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Individual and Developmental Differences in Eyewitness Recall and Suggestibility in Children with Intellectual Disabilities

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SUMMARY

This study examined two key issues: (1) whether there were developmental improvements in eyewitness memory performance for children with intellectual disabilities (ID); and (2) whether standardised measures of cognitive ability and suggestibility would relate to eyewitness recall and suggestibility. Children with ID and age-matched controls (ages 8/9 and 12 years) watched a video of a crime and were asked a range of open-ended and specific questions about the event in a subsequent interview. Free recall increased between the two age levels for children with and without ID, but at a faster rate for those without ID. For other question types, differences in performance between children with and without ID were far more marked than age differences. Standardised measures of interrogative suggestibility (Gudjonsson Suggestibility Scale, GSS), verbal IQ, non-verbal IQ, mental age and speed of information processing were related to eyewitness performance. In particular, higher eyewitness recall scores (free recall, non-leading specific questions) were related to higher scores on the standardised GSS free recall measure; and higher eyewitness suggestibility scores were related to higher scores on the standardised GSS suggestibility measures. Mental age was a better predictor of performance on a range of eyewitness memory question types than verbal or non-verbal IQ; and speed of information processing showed some relationships with eyewitness performance.

Although age differences in eyewitness recall have been well documented for typically developing children (Bruck & Ceci, 1999), there is no research of this kind for children with intellectual disabilities (ID). Children with ID are in a vulnerable position with regard to being victims or witnesses to crimes (Westcott, 1991; Westcott & Jones, 1999; Williams, 1995; Wilson & Brewer, 1992); however, their testimony is often assumed to be unreliable. These two factors mean that children with ID are being denied full access to the criminal justice system.

The types of factors that might impact on the fullness, accuracy and reliability of eyewitness memory in children with ID are only just being identified. Current work has focused on putting the eyewitness skills of children with ID into developmental context: do they recall as much as peers matched for chronological age, or are they performing more in

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line with their mental ages? Findings indicate that eyewitness skills of children with ID are poorer than those of typically developing peers of the same *chronological* age (CA). For example, children with ID generally produce less information in response to free recall instructions than CA controls (Agnew & Powell, 2004; Gordon, Jens, Hollings, & Watson, 1994; Henry & Gudjonsson, 2003; Milne & Bull, 1998; Pear & Wyatt, 1914), although not always significantly so (Henry & Gudjonsson, 1999). Children with ID are also reported to be more suggestible than CA controls in response to misleading questions (Gordon et al., 1994; Henry & Gudjonsson, 1999, 2003; Milne & Bull, 1998; Pear & Wyatt, 1914), although one study failed to find greater acceptance of 'interviewer suggestions' (Agnew & Powell, 2004). Nevertheless, the accuracy of the information produced by children with ID (the proportion of accurate to inaccurate information) on measures of open-ended recall is generally as high as that produced by CA controls (Agnew & Powell, 2004; Gordon et al., 1994; Henry & Gudjonsson, 1999, 2003; Milne & Bull, 1998; Pear & Wyatt, 1914).

By contrast, when children with ID are compared to typically developing peers of comparable intellectual ability, (i.e. peers matched for *mental* age—MA), there are relatively few differences in performance (Gordon et al., 1994; Henry & Gudjonsson, 1999, 2003; Michel, Gordon, Ornstein, & Simpson, 2000; although see Agnew & Powell, 2004, for differing results).

However, there is no currently available evidence on the *developmental progression* of eyewitness recall and suggestibility in children with ID. Do children with ID become better able to provide free narrative accounts of events, more accurate in answering specific questions and better able to resist misleading questions with age as typically developing children do (Bruck & Ceci, 1999)? A related issue is whether any such developments occur at the same *pace* as their peers. Although Hulme and Mackenzie (1992) found that children with severe ID failed to improve in line with their mental ages over 5 years on a measure of digit span, it is not clear that this result can be generalised to the eyewitness memory paradigm, which is an incidental test of event memory as opposed to a formal test of auditory memory. The incidental nature of eyewitness recall means that eyewitness memory tasks are both unexpected and relatively naturalistic, and may lead to better performance in children with ID (Burack & Zigler, 1990) than in more traditional laboratory style tests of memory like digit span (e.g. Borkowski, Peck, & Damberg, 1991; Weiss, Weisz, & Bromfield, 1986).

In order to examine age-related changes in eyewitness recall and suggestibility in children with ID and to compare them to any such changes in typically developing (TD) children, the present study included groups of children at two age levels (8/9 and 12 years). All children took part in a session involving a range of cognitive assessments and an eyewitness memory task. During this session, they watched a short crime-related video, completed a buffer task, and were then given an unexpected interview about the video to assess various aspects of eyewitness recall and suggestibility. It was tentatively predicted that (a) some age differences would be apparent between 8/9- and 12-year olds; and that (b) improvements in performance may be slower for children with ID than for TD children, given their slower rate of general intellectual development.

