtest, respectively, were referred to as intelligence. This classification was adopted because both measures have been shown to be substantially inter-correlated with full scale Wechsler Intelligence Scales (e.g. Martin & Wiechers, 1954; Walters & Weaver, 2003). Within the Cattell Horn-Carroll model of intelligence, these two subtests would be classified as measures of fluid reasoning.
Performance on the RCPM is expressed as a standardised score, which has a mean of 100 and a standard deviation of 15.

The RCPM has been shown to have high reliability (Cotton et al., 2005). Internal consistency estimates have been demonstrated to range from a low of 0.76 for 11-year-olds, to a high of 0.88 for 8- and 9-year-olds. Similar results have been obtained for split-half reliability, with values shown to range from 0.81 for 10- and 11-year-olds, to 0.90 for 9-year-olds. The RCPM has also been shown to have convergent validity. Research (Kluever, Smith, Green, Holm, & Dimson, 1995) shows a significant positive correlation, $r = .67; p = .01$, between RCPM percentiles and full scale scores on the Wechsler Intelligence Scale for Children, Third Edition (Wechsler, 1991).

**Measure of Expressive and Receptive Language.** The CELF-4 Australian (Semel et al., 2003) was used to measure children’s ability to understand and produce language. Children’s ability to understand spoken language, otherwise known as receptive language is assessed by the Concepts and Following Directions, Word Classes (Part I) and Sentence Structure subtests. Children’s ability to produce language, otherwise known as expressive language is assessed by the Recalling Sentences, Formulated Sentences, Word Classes (Part II), and Word Structure subtests. A summary of each subtest is now presented.

**Concepts and following directions.** This subtest evaluates a child’s ability to comprehend and understand instructions of varying length and complexity. On this subtest, the child is asked to point to one or more objects in an order presented by the test administrator. For example, on one item the child is asked to “Point to the yellow car after you point to the green ball”. A score of one is awarded for each correct response.
Word classes (Part I). This subtest evaluates a child’s ability to understand relationships between words that are related by semantic class. In Part I, the child is asked to select which two of a number of presented objects or words go together to make a pair. For example, on one item the child is shown a picture of a trumpet, a drum and a sign and asked to select a pair. A score of one is awarded for each correct pair identified.

Sentence structure. This subtest is for administration with children aged 5- to 8- years only. It evaluates a child’s ability to listen to, and interpret sentences of increasing length and complexity. On this subtest, the child is asked to identify, among several picture choices, the picture that best depicts the meaning of a sentence. For example, on one item the child is asked to “Point to the girl that has a big, spotted, black-and-white dog”. A score of one is awarded for each correct response.

Recalling sentences. This subtest measures a child’s ability to recall and imitate spoken sentences of increasing length and complexity. On this subtest, the child is asked to verbally repeat a series of sentences verbatim. For example, on one item the child is asked to repeat the sentence “The book was not returned to the library by the teacher”. On each item, the child receives a score that can range from zero to three. A score of three is awarded for a sentence that is reproduced without any errors.

Formulated sentences. This subtest evaluates a child’s ability to formulate complete, grammatically correct and meaningful spoken sentences. Each child is presented with a picture and asked to produce a sentence about the picture using a given word. For example, on one test item the child is instructed to use the word “longest” to produce a sentence about a picture depicting three dogs with different
characteristics. Item scores range from two to zero, with scores closer to zero reflecting more errors.

**Word classes (Part II).** In the second part of this subtest, the child is asked to explain how the pair of words they selected in part one 'go together'. For example, on one test item, after identifying drum and trumpet as a pair, the child is required to include the critical information that the objects are ‘musical instruments’ in their in explanation of how the words go together. A score of one is awarded for each correct response.

**Word structure.** This subtest is for administration with children aged 5- to 8-years only. The task measures a child’s ability to apply grammar, and select and use appropriate pronouns to refer to people, objects and possessive relationships. For each item in the subtest, the child is shown a picture and asked to finish the test administrator’s sentence. For example, on one test item the child is presented with a picture of a bird eating and a picture of a bird flying, and asked to complete the sentence “Here the bird eats. Here the bird____ - flies”. A score of one is awarded for each correct response.

**Dependent variables from the CELF-4.** Three composite variables from the CELF-4 were used in the analyses. These were the Receptive Language Index (RLI), Expressive Language Index (ELI) and Core Language Score (CLS). Each of these composites are standardised to a mean of 100 and standard deviation of 15. The RLI provides an estimate of receptive language ability. That is, how well a child can comprehend spoken language. The RLI is obtained by summing scores from the Concepts and Following Directions, Word Classes (Part I) and Sentence Structure subtests. The ELI provides a measure of expressive language ability. That is, how well a child can produce sentences that are grammatically correct and semantically appropriate. In 5- to 7-year-olds the ELI is obtained by summing scores from
Recalling Sentences, Formulated Sentences and Word Structure subtests. In 9- to 12-year-olds scores from the Recalling Sentences, Formulated Sentences and Word Classes (Part II) subtests are combined to create the ELI. Finally, the CLS provides an overall measure of children’s expressive and receptive language skills. This index best approximates the type of measure that has previously been used to study the relationship between suggestibility and language (e.g., Clarke-Stewart et al., 2004; Roebers & Schneider, 2005).

The CELF-4 has been shown to be both a reliable and valid measure of expressive and receptive language (Semel et al., 2003). Test-retest reliability coefficients for individual subtests have been demonstrated to range from 0.71 to 0.86 and from 0.88 to 0.92 for composite scores. Cronbach’s alpha for internal consistency reliability has similarly been reported to range from 0.69 to 0.91 for subtests, and from 0.87 to 0.95 for composite scores. Split-half reliability coefficients range from 0.71 to 0.92 for subtests, and from 0.87 to 0.95 for composite scores. The measure has been demonstrated to have convergent validity. Scores on the CLS have been shown to positively correlate with composite scores on other language instruments, including the CLS from the Clinical Evaluation of Language Fundamentals, Third Edition (CELF-3; Semel, Wiig, & Secord, 1995), \( r = .84; p = .01 \), and verbal comprehension measures such as the Verbal Comprehension Index from the Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV; Wechsler, 2003), \( r = .69; p = .01 \).

**Measure of Narrative Language.** The current study also examined children’s narrative language skills. This was achieved by administering the Test of Narrative Language (TNL; Gillam & Pearson, 2004). The TNL is a standardised test that assesses children’s ability to understand and use language to produce a narrative. That is, the TNL assesses narrative language abilities in the receptive and expressive
domains. The general format of the TNL involves presenting children with a series of stories. On items/tasks that assess receptive narrative language skills, children are auditorily presented with a story. They are then asked a series of questions about the story. On items/stories that assess expressive narrative language skills, children are shown a series of pictures that present an event. Children are asked to describe the event and are assessed on how well they can logically present each story element.

Receptive narrative language skills are assessed by the McDonald’s Story, The Shipwreck Story, and The Dragon Story tasks. Expressive language skills are assessed by the McDonald’s Retell, The Late for School Story, and Aliens Story tasks. A summary of each task is now presented.

**McDonald’s story.** The child is read aloud a story about two children who go to McDonald’s with their mother. See Appendix D for an excerpt from the story. The child is asked to respond to comprehension questions about the story, for example, on one item the child is asked, “What was the boy’s name?”. Children are awarded a score of one for each correct response.

**The shipwreck story.** The child is read aloud a story about a girl who completed an art project and accidentally dropped it on her way to school. See Appendix D for an excerpt from the story. At the same time that the story is being verbally presented, the child is shown a series of five pictures depicting significant events in the story. The child is then asked to respond to comprehension questions about the story, for example, “What was the problem in the story?”. Children are awarded a score of one for each correct response.

**The dragon story.** The child is read aloud a story about two children who come across a dragon guarding treasure. See Appendix D for an excerpt from the story. As the story is being told the child is shown a single picture depicting a dragon guarding treasure and two children hiding behind a rock. The child is then asked to
respond to comprehension questions about the story, for example, on one item the child is asked “Where were they walking before they saw the dragon?”. Children are awarded a score of one for each correct response.

**McDonald’s retell.** Following administration of the McDonald’s Story task the child is asked to retell the entire McDonald’s story. The story contains 26 target words and the child is awarded a score of one per target word recalled. Examples of target words include, ‘McDonald’s’, ‘cheeseburger’ and ‘purse’.

**Late for school story.** The child is shown a sequence of five pictures that depict a boy running late for school and missing the school bus. The child is instructed to create a story that corresponds to the sequence of pictures. Points are awarded for referencing information depicted in the picture sequence, indicating temporal and causal relationships between events, correct use of grammar, and producing semantically correct narratives.

**Aliens story.** The child is shown a single picture that depicts two children watching as aliens disembark from a spaceship. The child is instructed to create a story that corresponds to the picture. Children score points for including story setting and character information, story actions and events, correct vocabulary and grammar, and for producing semantically correct narratives.

Scores from the McDonald’s Story, The Shipwreck Story, and The Dragon Story tasks are combined to create the Narrative Comprehension (i.e., receptive narrative language) score. Scores from the McDonald’s Retell, Late for School Story, and the Aliens Story tasks are combined to create the Narrative Production (i.e., expressive narrative language) score. Narrative Comprehension and Narrative Production scores are standardised to have a mean of 10 and a standard deviation of 3. Narrative Comprehension and Narrative Production scores are combined to produce an overall measure of narrative language, the Narrative Language Ability
Index (NLAI), which is standardised to have a mean of 100 and a standard deviation of 15. Higher scores indicate better narrative language skills.

Test-retest, internal consistency and inter-scorer reliability coefficients for the TNL have been shown to range between 0.76 and 0.94 (Gillam & Pearson, 2004). Convergent validity of the measure is evidenced by significant positive correlations between scores on the TNL and scores on a measure assessing similar language ability, the Spoken Language Quotient of the Test of Language Development Primary, Third Edition (Hamill & Newcomer, 1997), $r = 0.78$ to 0.82, $p < .001$. The TNL has had limited use, and as such there are limited publications on the validity and reliability of this scale.

**Measure of Working Memory.** Finally, children’s working memory was assessed using the short form of the Automated Working Memory Assessment, First Edition (AWMA; Alloway, 2007). This test assesses short-term and working memory in the auditory and visuo-spatial domains. Subtests that assess short-term memory require the child to store verbal or visuo-spatial information for a short period of time. These include the Nonword Recall (verbal short-term memory) and Dot Matrix (visuo-spatial short-term memory) subtests. Subtests which assess working memory involve the short-term storage and manipulation or processing of information. These skills are assessed in the verbal and visuospatial domain by the Backward Digit Recall and Spatial Recall subtests respectively. A summary of each subtest is now presented.

**Nonword recall.** This subtest evaluates a child’s verbal short-term memory. The child listens to a sequence of nonsense words and is instructed to recall each sequence in the correct order. For example, on one test item the child was asked to repeat the nonsense words “nop, jitch, garm”.
**Dot matrix.** This subtest evaluates a child’s visuo-spatial short-term memory. For each test item, the child is shown the position of a red dot in either one or a series of consecutively presented four by four grids. Next, they are instructed to recall the position/s in the correct order by tapping the corresponding grid squares on the computer screen. See Appendix E for an example of a one-grid test item.

**Backwards digit recall.** This subtest evaluates a child’s verbal working memory. For each test item, the child is verbally presented a sequence of digits before being asked to recall the sequence in backwards order. For example, if the child were auditorily presented with the numbers 4-6-1, he or she would be required to repeat 1-6-4 to the test administrator.

**Spatial recall.** This subtest evaluates a child’s visuo-spatial working memory. This test consists of trials in which the child views sets of two shapes. The shape on the right of the screen has a red dot positioned in one of three locations. The child first states whether the shapes are the ‘same’ or ‘opposite’ in terms of their rotation. Next, the child is instructed to recall the location order of the red dots by tapping on the picture. See Appendix E for an example of a one trial test item.

Performance on the AWMA is described by four subtests that each measures a different aspect of working memory. These are Verbal Short-Term Memory, Visuo-Spatial Short-Term Memory, Verbal Working Memory, and Visuo-Spatial Working Memory. Scores from the subtests are combined to create the Working Memory Composite, which provides an overall measure of children’s working memory abilities. Subtest scores and the composite score are standardised to a mean of 100 and standard deviation of 15. Higher scores indicate better working memory ability.

The reliability of the AWMA is reported in Alloway, Gathercole, and Pickering (2006). For children aged 4- to 11- years, test–retest reliability has been
shown to be .64, .64, .83, and .82 for nonword recall, backward digit recall, dot matrix and spatial recall respectively. Evidence for convergent validity is provided by research finding a high degree of convergence in performance between the AWMA and WISC-IV (Wechsler, 2003) Working Memory Index (Alloway, Gathercole, Kirkwood, Elliott, 2008).

**Procedure**

Ethical approval was obtained from Deakin University Human Research Ethics Committee (Reference: 2010-039, see Appendix F) and the Catholic Education Office (Reference: GE10/0009 1658, see Appendix G). Once ethical approval was obtained, Primary Schools in Victoria were contacted via telephone and asked if they would be interested in receiving information about the study. Those schools expressing interest were mailed a letter summarising important project information (see Appendix H), as well as an organisational plain language statement and consent form (see Appendix I). Information contained in the organisational plain language statement included the study purpose, participation requirements, task descriptions, confidentiality limits and contact information of the research team. A follow-up letter (see Appendix J) was emailed to school principals containing the contact details of the research team should they require further information and/or consent to participate in the study. The consenting school requested that the school liaison be responsible for communicating details about the project and distributing participant plain language statements and consent forms (see Appendix A) to parents expressing interest. Information contained in the participant plain language statement was similar to that contained in the organisational plain language statement. Due to difficulty excluding students from school classes for the lengthy periods of time required for testing, it was decided that word-of-mouth would be used to obtain further participants. This involved the primary researcher distributing participant
plain language and consent forms to family and friends whom were willing to participate in the study.

The children were tested individually in a quiet room located at their school or home. Administration of the standardised tests took between two hours and twenty minutes and three hours dependent upon the child’s responses. Given this, the battery of tests was presented over three or four forty-five minute sessions. The presentation of the tasks was randomised to average potential differential carry over effects. To protect confidentiality, test scores were stored and entered separately to the consent forms with participants’ names and addresses.

It should be noted that the day-to-day practicalities of the study (travel requirements, maintaining records of research, arranging testing times, and additional trips to test due to children having conflicting appointments or absences) placed numerous demands on the researcher during the data collection phase of the study.

**Statistical Design**

The dependent variable of this study was children’s suggestibility. The independent variables were age, intelligence, working memory and language, including general expressive and receptive language as well as narrative language. Correlation and multiple linear regression analyses were used to examine the relationship between suggestibility and the independent measures.
Results

Preliminary Analyses

Missing data were examined using the SPSS Statistics frequencies command. See Appendix K for a copy of the SPSS frequency table. There were no cases of missing data. The data were screened to ensure assumptions necessary for parametric analyses were met. Details of the preliminary analyses are included in Appendix L.

Descriptive Statistics

Descriptive statistics for the variables analysed are provided in Table 3.1.

Table 3.1
Means and Standard Deviations for the Dependent and Independent Variables

<table>
<thead>
<tr>
<th>Measures</th>
<th>Range</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggestibility</td>
<td>1 – 15</td>
<td>9.18</td>
<td>3.03</td>
</tr>
<tr>
<td>Age</td>
<td>5.02 – 11.96</td>
<td>8.57</td>
<td>2.16</td>
</tr>
<tr>
<td>Intelligence</td>
<td>71 – 133</td>
<td>108.25</td>
<td>14.57</td>
</tr>
<tr>
<td>Language Variables</td>
<td></td>
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</tr>
<tr>
<td>General Language</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receptive Language</td>
<td>64 – 122</td>
<td>102.98</td>
<td>13.05</td>
</tr>
<tr>
<td>Expressive Language</td>
<td>68 – 132</td>
<td>102.05</td>
<td>12.00</td>
</tr>
<tr>
<td>Core Language Score</td>
<td>70 – 128</td>
<td>102.58</td>
<td>11.66</td>
</tr>
<tr>
<td>Narrative Language</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Narrative Comprehension</td>
<td>6 – 17</td>
<td>10.30</td>
<td>2.42</td>
</tr>
<tr>
<td>Narrative Production</td>
<td>4 – 13</td>
<td>8.25</td>
<td>2.36</td>
</tr>
<tr>
<td>Narrative Language Ability Index</td>
<td>70 – 127</td>
<td>95.73</td>
<td>12.26</td>
</tr>
<tr>
<td>Working Memory Variables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal Short-Term Memory</td>
<td>68 – 137</td>
<td>107.00</td>
<td>15.84</td>
</tr>
<tr>
<td>Visuo-Spatial Short-Term Memory</td>
<td>72 - 144</td>
<td>106.75</td>
<td>19.30</td>
</tr>
<tr>
<td>Verbal Working Memory</td>
<td>82 – 141</td>
<td>110.70</td>
<td>15.08</td>
</tr>
<tr>
<td>Visuo-Spatial Working Memory</td>
<td>57 – 138</td>
<td>104.52</td>
<td>20.23</td>
</tr>
</tbody>
</table>

Note. In Table 4.2, age normed adjusted scores for the cognitive variables have been presented to aid interpretation. In all subsequent analyses raw scores were used.

The sample mainly consisted of children around eight and a half years-old. However,
the study did include children who ranged in age from those that had just started primary school to older children who were near completing primary school. The number of leading interviewer questions children in the sample agreed with was higher than predicted by normative data. Across all age groups children in the sample agreed with approximately three more of the fifteen leading questions than children in the normative sample. Age differences observed in the normative sample were also observed in the study sample. Younger children agreed with more of the interviewer’s leading questions compared with older children. On average, children aged 5- to 6-years agreed with between two and three more questions than older children did. Children aged 7- to 8-years, 9- to 10-years, and 11- to 12-years were differentiated by a mean of 0.5 questions. On average, children performed within normal limits on all measures of intelligence, language and working memory.

**Associations between Measures of Age, Intelligence, Language, Working Memory and Suggestibility**

The first set of analyses examined associations between suggestibility and measures of age, intelligence, language and working memory. Associations between variables were computed using Pearson’s $r$. Significance tests for all values were computed using two-tailed tests. The results of these analyses are presented in Table 3.2.

Multiple variables were found to be associated with the measure of suggestibility. First, there was a significant negative medium correlation between suggestibility and chronological age. This indicates children who were older, were less likely to agree with leading questions asked by the interviewer. A negative association between suggestibility and intelligence was found. However, this association was not found to be significant.

There were mixed findings with respect to the associations observed between
Table 3.2
Pearson Correlations between Suggestibility and the Independent Variables

<table>
<thead>
<tr>
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<td>1. Suggestibility</td>
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<tr>
<td>2. Age</td>
<td>-.422**</td>
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<td>3. Intelligence</td>
<td>-.226</td>
<td>.022</td>
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<tr>
<td>4. Receptive Language</td>
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<td>.153</td>
<td>.710**</td>
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<tr>
<td>5. Expressive Language</td>
<td>-.217</td>
<td>-.032</td>
<td>.543**</td>
<td>.701**</td>
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<tr>
<td>6. Core Language Score</td>
<td>-.300</td>
<td>.012</td>
<td>.633**</td>
<td>.793**</td>
<td>.962**</td>
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<td>Narrative Language</td>
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<tr>
<td>7. Narrative Comprehension</td>
<td>-.483**</td>
<td>.090</td>
<td>.372**</td>
<td>.536**</td>
<td>.545**</td>
<td>.605**</td>
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<tr>
<td>8. Narrative Production</td>
<td>-.332**</td>
<td>-.090</td>
<td>.335**</td>
<td>.437**</td>
<td>.510**</td>
<td>.517**</td>
<td>.462**</td>
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<tr>
<td>9. Narrative Language Ability Index</td>
<td>-.478**</td>
<td>-.008</td>
<td>.412**</td>
<td>.570**</td>
<td>.622**</td>
<td>.657**</td>
<td>.858**</td>
<td>.851**</td>
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<tr>
<td>10. Overall Language Composite</td>
<td>-.428**</td>
<td>.002</td>
<td>.574**</td>
<td>.748**</td>
<td>.870**</td>
<td>.910**</td>
<td>.803**</td>
<td>.751**</td>
<td>.910**</td>
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<tr>
<td>Working Memory Variables</td>
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<tr>
<td>11. Verbal Short-Term Memory</td>
<td>.129</td>
<td>-.454**</td>
<td>.214</td>
<td>.046</td>
<td>.208</td>
<td>.228</td>
<td>-.139</td>
<td>.003</td>
<td>-.069</td>
<td>.087</td>
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<tr>
<td>12. Visuo-Spatial Short-Term Memory</td>
<td>-.189</td>
<td>-.030</td>
<td>.519**</td>
<td>.390**</td>
<td>.289</td>
<td>.415**</td>
<td>.294</td>
<td>.310</td>
<td>.350**</td>
<td>.420**</td>
<td>.229</td>
<td></td>
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</tr>
<tr>
<td>13. Verbal Working Memory</td>
<td>-.134</td>
<td>-.058</td>
<td>.249</td>
<td>.125</td>
<td>.279</td>
<td>.281</td>
<td>.090</td>
<td>.096</td>
<td>.117</td>
<td>.218</td>
<td>.238</td>
<td>.237</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Visuo-Spatial Working Memory</td>
<td>-.048</td>
<td>.073</td>
<td>.622**</td>
<td>.638**</td>
<td>.640**</td>
<td>.715**</td>
<td>.432**</td>
<td>.476**</td>
<td>.522**</td>
<td>.680**</td>
<td>.130</td>
<td>.453**</td>
<td>.275</td>
<td></td>
<td></td>
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<tr>
<td>15. Working Memory Composite</td>
<td>-.088</td>
<td>-.148</td>
<td>.625**</td>
<td>.491**</td>
<td>.565**</td>
<td>.650**</td>
<td>.287</td>
<td>.363</td>
<td>.382**</td>
<td>.567**</td>
<td>.557**</td>
<td>.709**</td>
<td>.628**</td>
<td>.762**</td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.05  **p < 0.01
the different measures of language functioning and suggestibility. There was a
significant negative medium correlation between receptive language and
suggestibility. This result indicates that children with better receptive language skills
were more likely to reject suggested misinformation than children with poor
receptive language skills. The measure of expressive language and the core language
score, the composite measure of general language, were not found to be significantly
associated with suggestibility. The measures of narrative language were all found to
be significantly correlated with suggestibility. Specifically, the measures of receptive
and expressive narrative language skills as well as overall narrative language ability
were significantly correlated with suggestibility. For all measures, a negative
association was observed. Thus, children with better narrative language skills were
less suggestible.

Neither of the working memory subtests was found to be significantly
correlated with suggestibility.

Intelligence was significantly associated with performance on all language
measures. The correlations were positive and ranged from medium to large in size.
There were mixed findings with respect to the associations observed between the
different measures of working memory, and intelligence and language. Visuo-spatial
measures of short-term and working memory were found have medium to large
positive correlations with intelligence and most of the language measures. Verbal
measures of short-term and working memory did not correlate with intelligence or
the majority of the language measures. The measures of general language ability
were all positively associated with the measures of narrative language ability. These
correlations ranged from medium to large in size. Age was not found to be
significantly associated with any of the measures of intelligence or language, and
was not significantly associated with the majority of the working memory measures.
Assessing Predictors of Suggestibility in Children

One question examined in Study 1 was whether age, intelligence, language and/or working memory were predictors of primary school aged children’s suggestibility. To investigate this, multiple linear regression analysis was used. Two separate multiple linear regression models were performed. The predictor variables in the first analysis were age, intelligence, language, and working memory. The second question examined in Study 1 was which aspects of language predicted children’s suggestibility. The outcome variable in both analyses was suggestibility. This analytic approach permits to investigate the unique effect of one measure whilst controlling for the effect of another. The rationale for using multiple regression arose from the significant correlations observed between the predictor variables used in these analyses. For example, Table 3.2 showed significant associations between intelligence and language. The results of the multiple linear regression analyses are displayed in Tables 3.3 and 3.4.

Investigating age, intelligence, language and working memory as predictors of suggestibility. The first multiple regression model examined the influence of age, intelligence, language and working memory on children’s suggestibility. In this analysis, overall composite variables of children’s language and working memory skills were entered as predictors in the model. The language composite variable was created by summing z-scores computed for the overall measure of general language, the core language score, and the overall measure of narrative language, the narrative language ability index. The working memory composite was created by summing z-scores computed for the subtests of the AWMA. The results of the regression are presented in Table 3.3. The model was found to be a significant predictor of individual differences in children’s suggestibility ($F (4, 35) = 5.205, p = .01, R^2 = .373, R^2_{Adjusted} = .301$). Overall, the
model accounted for 30 percent of variability in the data. Evaluation of individual predictors in the model revealed that only age and language accounted for a significant amount of variance in suggestibility after controlling for the influence of other variables in the model.

Table 3.3

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>B</th>
<th>SE(B)</th>
<th>β</th>
<th>t</th>
<th>Sig. (p)</th>
<th>sr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-.557</td>
<td>.192</td>
<td>-.398</td>
<td>-2.900</td>
<td>.006</td>
<td>-.388</td>
</tr>
<tr>
<td>Intelligence</td>
<td>-.006</td>
<td>.038</td>
<td>-.027</td>
<td>-.149</td>
<td>.883</td>
<td>-.020</td>
</tr>
<tr>
<td>Language</td>
<td>-.827</td>
<td>.288</td>
<td>-.497</td>
<td>-2.871</td>
<td>.007</td>
<td>-.384</td>
</tr>
<tr>
<td>Working Memory</td>
<td>.155</td>
<td>.190</td>
<td>.152</td>
<td>.816</td>
<td>.420</td>
<td>.109</td>
</tr>
</tbody>
</table>

\[ R^2 = .373 \]
\[ R^2_{\text{Adjusted}} = .301 \]

Investigating receptive language, expressive language, narrative comprehension and narrative production as predictors of suggestibility. The second regression model investigated which of the different aspects of language predicted individual differences in children’s suggestibility. The model examined the influence of measures of general language, specifically receptive and expressive language skills, and measures of narrative language, including narrative comprehension and narrative production. The results of the regression are displayed in Table 3.4. The model was found to be a significant predictor of individual differences in children’s suggestibility \((F(4, 35) = 3.815, p=.011, R^2 = .304, R^2_{\text{Adjusted}} = .224)\). Overall, the model accounted for 22 percent of variability in the data. Evaluation of individual predictors in the model revealed that only one of the measures of narrative language, narrative comprehension (i.e., receptive narrative
language), accounted for a significant amount of variance in suggestibility after controlling for the influence of other variables in the model.

Table 3.4
Investigating Receptive Language, Expressive Language, Narrative Comprehension, and Narrative Production as Predictors of Suggestibility

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>B</th>
<th>SE(B)</th>
<th>β</th>
<th>t</th>
<th>Sig. (p)</th>
<th>sr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptive Language (CELF-4)</td>
<td>-.071</td>
<td>.048</td>
<td>-.305</td>
<td>-1.488</td>
<td>.146</td>
<td>-.210</td>
</tr>
<tr>
<td>Expressive Language (CELF-4)</td>
<td>.077</td>
<td>.054</td>
<td>.305</td>
<td>1.429</td>
<td>.162</td>
<td>.202</td>
</tr>
<tr>
<td>Narrative Comprehension (TNL) (Receptive Narrative Language)</td>
<td>-.512</td>
<td>.224</td>
<td>-.409</td>
<td>-2.285</td>
<td>.028</td>
<td>-.322</td>
</tr>
<tr>
<td>Narrative Production (TNL) (Expressive Narrative Language)</td>
<td>-.212</td>
<td>.218</td>
<td>-.165</td>
<td>-.972</td>
<td>.338</td>
<td>-.137</td>
</tr>
</tbody>
</table>

\[ R^2 = .304 \]
\[ R^2_{Adjusted} = .224 \]
Discussion

Study 1 examined whether age, intelligence, language and working memory correlated with suggestibility in children. Two general results emerged from this study. The first was that age and language skills were found to significantly predict suggestibility. Importantly, these results were found after controlling for intelligence and working memory. The second was that not all aspects of language appear to be related to suggestibility. The results of this study indicate that the ability to understand narratives is an important predictor of suggestibility.

Age as a Predictor of Suggestibility

As noted, age was found to be a significant predictor of 5- to 12-year old children’s suggestibility. The results indicate that suggestibility in children decreases with age. This result is consistent with a number of past studies that have also showed suggestibility decreases with age during childhood (e.g., Bettenay et al., 2015; Caso et al., 2013; Chae et al., 2014; Warren et al., 1991). The results of the current study extend on past working by demonstrating an association between suggestibility and age even after controlling for intellectual functioning, language and working memory. This was an important methodological strength of the research since each of these variables have already been implicated in children’s suggestibility (Clarke-Stewart et al., 2004; Henry & Gudjonsson, 1999; Roebers & Schneider, 2005) and also correlate with age (Astington & Jenkins, 1999; Sternberg & Berg, 1985). Thus, in past research, the correlation observed between age and suggestibility might have been due to the influence of another variable.

An outstanding question to be addressed is why age might be correlated with suggestibility even when controlling for a wide range of other variables. It is still possible there might be one or more cognitive constructs that correlate with age that accounts for the association observed in this study. However, another possibility is
that the significant association observed between age and suggestibility reflects the role of general life experiences. For example, as children become older they experience an increasing range of positive and negative interactions with their classmates and adults in academic and social settings (Rubin, Bukowski, & Bowker, 2015). Children who have experienced a wider repertoire of experiences may be better equipped to resist the influence of leading questions. This issue will need to be addressed in future work by considering how age might be thought of as an indicator variable of ‘life experiences’.

The Role of Language Skills in Children’s Suggestibility

The results of the current study revealed that children’s receptive narrative language skills predicted suggestibility. Importantly, this finding was observed after controlling for the influence of expressive language, receptive language and expressive narrative language skills. Thus, other aspects of language cannot account for the association between receptive narrative language skills and suggestibility.

Interpreting the associations observed between language and suggestibility in the current study relative to past findings is problematic. As noted in Chapter One, only a small number of studies have been conducted examining whether children’s language skills are related to individual differences in suggestibility (Clarke-Stewart et al., 2004; Roebers & Schneider, 2005). Clarke-Stewart et al. (2004) and Roebers & Schneider (2005) both found that a composite measure of language correlated with suggestibility in children. In both studies, the composite measure combined expressive and receptive language skills. In Chapter 1 concerns were raised over this approach since expressive and receptive language skills are not the same construct. The correlation analysis provides support for this concern. Table 3.2 showed that the measure of receptive language skills was significantly correlated with suggestibility. However, the correlation between suggestibility and expressive language skills was
COGNITIVE SKILLS

not significant. This pattern of results highlights the limitations with combining different language measures that assess different constructs.

It was also considered in Chapter 1 that not all aspects of language might be related to suggestibility. The results from this study provide support for this claim. Bivariate correlations initially revealed that receptive language and all measures of narrative language were correlated with suggestibility. However, the regression analyses only found that receptive narrative language was a significant predictor of suggestibility. This result is partially consistent with Kulkofsky and Klemfuss (2008; Study 2) who found expressive narrative language skills and suggestibility to be associated after controlling for age and receptive and expressive language. Collectively, the results of the current study and those of Kulkofsky and Klemfuss (2008; Study 2) indicate that narrative language skills and not general language skills correlate with suggestibility.

The results of the current study implicate receptive narrative language skills in accounting for individual differences in children’s suggestibility. This suggests that children who can verbally encode an event are less suggestible. This finding differs from Kulkofsky and Klemfuss (2008; Study 2) who found an association between suggestibility and expressive narrative language skills. In accounting for this difference in findings, it should be noted that Kulkofsky and Klemfuss only assessed expressive narrative language skills. In the current study, both expressive and receptive narrative language skills were assessed. Since expressive and receptive narrative language skills are correlated (see Table 3.2), it could be that Kulkofsky and Klemfuss’ findings indirectly reflect the influence of receptive narrative language skills.

Why might narrative language skills correlate with suggestibility? Based on the results of the current study, it is suggested that children who can verbally encode
an event into a structured sequence into long-term memory are less likely to be
influenced by leading questions. This might be because they have a more strongly
represented memory trace that is less open to interference. This position contrasts
with Kulkofsky and Klemfuss (2008). They proposed that narrative language skills
reflect the strength an event is encoded and stored. Thus, better narrative language
skills are indicative of a better stored event. The results of this study were not
entirely consistent with this position. If this were the case, it might be expected that
all narrative language measures would make an equal unique contribution to
predicting suggestibility. In either case, additional research is now warranted to
investigate the role of narrative language skills in children’s suggestibility.

The Role of Intelligence and Working Memory in Children’s Suggestibility

The results of the study did not find that suggestibility was correlated with
intelligence and working memory. These results have been observed in past studies
(Bruck & Melnyk, 2004; Hritz et al., 2015). However, to the author’s knowledge,
only one other study has examined whether a relationship exists between working
memory and suggestibility (Roebers & Schneider, 2005). Collectively it seems that
intelligence and working memory are poor at accounting for individual differences in
suggestibility. Following Roebers and Schneider (2005), it might not be the case that
these variables play no role in children’s suggestibility. Inspection of Table 3.2
revealed that intelligence and working memory correlated with the majority of the
language variables. Given this, it could be that intelligence and working memory
indirectly influence suggestibility through their influence on other skills and abilities
such as language.

Conclusion

This study indicated that age and receptive narrative language skills reliably
predict suggestibility in children. One of the surprising findings of this study was that
Despite administering an assessment battery that examined age and intelligence, as well as language and working memory in depth, only two variables were identified that were significant predictors. The finding that receptive narrative language is an important predictor of suggestibility is a novel finding and requires replication. However, since this aspect of language functioning can be assessed reliably with a standardised test such as the TNL (Gillam & Pearson, 2004), the extent a child might be suggestible can be, albeit in part, known before an interview. If a child performs poorly on a test of receptive narrative language, investigative interviewers can be alerted to avoid the introduction of leading questions during questioning. In either case, the results of this study provide evidence about the importance of using a broad cognitive assessment in forensic psychology. In the next study, this same approach is used to understand outcomes in young-adult offenders.
Chapter Four: Study 2 - Cognitive Skills in Young Adult Offenders

Introduction

Study 2 investigated the intellectual, language and working memory capabilities of young adult offenders. In Chapter 2, research was reviewed that had examined cognitive functioning in adolescent and young-adult offenders. The review provided support for expecting young adult offenders to be disproportionately affected by impairments in intelligence and language. There was also preliminary evidence suggesting that working memory might also be lower in this group. Problems in one or more of these areas have been proposed to contribute to criminal behaviour via influence on academic performance (e.g., Greenwood et al., 1996; Welsh et al., 2008) and/or psychosocial outcomes (Snow & Powell, 2011). This study had two aims. The first was to examine the status of intellectual, language and working memory capabilities in young adult offenders. The purpose of this part of the study was to examine whether intelligence, language and working memory were equally affected in this group or some aspects were more disrupted than others. The second aim of the study was to examine the relationship between each cognitive skill and prior academic achievement and repeat offending.

It was first hypothesised that young adult offenders would have impairments or problems in the areas of intelligence, language and working memory above what is predicted by normative data. Second, despite a lack of research evidence, based on theory, it was predicted that performance on the measures of intelligence, language and working memory would be associated with early school leaving. Whereby, offenders who left school prior to the completion of their secondary education would experience greater cognitive difficulties compared to offenders who completed their education. Third, it was hypothesised that poor intelligence, language and working memory skills would also be associated with repeat offending. Lastly, in addition to
variables considered in the review, it was hypothesised that aside from cognitive abilities, the age at which offenders in the sample first offended and first used substances would also be associated with early school leaving and recidivism.
Method

Participants

The participants were 35 male offenders aged 18- to 21-years. The mean age of the sample was 20; 5 (years; months) with a standard deviation of 0; 9. The sample was recruited from a Youth Justice Centre in a regional town in Australia. The Centre is responsible for supervising young adult offenders serving custodial orders with the Department of Humans Services Youth Justice Service. Participation in the study was voluntary. In order to participate offenders were required to sign a consent form. See Appendix M for a copy of the consent form. Offenders were excluded from the study if they did not understand English, were aged older than 21-years, if they were due for release prior to the commencement of the testing period, or if they were on operational regimes which restricted their movements. Offenders aged younger than 18-years were also excluded since they did not have the authority to consent to participating.

Materials

The participants were presented with a test battery that assessed intellectual functioning, language and working memory. A detailed description of each test is now presented.

Measure of Intelligence. The Matrices subtest from the Kaufman Brief Intelligence Test, Second Edition (KBIT-2; Kaufman & Kaufman, 2004) was used to measure problem solving. On this subtest, the participant is presented with non-verbalisable patterns and pictures that have a missing segment. The participant is asked to identify the missing segment from a number of possible alternatives. See Appendix N for an example of a KBIT-2 Matrices test item. Performance on this subtest is expressed as a standardised score that has a mean of 100 and a standard deviation of 15.
The KBIT-2 Matrices has sound psychometric properties. Split-half reliabilities and test-retest reliabilities have been shown to range between 0.78 and 0.90 (Kaufman & Kaufman, 2004). The measure has also been shown to have construct validity. Comparing non-verbal components of the KBIT-2 and the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999), Kaufman and Kaufman (2004) obtained adjusted correlation coefficients ranging from 0.62 to 0.80. A comparison of the non-verbal components of KBIT-2 and the Wechsler Adult Intelligence Scale, Third Edition (WAIS-III; Wechsler, 1997) produced an adjusted correlation of 0.83 (Kaufman & Kaufman, 2004).

**Measure of Language.** The CELF-4 Australian (Semel et al., 2003) was used to measure participants’ receptive (i.e., ability to understand spoken language) and expressive (i.e., ability to produce spoken language) language. This test was also used in Study 1. For the purposes of this study, an overall language composite referred to as the Core Language Score (CLS) that measured the participants’ overall language skills was used. The CLS is standardised to a mean of 100 and standard deviation of 15. Higher scores indicate increasing levels of language proficiency. Due to the limited time available to test each participant, it was not possible to present subtests to enable the independent calculation of expressive and receptive language scores. The subtests, which were administered and used to calculate the CLS, included; Recalling Sentences, Formulated Sentences, Word Classes, and Word Definitions. The Recalling Sentences and Formulated Sentences subtests were administered as per the method previously described in Chapter 3, in the Study 1 Method section. Summaries of the Word Classes and Word Definitions subtests are now presented.

**Word classes.** This subtest evaluates the test-taker’s ability to understand relationships between words that are related by semantic class. The test-taker is first
asked to select which two of a number of words presented orally go together to make a pair. An example item is “smooth, wise, rough, heavy”, with “smooth and rough” being the correct pairing. In the second part of this subtest, the test-taker is asked to explain how the pair of words they selected 'go together'. A score of one is awarded for each correct pair identified, and an additional point is awarded for each correct explanation.

**Word definitions.** This subtest evaluates the test-taker’s ability to interpret word meaning without context, and define words by referring to class relationships and shared meanings. Test-takers are orally presented with a word, immediately followed by a sentence that includes the word. An example of one test item is, “Cactus. Grandpa said, ‘Don’t touch the cactus’ ”. The test-taker is required to offer a definition of the word using descriptive language. Item scores range from 2 to 0, with scores closer to 0 reflecting poorer performance.

**Measure of Working Memory.** The Automated Working Memory Assessment, Second Edition (AWMA-2; Alloway, 2013) was used to assess participants working memory. A short-form of the test was administered. This comprises four subtests; Digit Recall, Listening Recall, Dot Matrix and Spatial Recall.

**Digit recall.** The Digit Recall subtest measures how well a participant can temporarily store verbal information, and thus is a measure of short-term verbal memory. On this subtest, the participant is presented with increasingly longer strings of digits. The participant’s task is to repeat back the digits in the same order.

**Listening recall.** The Listening Recall subtest measures verbal working memory. That is, the ability to both temporarily store and manipulate/process verbal information. On this task the participant is presented with an increasing number of sentences (e.g., “Bananas live in water”, “Flowers Smell Nice”). After listening to
each sentence the test-taker is required to indicate if the sentence is factually ‘true’ or ‘false’. Following the presentation of each series of sentences, the test-taker is then prompted to recall the final word of each sentence in the correct order. For example, on the same item a correct response would be “Water, Nice”. The task increases in difficulty as participants are presented with an increasing number of sentences.

The Dot Matrix and Spatial Recall subtests were administered as per the method previously described in Chapter 3, Study 1. The Dot Matrix subtest measures how well a participant can temporarily store a visuo-spatial pattern. This subtest measures short-term visuo-spatial memory. The Spatial Recall subtest measures how well a participant can temporarily store and manipulate visuo-spatial information. This subtest measures visuo-spatial working memory.

Each subtest is standardised to a mean of 100 and standard deviation of 15. Higher scores correspond to increased working memory capacity. A working memory composite variable was created by summing z-scores computed for the individual subtests.

Procedure

Ethics approval to conduct the study was granted by the Deakin University Human Research Ethics Committee (Reference: 2013-142, see Appendix O). Ethics approval was also obtained from the Department of Human Services Centre for Human Services Research and Evaluation (Reference: ADD/13/27914, see Appendix P). Following ethics approval, young adult offenders were recruited from the Youth Justice Centre. The first stage of recruitment involved the researcher attending units at the justice centre. Young offenders were verbally presented a brief overview of the project as a group. As a part of this presentation, young offenders were offered the opportunity to meet with the researcher individually at a later time, to receive further information about the project. A total of 66 young offenders, representing 100
percent of the justice centre’s population, voluntarily met with the researcher to hear further details about the study. During individual meetings important information about the study and a copy of the plain language statement, consent and revocation forms were provided (See Appendix M for a copy of the Plain Language Statement, Consent and Revocation forms). Information conveyed included the study purpose, details of the research team, ethics, participation requirements and confidentiality. Participants interested in participating in the study were invited to sign a consent form. Sixty young offenders initially provided consent to participate, however two offenders later revoked consent. Twelve offenders were excluded from participating for reasons previously described. Due to lengthy testing times and restrictions on the period of data collection, 35 of the total 46 consenting eligible participants were tested. Table 4.1 presents a summary of consent and participation rates.

**Table 4.1**

*Consent and Participation Rates*

<table>
<thead>
<tr>
<th></th>
<th>% YJC Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receiving Project Information</td>
<td>100.0</td>
</tr>
<tr>
<td>Consenting</td>
<td>87.9</td>
</tr>
<tr>
<td>Eligible</td>
<td>69.7</td>
</tr>
<tr>
<td>Tested</td>
<td>53.0</td>
</tr>
</tbody>
</table>

Participants were tested individually in one of a number of quiet rooms located at the justice centre. Administration of the standardised tests took between one hour 15 minutes and three hours dependent upon the participants’ responses. Given this, the battery of tests was presented over one, two or three sessions that were each approximately one hour in duration. The presentation of the tasks was randomised to average potential differential carry over effects.

Demographic information about participating offenders’ criminal history,
years of education and previous substance use was obtained via a review of each offender’s intake assessment. Offenders provided written consent for the researcher to access this information (see Attachment M). The intake documents were accessed under the supervision of the justice centre’s staff. The information obtained from the intake documents for use in the analyses included age at first offence, age when substance/s were first used, whether high school was completed and whether the participant was a repeat offender.

It should be noted that the day-to-day practicalities of the study (travel requirements, arranging times for testing and data collection, and additional trips to test due to participants being unwell, having conflicting appointments, or as a result of prison operations) placed numerous demands on the researcher during the data collection phase of the study.

**Statistical Design**

The dependent variables of this study were young offenders’ education level, as measured by the highest year level of secondary school they reported having completed, and repeat offending. The independent variables were intelligence, language, working memory, age at first offence and age when substance/s were first used. Correlation and independent samples t-tests were used to examine the relationships between the dependent and the independent variables.
COGNITIVE SKILLS

Results

Preliminary Analyses

Missing data were examined using the SPSS Statistics frequencies command. See Appendix Q for a copy of the SPSS frequency table. There were no cases of missing data. Details of additional preliminary analyses are included in Appendix R.

Descriptive Statistics

Descriptive statistics for the cognitive and background variables are provided in Table 4.2. The sample mainly consisted of young adult offenders aged 20-years.

Table 4.2
Means and Standard Deviations for the Cognitive and Demographic Variables

<table>
<thead>
<tr>
<th>Measures</th>
<th>Range</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>18.88 - 21.99</td>
<td>20.43</td>
<td>0.75</td>
</tr>
<tr>
<td>Intelligence</td>
<td>52 - 125</td>
<td>88.66</td>
<td>15.50</td>
</tr>
<tr>
<td>Language</td>
<td>40 - 111</td>
<td>72.17</td>
<td>18.01</td>
</tr>
</tbody>
</table>

Working Memory Variables

<table>
<thead>
<tr>
<th>Measures</th>
<th>Range</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Short-Term Memory</td>
<td>67 - 131</td>
<td>85.37</td>
<td>12.83</td>
</tr>
<tr>
<td>Visuo-Spatial Short-Term Memory</td>
<td>63 - 130</td>
<td>93.46</td>
<td>16.24</td>
</tr>
<tr>
<td>Verbal Working Memory Recall</td>
<td>70 - 136</td>
<td>88.26</td>
<td>16.79</td>
</tr>
<tr>
<td>Verbal Working Memory Processing</td>
<td>73 - 129</td>
<td>89.69</td>
<td>15.64</td>
</tr>
<tr>
<td>Visuo-Spatial Working Memory</td>
<td>72 - 136</td>
<td>93.66</td>
<td>17.43</td>
</tr>
<tr>
<td>Visuo-Spatial Working Memory Processing</td>
<td>72 - 129</td>
<td>93.74</td>
<td>16.06</td>
</tr>
<tr>
<td>Average Working Memory Performance</td>
<td>70 – 132</td>
<td>90.70</td>
<td>15.83</td>
</tr>
</tbody>
</table>

Demographic Variables

<table>
<thead>
<tr>
<th>Measures</th>
<th>Range</th>
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<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in Years at First Offence</td>
<td>10-20</td>
<td>16.09</td>
<td>2.52</td>
</tr>
<tr>
<td>Age in Years when Substance/s First Used</td>
<td>6-18</td>
<td>13.97</td>
<td>2.58</td>
</tr>
<tr>
<td>High-School Year Level Completed</td>
<td>7-12</td>
<td>9.77</td>
<td>1.52</td>
</tr>
<tr>
<td>Repeat Offender(^a)</td>
<td>%</td>
<td>77.14</td>
<td></td>
</tr>
</tbody>
</table>

Note. In Table 4.2, age normed adjusted scores for the cognitive variables have been presented to aid interpretation. In all subsequent analyses raw scores were used.

\(^a\) The percentage of the sample found guilty of prior offences.

On the measures of intelligence, language and working memory a score of
85 or less indicates functioning that is one standard deviation below the normative mean. This indicates functioning in the bottom 16 percent. A score two or more standard deviations below the mean (i.e., a score of 70 or below) indicates functioning that is in the bottom two percent.

Twenty-nine offenders or 82.85 percent of the sample experienced impairment in one or more areas of cognitive ability, as defined by a score that is one or more standard deviations below the mean on one of the tests presented in Table 4.2. In relation to the measure of intelligence, the average score of the sample indicates functioning that is almost one standard deviation below the mean. Specifically, for this sample of young-adult offenders intellectual functioning is in the bottom 21 percent of the normative sample. Five participants (14.29 percent of the sample) obtained a score of 70 or lower, indicating functioning in the bottom two percent of the normative sample. Thus, on the K-BIT the sample’s performance indicates intellectual functioning that is generally lower than expected for their age.

The mean performance of the sample on the measure of language was almost two standard deviations below the normative mean. The average functioning of this group of young-adult offenders is in the bottom three percent of the normative sample. Thirteen offenders (representing 37.14 percent of the sample) appear to have very severe language impairment in language, obtaining a standard score of 70 or lower. This would indicate language functioning that is in the bottom two percent of the normative sample. A paired-samples t-test was conducted to compare the difference in the mean performance of the sample on the measures of language and intelligence. There was a significant (not a significant) difference in the mean performance on the intelligence ($M= 88.66, SD=15.50$) and language ($M= 72.17, SD=18.01$) measures; $t(34) = 5.37, p < .001; d = 0.98$. The effect size for this analysis ($d = 0.98$) was found to exceed Cohen’s (1988) convention for a large effect.
COGNITIVE SKILLS

These results indicate that language skills are especially compromised in this sample, considerably more compared to intellectual functioning.

Working memory appears to be the least affected in this sample. However, the mean scores across all subtests are below the normative mean. Verbal short-term memory for this group is especially affected. On this subtest, the mean score of the sample was one standard deviation below the mean. Thus, for this sample of young-adult offenders verbal short-term memory is in the bottom 16 percent of the normative sample. For all other measures of working memory, the average score of the sample was around 0.6 standard deviations below the normative mean. Thus, on these measures the sample is in the bottom 23 percent for their age.

The background data for the sample is now summarised. Offenders in the sample were typically around sixteen years of age when they first offended. However, there is considerable variability between participants. For some individuals in the sample offending behaviour commenced in childhood, whereas for others first offences were not recorded until adulthood. The participants reported commencing substance use at around 14-years. In some cases, the first episode of substance use was noted to be at 6-years of age, but for others at 18-years of age. With respect to education, all offenders in the sample commenced secondary education. However, as is common in young offenders (e.g., Anderson, 2014; Christle et al., 2005; Smale & Gounko, 2012) many did not complete secondary education. On average, participants in the sample left school after Year 9. Over three quarters of the sample had been charged with offences prior to the offences relating to their current sentence.

**Associations between Cognitive and Demographic Variables**

The first set of analyses examined associations between cognitive ability and measures of age, education, offending behaviour and substance use. These analyses were undertaken to examine two issues. The first was whether poor intellectual,
language and working memory functioning co-occurred in individuals in the sample. If this were the case, a correlation between measures would be expected. Alternatively, if ‘dissociations’ between performance on the tests were common the expectation is that performance on the cognitive tests would not be correlated. The second issue examined in the correlation analyses was the extent the cognitive measures were related to demographic background factors. Specifically, age at first offence, age substance use first occurred, whether high school was completed, and whether the individual was a repeat offender. The results of these analyses are presented in Table 4.3.

Associations between variables were computed using Pearson’s $r$, except for associations examining education level, which were computed using Spearman’s rho. Significance tests for all values were computed using two-tailed tests with alpha set at 0.05. In the first instance, age was not found to be significantly correlated with any of the other variables. Thus, significant associations observed between other variables does not reflect individual differences in age. The first trend to emerge from Table 4.3 is that measures of intelligence, language and working memory were all significantly correlated with each other. Furthermore, the magnitude of the association ranged from $r = .420$ to $0.966$. In all cases, the association was positive. This result indicates that poor performance on one test (or subtest) occurred alongside poor performance on every other test. Thus, a low score on the test of intelligence would likely indicate low scores on language and working memory.

Interestingly, there were few significant associations between the cognitive variables and demographic variables. The exception was for repeat offending. Repeat offending was found to be negatively associated with intelligence, visuospatial working memory, and overall working memory. That is, individuals with poorer intelligence and working memory were more likely to re-offend. Repeat offending
Table 4.3
Pearson’s Correlations between Age, Cognitive Ability, Offending, Education\(^a\) and Substance Use Variables

<table>
<thead>
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<th>Variable</th>
<th>1</th>
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<th>14</th>
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<tbody>
<tr>
<td>1. Age</td>
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<td>2. Intelligence</td>
<td>-.096</td>
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<td>3. Language</td>
<td>.140</td>
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<tr>
<td>4. Verbal Short-Term Memory</td>
<td></td>
<td>-.108</td>
<td>.541**</td>
<td>.684**</td>
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<td>5. Visuo-Spatial Short-Term Memory</td>
<td></td>
<td>.086</td>
<td>.653**</td>
<td>.605**</td>
<td>.556**</td>
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<td>-.218</td>
<td>.612**</td>
<td>.702**</td>
<td>.759**</td>
<td>.663**</td>
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<td>7. Verbal Working Memory Processing</td>
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<td>.527**</td>
<td>.684**</td>
<td>.694**</td>
<td>.689**</td>
<td>.966**</td>
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<td>8. Visuo-Spatial Working Memory</td>
<td></td>
<td>.235</td>
<td>.702**</td>
<td>.449**</td>
<td>.455**</td>
<td>.733**</td>
<td>.522**</td>
<td>.483**</td>
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<td>10. Working Memory Composite</td>
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<td>.022</td>
<td>.732**</td>
<td>.708**</td>
<td>.788**</td>
<td>.867**</td>
<td>.871**</td>
<td>.850**</td>
<td>.824**</td>
<td>.776**</td>
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<tr>
<td>11. Age in Years at First Offence</td>
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<td>.212</td>
<td>-.015</td>
<td>-.028</td>
<td>.203</td>
<td>.064</td>
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<td>.097</td>
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<tr>
<td>12. Age in Years when Substance/s First Used</td>
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<td>-.129</td>
<td>.108</td>
<td>-.026</td>
<td>.090</td>
<td>.086</td>
<td>.070</td>
<td>.083</td>
<td>.049</td>
<td>-.014</td>
<td>.073</td>
<td>.478**</td>
<td></td>
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<tr>
<td>13. High-School Year Level Completed(^a)</td>
<td></td>
<td>-.107</td>
<td>.277</td>
<td>.082</td>
<td>.103</td>
<td>.229</td>
<td>.321</td>
<td>.320</td>
<td>.091</td>
<td>.099</td>
<td>.185</td>
<td>.500**</td>
<td>.298</td>
<td></td>
</tr>
<tr>
<td>14. Repeat Offending</td>
<td></td>
<td>.025</td>
<td>-.391*</td>
<td>-.171</td>
<td>-.221</td>
<td>-.274</td>
<td>-.325</td>
<td>-.302</td>
<td>-.340*</td>
<td>-.224</td>
<td>-.338*</td>
<td>-.528**</td>
<td>-.434**</td>
<td>-.568**</td>
</tr>
</tbody>
</table>

\(^a\) Spearman’s rho correlation coefficients computed for High School Year Level Completed.
\(^*\) p < 0.05 \(^**\) p < 0.01
was also found to be significantly negatively correlated with age at first offence, age substance use commenced and an early departure from high school. That is, those offenders who completed less of their high-school education, commenced offending earlier, and/or used substances earlier, were more likely to have been found guilty of offences on multiple occasions.

The age at which those in the sample first offended and first used substances was significantly positively associated. Offenders in the sample who commenced using substances at a younger age were more likely to offend at an earlier age. Finally, offenders who offended at an earlier age were less likely to attain higher levels of high-school education, as evidenced by a significant positive association.

Comparing Early School Leavers and School-Completers on Measures of Cognitive Ability, Offending and Substance Use.

The next question examined further was whether poor cognitive ability contributes to early school leaving, a factor associated with engagement in crime (e.g., Maynard et al., 2015). Independent sample t-tests were conducted to compare cognitive ability in offenders who were early-school leavers and offenders who were school completers. Differences between the groups on offending and substance use variables were also examined. Early school leavers were defined as those who left school prior to completing the final year of high school. School-completers were defined as those who had completed the final year of high school. The results of the independent sample t-tests are displayed in Table 4.4.

In all cases, offenders who were early school leavers had lower intelligence, and poorer language and working memory skills. The difference was significant with respect to intelligence and working memory. There were no differences between early school leavers and school completers with respect to age at first offence and onset age of substance use.
Table 4.4
Means and Standard Deviations for Variables in Early-School Leavers and School-Completers

<table>
<thead>
<tr>
<th></th>
<th>Early School Leavers</th>
<th>School Completers</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Intelligence</td>
<td>86.51</td>
<td>13.81</td>
<td>105.25</td>
</tr>
<tr>
<td>Language</td>
<td>70.06</td>
<td>16.54</td>
<td>88.50</td>
</tr>
<tr>
<td>Working Memory</td>
<td>88.76</td>
<td>11.20</td>
<td>105.63</td>
</tr>
<tr>
<td>Age at First Offence</td>
<td>15.81</td>
<td>2.51</td>
<td>18.25</td>
</tr>
<tr>
<td>Age Substance/s First Used</td>
<td>14.10</td>
<td>2.27</td>
<td>13.00</td>
</tr>
</tbody>
</table>

*p < 0.05  **p < 0.01

Comparing One-Time and Repeat Offenders on Measures of Cognitive Ability, Education, Offending and Substance Use.

A further question examined in Study 2 was whether offenders who repeatedly offend are disproportionately affected by impairments in cognitive ability. To investigate this question further, independent sample $t$-tests were conducted comparing one-time offenders with repeat offenders with respect to the measures of cognitive functioning as well as on the background variables. The results of the independent sample $t$-tests are presented in Table 4.5.

Table 4.5
Means and Standard Deviations for Variables in One-Time and Repeat Offenders

<table>
<thead>
<tr>
<th></th>
<th>One-Time Offenders</th>
<th>Repeat Offenders</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$N = 8$</td>
<td>$N = 27$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Intelligence</td>
<td>99.63</td>
<td>16.11</td>
<td>85.41</td>
</tr>
<tr>
<td>Language</td>
<td>77.75</td>
<td>21.43</td>
<td>70.52</td>
</tr>
<tr>
<td>Working Memory</td>
<td>98.83</td>
<td>18.48</td>
<td>88.28</td>
</tr>
<tr>
<td>Year Level Completed</td>
<td>11.25</td>
<td>0.71</td>
<td>9.33</td>
</tr>
<tr>
<td>Age at First Offence</td>
<td>18.50</td>
<td>0.93</td>
<td>15.37</td>
</tr>
<tr>
<td>Age Substance/s First Used</td>
<td>16.00</td>
<td>1.31</td>
<td>13.37</td>
</tr>
</tbody>
</table>

*p < 0.05  **p < 0.01
Overall, repeat offenders generally scored lower on the cognitive measures. On the measures of intelligence and working memory, this difference was found to be statistically significant. There were differences between the two groups with respect to background variables. Compared to one-time offenders, repeat offenders left high school earlier, first offended earlier and engaged in substance use at a younger age. The difference between groups on all of the background variables was significant.
Discussion

Study 2 examined the status of intellectual, language and working memory functioning in a sample of young adult offenders. As a group, average scores on each of the cognitive tasks were lower than the normative mean. The lowest score was observed on the measure of language. There was some evidence that these variables might also be related to the participant’s offending history. Poorer intellectual functioning and working memory was associated with repeat offending. Whilst these results clearly show that young adult offenders are disproportionately affected by cognitive deficits, the relationship between cognitive skills and the participants’ other background variables was less clear.

Intelligence, Language and Working Memory Functioning in Young Adult Offenders

The performance of the sample on the cognitive measures is generally consistent with past findings. Intellectual functioning in young-adult offenders is typically found to be lower than the normative mean and also compared to control group populations (e.g., Chitsabesan et al., 2007; Fougere et al. 2013; Herrington, 2009). Poor language skills have also been found to be present in this group as well (e.g., Blanton & Dagenais, 2007; Bryan, 2004; Bryan, et al., 2007; Rucklidge et al., 2013; Snow & Powell, 2008; 2011). However, one finding emerging from this literature is that language skills are substantially more affected in young adult offenders compared to intellectual functioning. In this study the average language score for the sample was around two standard deviations below the mean compared to one standard deviation below the mean for intellectual functioning. Thus, this sample of young-adult offenders possesses very poor language skills. This finding is highly consistent with previous research by Snow and Powell (2011) whom likewise found the average language score ($M = 71.4, SD = 19.5$) for a group of young poorly
educated offenders to be approximately two standard deviations below the mean compared to one standard deviation below the mean for intellectual functioning \( (M = 86, SD = 16.4) \). However, a notable limitation with interpreting the above result with respect to the difference between language and intelligence is that it may not be unique to the offender sample. It is recommended that future research investigate evidence of a similar difference between language and intelligence in samples of non-offenders with very poor levels of education.

This study is one of the few to have examined working memory in young adult offenders. One of the reasons for examining working memory in this group is that poor working memory skills have been linked to academic difficulties (Alloway & Alloway, 2010), a factor previously shown to correlate with offending (e.g., Katsiyannis et al., 2008). At first glance, the data presented in Table 4.2 showed that working memory functioning in the sample was on average, around 1 to 0.6 standard deviations below the normative mean. This was better compared to performance on the intelligence and language tests. However, it should be noted that on standardised tests of working memory, an individual with a score one standard deviation below the mean or lower is likely to have academic difficulties (Gathercole & Alloway, 2006). The composite working memory standard score for the group at least approaches one standard deviation below the mean. At a practical level, this would mean the level of working memory functioning in the group places most at risk for academic problems.

**Relationship between Cognitive and Demographic Variables**

Few significant correlations were found between performance on the cognitive tests and the demographic background variables. Intelligence and working memory were only found to be correlated with repeat offending. Language was not found to be correlated with the demographic background variables. When offenders
who completed their final year of high school were grouped and compared to offenders who had not completed their high school education, there were significant differences in intelligence and working memory observed. However, performance on the cognitive tests was not found to be correlated with the specific level of high school education offenders completed. This result is somewhat surprising given the close association observed between the cognitive variables and academic achievement (e.g., Carver, 1990; Conti-Ramsden et al., 2009; Gathercole & Pickering, 2000). However, this result is not entirely unprecedented. Non-significant findings between cognitive measures and demographic variables have been reported in other studies (e.g., Bryan, 2004; Snow & Powell, 2011). To the author’s knowledge, this is the first study to examine the association between cognitive skills and early school leaving in a sample of young adult offenders. The accuracy of the demographic data might explain these results. The demographic data concerning academic attainment and drug use was self-report. To determine whether this is an issue, future studies should aim to obtain background information for young-adult offenders from official records.

Another possibility is that language, intelligence and/or working memory might contribute to offending behaviour via means other than affecting educational attainment. As noted earlier, Snow and Powell (2011) suggest that poor language skills might negatively impact on interpersonal relationships, psychosocial skills and also how well an individual performs in various stages of the criminal justice system. In the context of an investigative interview, an individual with language problems might come across as being uncooperative when in fact s/he has difficulties either understanding or explaining events to an interviewer. This is consistent with the language profiles of the participants in this sample. The average language score for the group was around two standard deviations below the normative mean, indicating
very severe language problems. Poor language skills might therefore be a risk factor for criminal conviction, but not via its influence on academic skills.

Evidence in this study was found to suggest repeat offending was associated with lower intelligence and working memory. The association between repeat offending and intellectual functioning has been examined in a past study. Fougere et al. (2015) also found a significant negative association between intelligence and repeat offending in 16- to 30-year olds. In explaining this result, it was suggested that higher intellectual functioning might be a factor contributing to increased resilience, a protective factor against recidivism (Efta-Breitbach & Freeman, 2004). Also, meta-analysis has shown that higher intellectual functioning is strongly associated with vocational and career success (Kalechstein, Newton, & Van Gorp, 2003). In this instance, higher levels of intellectual function may afford first time offenders opportunities to secure employment, which in turn reduces the likelihood of reoffending.

Interpreting the significant relationship between working memory and repeat offending is problematic at this time. This is because to the author’s knowledge no research has been published to date, which investigates the association of working memory and repeat offending. In the first instance the study’s finding of lower working memory in offenders is consistent with past research (e.g., Cauffman et al., 2005; Hoaken et al., 2007; Syngelaki et al., 2009). One explanation for the observed relationship between working memory and repeat offending might lie in the specific cognitive processes required to complete the task. Working memory requires executive processes (Miyake, Friedman, Rettinger, Shah, & Hegarty, 2001). This includes inhibiting a response or maintaining attention to task. Problems with executive function have a strong link with risk taking behaviour, especially in young offenders (Syngelaki et al., 2009). Presumably, poorer executive functioning may
mean individuals are less likely to inhibit a response that is associated with poor outcomes, such as repeating engaging in behaviour that leads to a criminal conviction. In the absence of other research in the area, this proposal is forwarded tentatively.

**Conclusion**

Study 2 has shown that young adult offenders are disproportionately affected by language impairments, and all too often global cognitive impairments that occur across multiple areas of cognitive function. It seems likely that these impairments affect an individual’s prospects of rehabilitation, with repeat offenders presenting with impairments more frequently than one-time offenders. Lastly, whether or not cognitive impairment may be associated with early disengagement from education, a proven risk factor for engagement in crime remains unclear.
Part III: General Discussion

Chapter Five

Chapter Overview

In this thesis, the role of intelligence, language and working memory in understanding children’s suggestibility and young adult offending behaviour was examined. In this chapter, the clinical implications from the empirical chapters are considered. Specifically, the discussion focuses on the relative importance of intelligence, language and working memory with respect to understanding suggestibility in children and young adult offending.

Intelligence in Forensic Practice

In Study 1, intelligence was not shown to be a predictor of individual differences in children’s suggestibility. To date, research investigating the relationship between suggestibility and intelligence has been mixed. There have been reports in the literature of an association between suggestibility and intelligence (e.g., McFarlane et al., 2002; Roma et al., 2011). However, from their review of the literature, Bruck and Melnyk (2004) found that non-significant associations between intelligence and suggestibility appeared to be the norm rather than the exception. The findings from Study 1 are consistent with this position.

In an applied forensic context, intelligence does not seem to be useful in explaining or understanding individual differences in children’s suggestibility. Previously it has been suggested that intelligence might be linked to suggestibility. According to one view people with low intelligence are likely to become confused and uncertain when asked leading questions (Gudjonsson, 1988). According to another view intelligence is an indicator variable of meta-memory skills (Chae & Ceci, 2005). This thesis questions these proposals. Instead, it is suggested that the association between intelligence and suggestibility might be better explained with
respect to another variable that correlates with intelligence. In this thesis, this variable appears to be language skills. Thus, to better understand the extent a child might be suggestible, it might be more prudent to focus on language skills rather than intelligence.

The extent intellectual functioning can be useful to understand criminal behaviour and recidivism in young adult offenders is challenged in this thesis. Results from Study 2 replicated findings of past research (e.g., Chitsabesan et al. 2007; Fougere et al. 2013; Herrington, 2009). That is, intellectual functioning was shown to be below the normative mean on a standardised test of intelligence. This finding is concerning, especially given previous research showing offenders with intellectual impairments are at greater risk of reoffending (e.g., Fougere et al., 2015; Victorian Ombudsman, 2015). However, Study 2 demonstrated language skills to be substantially more compromised in this group. Since language skills are strongly tied to psychosocial outcomes (e.g., Clegg et al., 2005), in order to understand criminal behaviour and recidivism pathways, it could be better to assess language skills.

Language in Forensic Practice

In this thesis, a broad range of skills were assessed with respect to children’s suggestibility and young adult offending behaviour. Language skills were found to be a correlate of both domains. First, in line with previous studies (e.g., Clarke-Stewart et al., 2004; Roebers & Schneider, 2005) Study 1 found that a composite measure of language significantly predicted children’s suggestibility. Thus, children with poor language skills were found more suggestible than children with better language skills. Unlike past studies, this finding was observed after controlling for the influence of age, intelligence and working memory.

This thesis builds on past work by adopting a multi-dimensional approach to assessing language skills in the context of understanding individual differences in
suggestibility. This approach has not been undertaken previously (e.g., Danielsdottir et al., 1993; Imhoff & Baker-Ward, 1999; Roebers & Schneider, 2005). The results from Study 1 highlight the importance of this approach. Regression analyses revealed that only receptive narrative language skills accounted for a significant amount of variance in suggestibility, after controlling for the influence of general expressive and receptive language, as well as expressive narrative language. This finding suggests that not all types of language skills are important in explaining individual differences in children’s suggestibility. At an applied level when assessing language it might be important to focus on a wide range of skills. A more efficient approach would be to assess those language skills thought to be important in explaining individual differences in an outcome variable. Based on the results presented in Study 1, it seems that narrative language skills might be important in determining which children are more suggestible. Alternatively, it might be feasible to improve children’s narrative skills with the goal being to reduce suggestibility. This is a possibility. Previous research has shown that narrative language interventions can improve children’s receptive narrative language skills (e.g., Evans, 2013; Spencer, Kajian, Petersen, & Bilyk, 2014). Given this, future research could explore whether administering interventions designed to improve receptive narrative language, prior to participation in investigative interviews, reduces children’s suggestibility.

In Study 2, almost three quarters of young adult offenders in the sample were found to experience some degree of language impairment. In this sample, the prevalence of severe language impairment was 16 times greater than the prevalence estimated to occur in the general population (Semel et al., 2003). These findings are in line with the results of at least two previous studies (e.g., Bryan, 2004; Snow & Powell, 2011) that likewise detected a far higher level of language impairment in
samples of young offenders than what occurs in the general population. While language appeared to be impaired in young offenders, it is not clear how a deficit in this area affects this group. For example, consistent with Bryan (2004) Study 2 did not find evidence of an association between language skills, criminal behaviour and educational attainment. Alternate pathways that language might increase the risk of criminal convictions include through negative impact on interpersonal relationships, psychosocial skills, and how well an individual performs in various stages of the criminal justice system (Snow & Powell, 2011).

**Working Memory in Forensic Practice**

The role of working memory in forensic practice has received relatively less research. Results from research presented in this thesis suggest that working memory is not a useful construct in explaining individual differences in children’s suggestibility. This suggestion is consistent with the two studies previously undertaken (e.g., Lee, 2004; Roebers & Schneider, 2005). Given the measures of working memory were found to correlate with language, it could be that like intelligence, working memory might indirectly influence suggestibility through its influence on language. However, based on the results of this thesis and past research, assessing working memory with the purposes of understanding which children are likely to be more suggestible than others, is not supported by the evidence at this time.

The research presented in this thesis provides further evidence that working memory is affected in young adult offenders. This is consistent with previous research that has shown offenders to perform worse on measures of working memory than non-offending controls (e.g., Cauffman et al., 2005; Syngelaki et al., 2009). However, the results from Study 2 indicate that working memory is the area of cognitive functioning that is least affected when compared with intelligence and
language skills.

The extent working memory relates to young adults offending behaviour has yet to be investigated in detail. To the author’s knowledge Study 2 was the first study to investigate the association between working memory and repeat offending. Interestingly, young adult offenders with poor working memory skills were found to be at greater risk of reoffending. Given this result, it is possible that a working memory impairment modest in severity is sufficient to increase the risk of reoffending behaviour. A proposed pathway for the possible influence of working memory on repeat offending is via executive processes upon which working memory is reliant. Problems with executive function have be linked with risk taking behaviour in young offenders (Syngelaki et al., 2009).

**Considering Cognitive Skills in Forensic Practice**

Forensic research (e.g., Hayes et al., 2007; Henry & Gudjonsson, 2007; Herrington, 2009) has often prioritised examining intelligence over other cognitive skills. However, data presented in this thesis questions this approach with respect to understanding suggestibility in children and offending behaviour in young adults. A methodological strength of the research presented in this thesis is that a wide range of cognitive skills were systematically investigated. Not only were intelligence, language and working memory considered, but also various skills that make up these functions. Collectively the results of this thesis suggest that rather than intelligence, it seems that language skills might be important to consider in forensic practice. Language has previously been identified a key consideration in a number of other areas of forensic practice, including, restorative justice (Hayes & Snow, 2013) and offending severity (Snow & Powell, 2011). Along with these past findings and those of the current thesis, it seems prudent to assess children’s and young adult offenders’ language skills in forensic settings.
Clinical Implications for Children in Investigative Interviews

Current Australian law necessitates that children who are capable of forming a view have the right to express that view and have that view taken into account (Australian Law Reform Commission, 1997). Children may be involved in investigative interviews relating to family law proceedings, administrative tribunals, civil law matters and federal criminal proceedings (Australian Law Reform Commission, 1997). In cases where the child's report is the only or the most significant evidence of alleged abuse or mistreatment (e.g., in child sexual abuse cases), accurate consideration and assessment of children’s capacities, including susceptibility to suggestibility, is especially crucial. In order to reduce children’s suggestibility in investigative interviews, it seems critical that in addition to age, interviewers consider children’s receptive language skills. That is, children’s capacity to encode their experiences and then understand and respond to questions about these experiences. If the child’s language level is known, for example from a language assessment, investigators can use questions that are commensurate with a child’s linguistic capabilities. The findings concerning language and suggestibility to emerge from this thesis, support existing best-practice guidelines for investigative interviewers that recommend that questions be simply phrased and target concepts that are appropriate for the developmental level of the child (e.g., Graffam-Walker 1999; Powell & Snow 2007).

Clinical Implications for Young Adult Offenders

Whilst past findings (e.g., Bryan, 2004; Snow & Powell, 2011) and the results of thesis show young adult offenders to be disproportionately affected by language impairments, research has yet to confirm or disconfirm language impairment to be a determinant of offending behaviour. Thus, it is difficult to discuss clinical implications regarding an association between language and offending at this time.
The fact that language impairment is more common than not in this population group is concerning in the context of a recent investigation by the Victorian Ombudsman (2015). This investigation revealed that adult offenders in Victorian prisons are not systematically assessed for cognitive impairment, and those who are identified as being impaired are not receiving the appropriate support whilst in prison. Failure to identify cognitive impairment, and the specific nature of that impairment, may result in offenders receiving rehabilitative interventions that are not responsive to their needs. For example, a person with a language impairment might have difficulties engaging in common practice rehabilitative interventions, such as cognitive behaviour therapy, which places considerable demands on language processing and production skills (Snow and Powell, 2012). Thus, in order to ensure the utility and effectiveness of rehabilitative interventions it is critical that the justice system moves towards systematic assessment of cognitive impairment, and that this assessment considers multidimensional aspects of cognitive functioning.

**Implications for the Teaching of Forensic Psychology at Doctoral Level**

The results from this thesis have implications for the types of psychological assessments that students of forensic psychology need to be taught. In Australia, current standards only require students to be proficient in administering intelligence and memory tests (Kendall et al., 1997; Psychology Board of Australia, 2011). The results from the studies presented in thesis suggest that a broader approach to cognitive assessment might be required. Specifically, at the doctoral level, students of forensic psychology should become more familiar with the assessment of language skills.

**Limitations and Avenues for Future Research**

The central argument forwarded in this thesis is that language skills should be given greater consideration in forensic settings. The importance of working memory
is not yet clear. One limitation when considering these proposals is that the data from which they are based on is cross sectional in nature. As a consequence, it is not clear whether language functioning is a determinant of suggestibility or offending in young adults. Given this, the next step in this research program would be to use longitudinal and intervention research. In relation to longitudinal designs, it would be interesting whether language impairment in the early years of childhood predicts offending in adulthood. Alternatively, a number of studies have shown that language skills can be improved (Law, Garrett, & Nye, 2003). If language skills are causally related to individual differences in suggestibility or adult offending, it would be expected improving language skills might be associated with a reduction in these areas. This hypothesis will need to be tested in subsequent research. Identifying alternate theoretical rationale which might further link the two studies, for example, investigating the impact of neurological deficits in frontal lobe functioning on cognitive skills and subsequent effects to suggestibility and offending would be another interesting area for future research.

Given intelligence, language, and working memory skills were shown to be typically intercorrelated in Study 1 and 2 (see tables 3.2 and 4.3) an additional step in this research program would be to use factor analysis to explore the existence and implications of an underlying general factor of cognitive ability. If a global element of cognitive ability were found to better explain the two areas of forensic practice examined in this thesis, than the specific cognitive skills identified in this research, this would challenge the multidimensional approach of the current research to cognitive ability. When interpreting the results from both studies it could be that the findings actually represent the association between IQ and suggestibility. There is evidence to suggest that both language ability and working memory capacity are dimensions of intelligence. Both language and working memory have been shown to
be substantially inter-correlated with intelligence (Carroll, 1993). Within the Cattell-Horn-Carroll model of intelligence, language tests are classified as measures of crystallised intelligence and working memory capacity measures are classified as measures of fluid intelligence (see Schneider & McGrew, 2012, for a review). However, arguably the language and working memory measures employed in this thesis assess more comprehensive aspects of language and working memory than that offered by traditional measures of intelligence (e.g., narrative language). There is also considerable evidence which challenges such a unidimensional approach to cognitive ability. The first piece of evidence comes from the study of children with Specific Language Impairment (SLI). Children with SLI have below average expressive and receptive language skills, but show normal development in all other areas including IQ (Bishop, 2006). If language was a dimension of intelligence such a disorder should not exist. Second, there is evidence that working memory is not simply a proxy for IQ but rather represents a dissociable cognitive skill with unique links to academic attainment. Alloway and Alloway (2010) found that working memory at the start of formal education is a better predictor of subsequent academic success than IQ. If working memory was a dimension of intelligence it would not be a better predictor. Thus, collectively the evidence from research examining children with specific language impairment and research examining working memory as a predictor of academic success, suggests language and working memory are two aspects of cognitive functioning that can independently influence the outcome measures studied in this thesis.

Structural equation modelling could also be employed in future research to develop causal understanding of the cognitive findings. The reverse trends than what have been suggested in this thesis could be operating. For example, with respect to Study 2, it may be that criminal behavior and associated incarceration can cause a
young person to leave school earlier which in turn has a negative impact on cognitive performance.

A final limitation of the current research is that whilst the internal consistency reliabilities of the cognitive measures associated with previous studies were reported in the method section, due to the use of computer based assessments for which scoring was fully automated, all of the individual item level responses were not recorded and the internal consistency reliabilities of the test scores associated with the thesis’ samples were not calculated. Thus, it could be argued that the relative magnitudes of beta weights associated with the multiple regressions presented in study one could not be evaluated meaningfully, and that the only reason language was observed to be the numerically largest contributor to suggestibility in the regression equation (see Table 3.3) is because the language ability scores were associated with the highest levels of internal consistency reliability. However, if a test is relatively reliable its correlation with another variable will tend to be higher than a test which is unreliable (Machin, Campbell, Tan, & Tan, 2009). Given significant correlations between the languages measures were found, this suggests that the reliability of the test scores is relatively good and ultimately the internal consistency reliabilities of the test scores associated with the thesis’ samples are unlikely to have had a significant impact on the results regarding language. If anything it is more likely that the true population correlation may be underestimated as measurement error tends to attenuate effect sizes (Thompson & Snyder, 1998).

Conclusion

This thesis examined the role of intelligence, language and working memory in two areas of forensic practice. Study 1 revealed receptive narrative language skills to be a strong predictor of children’s suggestibility. The second study revealed young adult offenders to be disproportionately affected by specific and global cognitive
impairments, with language found to be the most compromised area of cognitive functioning. Low intelligence and poor working memory function were identified as risk factors for recidivism. Given a number of the findings presented in this research are novel, replication is critical to determine their reliability. However, together the results raise important issues about the need for forensic psychologists to be able to assess language and possibly working memory in children and young adults. The inclusion of these assessments may lead to delivering better outcomes for children and adults who come into contact with the criminal justice system.
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doi: 10.1016/S0191-8869(02)00138-1


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Appendix A

Study 1: Copy of the Plain Language Statement, Consent Form and Request for Feedback for Parents

PLAIN LANGUAGE STATEMENT AND CONSENT FORM

To: Parents or Guardians

Plain Language Statement

Date: 09/09/2011
Project Title: Language Development in Children
Principal Researchers: Prof. Martine Powell, Dr Jarrad Lum and Dr Pamela Snow
Associate Researchers: Ms Louise Steel

What we are researching in this study?
In this study we are researching children’s language skills from different backgrounds. In order to complete this research we need to examine the language skills of typically developing children from a range of typical backgrounds. This is why your child has received an invitation to participate in the study. Once we understand language in typically developing children we will be comparing this to children whom have had unfortunate experiences.

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, ethics permission was obtained from the Deakin University Ethics Committee and also from the Catholic Education Office to carry out the research. I also have met with and received permission from School Principal 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 will participate, irrespective of how they are going at school. This is because in order for this research to be carried out effectively we need to see children of all different levels and abilities.

What will my child be asked to do?
Children participating in the research will be presented with a number of different interesting tasks 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 game. This will involve taking your child out of class at a time that is most convenient for teachers. Children will be presented with the tests in an open room that is visibly accessible to staff at all times. These activities will be presented over two-three 45 minute sessions on consecutive weeks by Ms Louise Steel, who is a research assistant.
and works within the Psychology Department at Deakin University. This project is being undertaken by Prof. Martine Powell from Deakin University as part of a project funded by the Australian Research Council. All of these tasks have been developed and used with children all over the world and are safe to use. Children will receive a young scientist certificate and sticker for participating.

A brief description of the tasks & activities:

- **Language Tests:** Children will be presented with two language tests. One test measures children’s general experience with language. On this test children are asked to repeat back sentences, point to a picture which matches a sentence and make sentences about pictures. A second test measures children knowledge of the sounds of language. On this test children are asked to manipulate the sounds of difference language (e.g., what word is made when “hot” and “dog” are put together).
- **Problem Solving Tasks:** This task involves presenting children with a pattern that has a piece missing from it. Children are asked to select the missing piece.

**Important Note:** The language tests used in this study may sometimes be used by speech pathologists or psychologists to assist in working out whether a child is experiencing difficulties with language. Please note that because we are researchers and not clinicians we are not able to provide a formal clinical interpretation of test scores. However, we are able to provide you with some general feedback as to whether your child should have an additional assessment and also whom to contact. If you would like this feedback please fill out the attached form titled "Request for Feedback". If you would like more information on this matter feel free to contact me (my contact details are listed on the letterhead). Please note you should contact a qualified clinician if you have any concerns about the language or reading skills of your child.

If you have any questions relating to this issue feel free to contact me. My details are listed on the letterhead.

**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 can withdraw your child from the study. This can be before your child starts the study, during it or afterwards.

**Will the 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 on your child’s recording sheets or computer databases. 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 handout 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 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.

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.

Complaints

If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact:

The Manager, Office of Research Integrity, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: 9251 7129; Facsimile: 9244 6591; research-ethics@deakin.edu.au

Please quote project number [2010-039].

Yours Sincerely,

Ms Louise Steel
TO: Parents/Guardians

Consent Form

Date: 09/09/11
Project Title: Language Development in Children
Reference Number: 2010-039

I have read, or have had read to me, and I understand the attached Plain Language Statement.

I freely agree to give my consent for my son/daughter to participate in this project according to the conditions in the Plain Language Statement.

I have been given a copy of the Plain Language Statement to keep.

The researcher has agreed not to reveal my identity and personal details, including where information about this project is published, or presented in any public form.

Parent/Guardian’s Name (printed) .................................................................

Child’s Name (printed) ..............................................................................

Signature of Parent/Guardian ................................................................. Date ...............
Request for Feedback

As I mentioned in the letter if you would like feedback on your child’s performance on the standardised language tests, then please complete and sign this form so that I can contact you when testing is completed.

I, __________________________ hereby request feedback from my child’s performance on the standardised tests.

Your Child’s Name: ________________________.

Child’s Date of Birth: ____________ (day/month/year).

The address you would like the feedback to be sent to:

Unit/House Number: ______________________
Street Name: ____________________________
Suburb/City/Town: _______________________
Post Code: ______________________________
Contact Phone Number: ___________________

Signature: ___________________________ Date: ________________
Appendix B

GSS-2 Story Excerpt

Anna and John/ were a happily married couple/in their thirties./ They had three
children,/two boys/ and a girl./ They lived in a small bungalow/which had a
swimming pool/in the garden.
Appendix C

Raven’s Coloured Progressive Matrices: Example Test Item
Appendix D

Test of Narrative Language: Narrative Comprehension Task Excerpts

**McDonald’s Story**

On Tuesday, when Lisa and Raymond got home from school, their mother said, “Tonight we’re going out to eat. Where do you want to go?” Lisa and Raymond both yelled, “McDonald’s!”

**The Shipwreck Story**

I’m going to call this story “The Shipwreck.” Last week, Samantha’s class was studying the ocean. Each child was supposed to turn in an art project that had something to do with the ocean.

**The Dragon Story**

I’m going to call this story “The Dragon.” One Saturday morning, Daniel and Michelle found a new trail they had never seen before. They decided to follow it to see where it led. As they came around a bend, they heard a strange hissing sound.
Appendix E
Automated Working Memory Assessment: Dot Matrix and Spatial Recall Example Items

Dot Matrix Grid Example

Spatial Recall Item Example
Appendix F

Study 1: Deakin University Ethics Approval

DEAKIN UNIVERSITY

Human Ethics Research
Office of Research Integrity
Research Services Division
70 Elgar Road Burwood Victoria
Postal: 221 Burwood Highway
Burwood Victoria 3125 Australia
Telephone 03 9251 7123 Facsimile 03 9244 6581
research-ethics@deakin.edu.au

Memorandum

To: Prof Martine Powell
   School of Psychology

B

cc: Deakin University Human Research Ethics Committee (DUHREC)

Date: 07 September, 2010

Subject: 2010-039

Understanding the relationship between child maltreatment and language competence: An empirical interviewing perspective

Please quote this project number in all future communications

The application for this project was considered at the DU-HREC meeting held on 03/05/2010. Approval has been given for Prof Martine Powell, School of Psychology, to undertake this project from 7/09/2010 to 7/09/2014.

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 Human Research Ethics Unit 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 HRECs.

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.

DUHREC 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).

Human Research Ethics Unit
research-ethics@deakin.edu.au
Telephone: 03 9251 7123
Appendix G

Catholic Education Office Ethics Approval

In reply please quote:

GE10/0009
1558

9 November 2010

Dr R. Cauchi
School of Psychology
Deakin University
Burwood campus
221 Burwood Highway
BURWOOD VIC 3125

Dear Dr Cauchi

I am writing with regard to your research application received on 8 November 2010 concerning your forthcoming project titled Understanding the relationship between child maltreatment and language competence: An evidential interviewing perspective. You have asked approval to approach Catholic schools in the Archdiocese of Melbourne, as you wish to involve Year Prep-Year 6 students and their parents.

I am pleased to advise that your research proposal is approved in principle subject to the nine standard conditions outlined below.

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.

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@ceomaelb.catholic.edu.au>.

Yours sincerely

Signature Redacted by Library

Nancy Bicchieri 11/11/2010
DEPUTY DIRECTOR
Date: __________

Dear School Principal,

My name is Louise Steel and along with Professor Martine Powell and Dr Jarrad Lum (both from Deakin University) and Dr Pamela Snow (Monash University), we are researching the language skills of children from different backgrounds.

In order to complete this research we need to examine the language skills of typically developing children from a range of typical backgrounds. This is why we would like to invite your students to participate in the study. Once we understand language in typically developing children we will be comparing this to children whom have had unfortunate experiences.

The study involves presenting children with standardised language and working memory tests. The tests would be presented to children in two 45 minute sessions (or over three 30 to 35 minute sessions if preferred). The tasks would be presented to children on school grounds, in an open room which is clearly visible and accessible to staff (e.g., library, staffroom). To ensure minimal disruption to the children’s learning, the tasks would only be presented at a time which is convenient for teachers and yourself. The tasks are presented in the context of a game and children are given constant positive feedback. Written consent is required before a child can participate. Parents/Guardians also will also be asked to complete a general demographic questionnaire.

The language tests provide a measure of children’s comprehension and production skills. On the various tests children are asked to point to pictures that match a sentence presented to them, repeat back sentences, and make up sentences about pictures. Children will also be presented with working memory tasks. These tasks involve presenting children with patterns and asking the child to repeat back sequences.

Prior to approaching your school, ethics permission was obtained from the Deakin University Ethics Committee (EC00213) and also from the Catholic Education Commission of Victoria to carry out the research.

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. In this correspondence I have also enclosed copies of the information letters, questionnaire and consent forms that we are using in this project. I will contact you shortly to discuss the application with you further. Alternatively, feel free to contact me by phone or e-mail on the details listed below.

Yours sincerely,

Louise Steel
Researcher in Psychology,
Deakin University
221 Burwood Highway Burwood, VIC 3125 Australia
Phone: 0418570912
Fax: +61 3 9244 6858
Appendix I

Plain Language Statement and Consent Form for Principals

DEAKIN UNIVERSITY

Faculty of Health, Medicine, Nursing and Behavioural Sciences
Ms. Louise Steel
School of Psychology
Burwood Campus
Burwood Victoria 3125 Australia
Telephone 0419 570 912
Facsimile 03 9244 6858
lsh@deakin.edu.au

PLAIN LANGUAGE STATEMENT AND CONSENT FORM

To: Principals

Plain Language Statement

Date: 08/12/11
Project Title: Language Development in Children
Principal Researchers: Prof. Martine Powell, Dr Jarrad Lum and Dr Pamela Snow
Associate Researchers: Ms Louise Steel

What we are researching in this study?
In this study we are researching children’s language skills from different backgrounds. In order to complete this research we need to examine the language skills of typically developing children from a range of typical backgrounds. This is why we would like to invite your students to participate in the study. Once we understand language in typically developing children we will be comparing this to children whom have had unfortunate experiences.

Why have we come to your school?
Your school has been selected on the grounds that it is located in Melbourne. Prior to coming to your school, ethics permission was obtained from the Deakin University Ethics Committee and also from the Catholic Education Commission of Victoria to carry out the research.

Why will your students be invited to participate in the study?
When we visit a school we hope that a large number of children in each year level will participate, irrespective of how they are going at school. This is because in order for this research to be carried out effectively we need to see children of all different levels and abilities. Because of this, we would like to ask teachers to distribute this letter out to all children age between 5 and 12 years.

What will your students be asked to do?
Children participating in the research will be presented with a number of different interesting tasks and activities which are presented at your school during school hours. As with all our work, the tasks and activities are presented in the context of a game. This will involve taking your students out of class at a time that is most convenient for teachers. Children will be presented with the tests in an open room that is visibly accessible to staff at all times. These activities will be presented over two 45-50 minute sessions on consecutive weeks by Ms Louise Steel, who is a research assistant, and is employed by the Psychology Department at Deakin University. This project is being undertaken by Prof. Martine Powell from Deakin...
University as part of a project funded by the Australian Research Council. All of these tasks have been developed and used with children all over the world and are safe to use. Children will receive a young scientist certificate and sticker for participating.

A brief description of the tasks & activities:

- **Language Tests:** Children will be presented with two language tests. One test measures children's general experience with language. On this test children are asked to repeat back sentences, point to a picture which matches a sentence and make sentences about pictures. A second test measures children knowledge of the sounds of language. On this test children are asked to manipulate the sounds of difference language (e.g., what word is made when “not” and “dog” are put together).

- **Working Memory Tasks:** These tasks involve presenting children with patterns and asking them to repeat back sequences.

**Important Note:** The language tests used in this study may sometimes be used by speech pathologists or psychologists to assist in working out whether a child is experiencing difficulties with language. Please note that because we are researchers and not clinicians we are not able to provide a formal clinical interpretation of test scores. However, we are able to provide parents/guardians with some general feedback as to whether their child should have an additional assessment and also whom to contact. This information will only be given to parents/guardians. If they would like this feedback they are invited to fill out the form titled “Request for Feedback”. If parents/guardians would like more information on this matter they are also invited to contact the researcher (my contact details are listed on the letterhead). If you have any questions relating to this issue feel free to contact me. My details are listed on the letterhead.

**Do students have to take part?**

Students do not have to take part in this study. Also if parents/guardians/students decide to take part and then later change their mind, the student can withdraw from (leave) the study. This can be before the student starts the study, during it or afterwards.

**Will the data be confidential?**

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

**Will parents/guardians have access to the results of the study?**

When the study has been completed we will produce a handout for teachers and parents outlining the findings of the study. These results can be given to you/parents/guardians by mail, e-mail or through a letter that will be given to participating students to take home.

**If parents/guardians would like their child to participate:**

If parents/guardians would like their child to participate in this research they are invited to please complete an attached consent form and place it in the envelope and have the student child return it to school. Alternatively, parents/guardians can place the reply paid envelope in the mail and it will be sent to my office at Deakin University.
Where can parents/guardians obtain more information?

If parents/guardians have any questions, comments or require further clarification about this research project they are invited to contact me on the details listed on the first page of this letter.

Complaints

If parents/guardians have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then they are invited to contact:

The Manager, Office of Research Integrity, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: 9251 7129, Facsimile: 9244 6581; research-ethics@deakin.edu.au

Please quote project number [2010-039].

Yours Sincerely,

Ms Louise Steel
TO: Principal’s Name and School’s Name to be entered

Organisational Consent Form

(To be used by Principals providing consent for staff/students to be involved in research)

Date:

Full Project Title: Language Development in Children

Reference Number: 2010-039

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

I give my permission for student’s of [school’s name] 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 researcher has agreed not to reveal the participants’ identities and personal details if information about this project is published or presented in any public form.

I agree that

1. The organisation MAY NOT be named in research publications or other publicity without prior agreement.

2. I DO require an opportunity to check the factual accuracy of the research findings related to the institution/organisation.

3. I EXPECT to receive a copy of the research findings or publications.

Name of person giving consent (printed)

.........................................................

Signature ............................................. Date ..........................

Address of researcher:

Ms. Louise Steel
School of Psychology, Deakin University.
221 Burwood Highway
Burwood, VIC
3125
Phone: 0418570912
Fax: 03 92446858
E-mail: lnsl@deakin.edu.au
Follow-up Email to School Principals

Date: __________

Dear School Principal,

My name is Louise Steel and along with Professor Martine Powell, Dr Jarrad Lum (both from Deakin University) and Dr Pamela Snow (Monash University), we are researching children’s language skills from different backgrounds. I recently posted you a package containing important information about the proposed research. In order to complete this research we need to examine the language skills of typically developing children from a range of typical backgrounds. This is why we would like to invite your students to participate in the study. Once we understand language in typically developing children we will be comparing this to children whom have had unfortunate experiences.

Your school has been selected on the grounds that it is located in Melbourne. Prior to coming to your school, ethics permission was obtained from the Deakin University Ethics Committee (EC00213) and also from the Catholic Education Commission of Victoria to carry out the research.

Students participating in the research will be presented with a number of different interesting tasks and activities which are presented at your school during school hours. As with all our work, the tasks and activities are presented in the context of a game. This will involve taking your students out of class at a time that is most convenient for teachers. Students will be presented with the tests in an open room that is visibly accessible to staff at all times.

This project is being undertaken by Prof. Martine Powell from Deakin University as part of a project funded by the Australian Research Council. All of these tasks have been developed and used with children all over the world and are safe to use. Students will receive a young scientist certificate and sticker for participating.

I very much look forward to your response and would be delighted to discuss the project and tasks with you in more detail. Alternatively, feel free to contact me by phone or e-mail on the details listed below.

Kind Regards,

Louise Steel
Researcher in Psychology,
Deakin University
221 Burwood Highway, Burwood, VIC 3125 Australia
Phone: 0418570912
Fax: +61 3 9244 6858
### Appendix K

**Study 1: SPSS Frequency Table Showing Number of Cases of Missing Data**

<table>
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<th>N Valid</th>
<th>Age</th>
<th>Suggestibility</th>
<th>Intelligence</th>
<th>Receptive Language</th>
<th>Expressive Language</th>
<th>Core Language Score</th>
<th>Narrative Comprehension</th>
<th>Narrative Production</th>
<th>Narrative Language Ability Index</th>
<th>Overall Language Composite</th>
<th>Verbal Short-term Memory</th>
<th>Verbal Working Memory</th>
<th>Visuo-spatial Short-term Memory</th>
<th>Visuo-spatial Working Memory</th>
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Appendix L

Study 1: Preliminary Analyses

Histograms were examined to determine whether the data were normally distributed. Skewness and kurtosis values were also considered. The frequency distributions of Study 1 variables are presented below in Histogram plots. Interpretation of normality, including skew and kurtosis values, appears above each plot.

**Suggestibility.** The histogram plot presented below indicates the distribution was negatively skewed. Review of skewness (-.287) and kurtosis (.638) statistics suggested that normality was a reasonable assumption. The level of skew was not considered significant enough to render the data non-normal.
**Age.** Review of skewness (-.100) and kurtosis (-1.383) statistics suggested that normality was a reasonable assumption. However, the histogram plot presented below shows a relatively uniform as opposed to a normal distribution. This is not unexpected given the researchers sought to test children of different ages relatively equally to enable comparisons across age groups.

![Histogram](image)

**Intelligence.** Review of skewness (-.311) and kurtosis (-.192) statistics suggested that normality was a reasonable assumption. The histogram plot presented below indicates the data was negatively skewed. The level of skew was not considered significant enough to render the data non-normal.

![Histogram](image)
**Receptive language.** Review of skewness (-.760) and kurtosis (-.559) statistics suggested that normality was a reasonable assumption. The histogram plot presented indicates that the data was negatively skewed. The level of skew was not considered significant enough to render the data non-normal.

![Histogram of Receptive Language](image)

**Expressive language.** Review of skewness (-.198) and kurtosis (1.167) statistics suggested that normality was a reasonable assumption. The histogram plot presented below also indicates normality was reasonable.

![Histogram of Expressive Language](image)
**General language composite, Core Language Score.** Review of skewness (-.201) and kurtosis (.566) statistics suggested that normality was a reasonable assumption. The histogram plot presented below also indicates normality was reasonable.

![Histogram of General Language Composite](image1)

**Narrative comprehension.** Review of skewness (.703) and kurtosis (.753) statistics suggested that normality was a reasonable assumption. The histogram plot presented below also indicates that the data was positively skewed. The level of skew was not considered significant enough to render the data non-normal.

![Histogram of Narrative Comprehension](image2)
**Narrative production.** Review of skewness (-.057) and kurtosis (-.420) statistics suggested that normality was a reasonable assumption. The histogram plot presented below also indicates normality was reasonable.

**Narrative language composite, Narrative Language Ability Index.** Review of skewness (.373) and kurtosis (.767) statistics suggested that normality was a reasonable assumption. The histogram plot presented below also indicates that the data was slightly positively skewed. The level of skew was not considered significant enough to render the data non-normal.
**Overall language composite.** Review of skewness (0.002) and kurtosis (0.559) statistics suggested that normality was a reasonable assumption. The histogram plot presented below also indicates normality was reasonable.

![Histogram](image1.png)

**Verbal short-term memory.** Review of skewness (0.131) and kurtosis (-0.302) statistics suggested that normality was a reasonable assumption. The histogram plot presented indicates that the data was slightly negatively skewed. The level of skew was not considered significant enough to render the data non-normal.

![Histogram](image2.png)
Visuo-spatial short-term memory. Review of skewness (.279) and kurtosis (-.973) statistics suggested that normality was a reasonable assumption. The histogram plot presented below also indicates normality was reasonable.

Verbal working memory. Review of skewness (.153) and kurtosis (-.945) statistics suggested that normality was a reasonable assumption. The histogram plot presented below also indicates normality was reasonable.
**Visuo-spatial working memory.** Review of skewness (-.482) and kurtosis (-.287) statistics suggested that normality was a reasonable assumption. The histogram plot presented indicates that the data was negatively skewed. The level of skew was not considered significant enough to render the data non-normal.

![Visuo-spatial Working Memory Histogram](image)

**Working memory composite.** Review of skewness (-.062) and kurtosis (-.524) statistics suggested that normality was a reasonable assumption. The histogram plot presented indicates that the data was positively skewed. The level of skew was not considered significant enough to render the data non-normal.

![Working Memory Composite Histogram](image)
DEAKIN UNIVERSITY
PLAIN LANGUAGE STATEMENT AND CONSENT FORM

TO: Participants

Date: Wednesday

Full Project Title: Relationship between life experiences, memory, language skills and rehabilitative outcomes.

Principal Researcher: Dr Jarrad Lum

Student Researchers: Louise Steel

This Plain Language Statement and Consent Forms is 5 pages long. Please make sure you have read all the pages.

Hello,

My name is Louise Steel and I am a student at Deakin University. This letter is to invite you to participate in a research project which I am conducting as part of my Doctorate in Psychology. This project is being supervised by Dr Jarrad Lum who is a senior lecturer in psychology.

What we are researching in this study?

In this study we are researching whether people’s memory and language are related to their life experiences. We are also researching whether memory and language skills are related to learning.

What will I be asked to do?

If you decide to participate in this study we will ask you to attend one testing session that last around 60 minutes. These tasks will be presented to you in a quiet room located at the Health Services building at Malmsbury Youth Justice Centre. The tasks will be presented to you by myself (Louise Steel).

In addition to the tasks being presented to you, we also ask for your permission to collect information about (a) your life experiences, and (b) your participation in, and achievement at Parkville College.

Information about your life experiences will be taken from the intake assessment you participated in upon entry to Malmsbury Youth Justice Centre. Information about your participation and achievement at Parkville College will be obtained via a questionnaire which will be completed by your Parkville College teacher. This questionnaire has questions about your behaviour and academic achievement in the classroom.
A brief description of the tasks & questionnaires:

- **Memory Tasks**: The memory tasks involve remembering a series of numbers or objects.
- **Language Test**: On this test you will be asked to repeat back sentences, create sentences, and provide definitions of words.
- **Non-Verbal Reasoning**: On the non-verbal reasoning task you will be presented with a pattern with a piece missing from it. Your task is to work out the missing piece.
- **Pragmatic Skills Questionnaire**: Your teacher will be asked to answer questions about your classroom behaviour and academic achievement.

**Do I have to take part?**

You do **not** have to take part in this study. Also if you decide to take part and then later change your mind, you can withdraw from (leave) the study. This can be before you start, during it or afterwards. If you decide to withdraw from the study we will destroy your data. It will not be used in any of the analyses. Whether you decide to participate or not has **no consequences** for any of the services that you may receive from Malmsbury Youth Justice Centre or Deakin University at the present or in the future. If you have any questions about participating please contact Louise Steel. These contact details are at the end of the letter.

**Will my data be confidential?**

All the information collected will be confidential (not told to anyone else) we will not write your name or any other identifying information on any piece of information we obtain from you or that we obtain from Malmsbury Youth Justice Centre health or education staff about you. Instead we will use a number. Also, your name will not appear in any report or publication of the results arising from this study. The data collected in this study will not be disclosed to any third party. The data will be destroyed after six years from publication.

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

When the study has been completed we will produce a handout outlining the findings of the study. If you would like a copy of the results please contact myself via telephone (details are provided at the bottom of this letter).

**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 last page of this letter.

**What are the risk and benefits to participating in this study?**
There are no foreseeable risks associated with participating in this research. You will be administered a series of behavioural tests and tasks that require you to provide a verbal response to different questions. In addition, you will be asked to provide permission for researchers to access information about your life experiences, and participation and achievement in education programs.

If you would like to participate?
If you would to participate in this research please contact Louise Steel.

Yours Sincerely,

Ms Louise Steel, School of Psychology, Deakin University.

Complaints
If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact:

The Manager, Research Integrity, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: 9251 7129, Facsimile: 9244 6581; research-ethics@deakin.edu.au

Please quote project number [201X-XXX].
To: Participant

Date: 28th October 2013

Full Project Title: Relationship between maltreatment, memory, language skills and rehabilitative outcomes.

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

I freely agree to participate in this project according to the conditions in the Plain Language Statement.

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

The researcher has agreed not to reveal my identity and personal details, including where information about this project is published, or presented in any public form.

Participant’s Name (printed) ……………………………………………………………………

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

Principal researcher’s name and contact details:

Ms Louise Steel
School of Psychology,
Deakin University.

221 Burwood Highway
Burwood
VIC
3125

Phone: 03 9244 6481
E-mail: lns@deakin.edu.au
TO: Participants

Revocation of Consent Form

(To be used for participants who wish to withdraw from the project)

Date: 28th October 2013
Full Project Title: Relationship between life experiences, memory, language skills and rehabilitative outcomes.

I hereby wish to WITHDRAW my consent to participate in the above research project and understand that such withdrawal WILL NOT jeopardise my relationship with Malmsbury Youth Justice Centre or Deakin University.

Participant’s Name (printed) ……………………………………………………
Signature ………………………………………………………………………… Date …………………

Principal researcher’s name and contact details:

Ms Louise Steel
School of Psychology,
Deakin University.

221 Burwood Highway
Burwood
VIC
3125

Phone: 03 9244 6481
E-mail: lns@deakin.edu.au
Appendix N

Kaufman Brief Intelligence Test, Second Edition: Example Test Item from the Matrices Subtest

Matrices Item 39
Appendix O

Study 2: Deakin University Ethics Approval.

Memorandum

To: Dr Jarrad Lum
School of Psychology

B

cc: Ms Louise Steel

From: Deakin University Human Research Ethics Committee (DUHREC)

Date: 25 June, 2013

Subject: 2013-142
Relationship between life experiences, memory, language skills and rehabilitative outcomes

Please quote this project number in all future communications

The application for this project was considered at the DU-HREC meeting held on 17/06/2013.

Approval has been given for Ms Louise Steel, under the supervision of Dr Jarrad Lum, School of Psychology, to undertake this project from 25/06/2013 to 25/06/2017.

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 Human Research Ethics Unit 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 HRECs.

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.

DUHREC 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).

Human Research Ethics Unit
research-ethics@deakin.edu.au
Telephone: 03 9251 7123
Appendix P

Department of Human Services Ethics Approval.

Ms Louise Steel
School of Psychology
Deakin University
BURWOOD VIC 3125

Dear Ms Steel

RE: Application to undertake research involving the Department of Human Services

I write to you concerning your application to the Department of Human Services (DHS) Centre for Human Services Research and Evaluation (CHSRE) to undertake research entitled: "Relationship between life experiences, memory, language skills and learning".

I am pleased to advise you that the DHS CHSRE is able to support your project subject to the following conditions:

Pre-research Commencement
- The proposed research is conducted in accordance with the documentation you provided to the CHSRE.
- An approval letter is received from your University's Human Research Ethics Committee or its equivalent.

Monitoring of Research
- The provision of milestone updates to the CHSRE on the progress of your research.
- The project is commenced within 12 months of this approval letter, after this time extensions can be granted by notifying the CHSRE.

Dissemination of Research Findings
- The provision of a final report to the CHSRE at the completion of the research.
- The provision of a one page summary of the outcomes of the research and how it relates to the work of DHS.
- The provision of a seminar/presentation to relevant DHS staff on the outcomes of the research - with details to be arranged with the CHSRE Secretariat.

Quality Assurance
- That you provide the CHSRE with the opportunity to review and provide comment on any materials generated from the research prior to formal publication. It is expected that if there are any differences of opinion between the CHSRE and yourself related to the research outcomes, that these differences would be acknowledged in any publications.
Acknowledgement of DHS Support
- That you acknowledge the support of the DHS CHSRE in any publications arising from the research.

After ethics approval has been received, please contact Mr Ian Curwood at jan.Curwood@dhs.vic.gov.au, telephone 5421 3102, who will be your DHS contact for this project.

If you have any further queries, please do not hesitate to contact me via email on alex.dordevic@dhs.vic.gov.au.

The CHSRE wishes you the best in your research and we look forward to seeing the results in due course.

Yours sincerely

Dr Alex Dordevic
Acting Director
Centre for Human Services Research and Evaluation

Cc: Mr Ian Curwood
### Appendix Q

#### Study 2: SPSS Frequency Table Showing No Cases of Missing Data

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Appendix R

Study 2: Preliminary Analyses

Histograms were examined to determine whether the data were normally distributed. Skewness and kurtosis values were also considered. The frequency distributions of Study 2 continuous variables are presented below in Histogram plots. Interpretation of normality, including skew and kurtosis values, appears above each plot.

**Age.** The histogram plot presented below indicates normality was reasonable. Review of skewness (.283) and kurtosis (-.410) statistics also suggested that normality was a reasonable assumption.

![Histogram](image)
**Intelligence.** Review of skewness (-.259) and kurtosis (1.070) statistics suggested that normality was a reasonable assumption. The histogram plot presented below indicates normality was reasonable.

![Histogram of Intelligence](image)

**General language composite, Core Language Score.** Review of skewness (-.165) and kurtosis (-.556) statistics suggested that normality was a reasonable assumption. The histogram plot presented below indicates that the data was positively skewed. The level of skew was not considered significant enough to render the data non-normal.

![Histogram of General Language Composite](image)