The second aim of this research was to examine individual differences in eyewitness memory performance. This is an area that has begun to receive attention among typically developing children (e.g. Bruck, Ceci, & Melnyk, 1997; Bruck & Melnyk, 2004; Quas, Qin, Schaaf, & Goodman, 1997); and there is a limited amount of similar research on children with ID (Henry & Gudjonsson, 1999, 2003; Young, Powell, & Dudgeon, 2003).

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There are several cognitive variables that have been examined; these are briefly reviewed below. The focus is on studies that have used some kind of eyewitness event or video to measure recall and suggestibility, although studies that have used standardised measures of recall and suggestibility are briefly mentioned.

INTELLIGENCE

Intelligence would appear to have only a modest and somewhat variable relationship with eyewitness recall and suggestibility. Elischiberger and Roebers (2001) found modest correlations between verbal IQ and quantitative measures of eyewitness recall in 7-year olds, although correlations for 5-year olds did not reach significance. Geddie, Fradin, and Beer (2000) found positive relationships between IQ and both recall and suggestibility in preschoolers, although other variables such as race, age and metamemory scores were more powerful independent predictors. Similarly, Roebers and Schneider (2001) found that IQ was not related to suggestibility; but it was related to free recall in 10-year olds, cued recall in 8-year olds, and neither in 6-year olds. Finnila, Mahlberg, Santtila, Sandnabba, and Niemi (2003) noted 'the effects of intelligence proved to be small and contradictory and are, therefore, not reported' (p. 36).

Slightly more emphatic evidence was provided by Burgwyn-Bailes, Baker-Ward, Gordon, & Ornstein (2001) who found that verbal IQ (receptive vocabulary) explained some of the variance in the amount of information recalled about emergency medical treatment in young children. Finally, Chae and Ceci (2005) found that verbal intelligence was related to open-ended recall in second grade children (but not in preschoolers), and to suggestibility in preschoolers (but not second grade children). Cued recall showed no relationships in either age group to verbal IQ, supporting the general conclusion that the relationships between IQ, recall and suggestibility are inconsistent, perhaps because they are developmentally sensitive. Some studies have found intelligence to be related to suggestibility as measured by standardised interrogative suggestibility measures such as the Gudjonsson Suggestibility Scale (Gudjonsson, 1997) (Danielsdottir, Sigurgeirsdottir, Einarsdottir, & Haraldsson, 1993; McFarlane, Powell, & Dudgeon, 2002; Young, Powell, & Dudgeon, 2003).

One might predict that intelligence would relate much more strongly to eyewitness recall and suggestibility in children with intellectual disabilities (ID), based on evidence that intelligence is related to standardised measures of suggestibility only at IQ levels below 100 (Gudjonsson, 1988). Henry and Gudjonsson (1999, 2003) found some evidence to support this view. One of their two measures of eyewitness suggestibility (misleading yes/no style questions) was related to intelligence in children with ID, but not in typically developing control groups matched for mental or chronological age. However, intelligence did not relate to any other of the six measures of eyewitness recall and suggestibility used in these studies in the ID groups. Similarly, Young et al. (2003) looked at the relationship between IQ and a standardised measure of suggestibility, finding that IQ was related to 'yield' suggestibility (the extent to which individuals accept misleading suggestions) in children with mild to borderline ID; this relationship was less marked in a mainstream sample. In the most recent review available, Bruck and Melnyk (2004) concluded that IQ was consistently related to suggestibility in samples of children with ID, but inconsistently related to suggestibility in typically developing samples.

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The current study examined the relationships between intelligence and eyewitness memory performance in more depth, given recent concerns that available evidence rarely considers 'exactly how various types of intelligence may be differently related to recall and suggestibility' (Chae & Ceci, 2005). In particular, separate measures of verbal and non-verbal intelligence were included, to test the prediction that the relationships between eyewitness recall and suggestibility may be stronger for verbal IQ than non-verbal IQ, given that the eyewitness task taps verbal skills. Additionally, two different age groups (8/9 years, 12 years) and two different ability groups (typically developing, ID) were included to test the prediction that age might be somewhat more strongly related to eyewitness recall and suggestibility in mainstream samples, whereas measures of intelligence might be more important in samples of children with ID (e.g. Bruck & Melnyk, 2004; Young et al., 2003).

An examination of the relationships between eyewitness recall, suggestibility and both verbal and non-verbal *mental age* was also included. Mental age is an estimate of current developmental level and may show stronger links with eyewitness memory performance than IQ. Although IQ is difficult to define adequately, and clearly includes a cluster of related attributes, it is a measure of the *potential* for problem-solving and new learning rather than an indicator of *current* developmental level. No previous research to date has used mental age as a predictor of eyewitness recall and suggestibility. It was tentatively predicted that MA may be a better predictor of eyewitness recall and suggestibility than IQ, particularly for those with ID.

SUGGESTIBILITY

Standardised measures of interrogative suggestibility have been moderately successful as predictors of eyewitness recall and suggestibility. For example, Finnila et al. (2003) found that children with higher suggestibility scores on the Bonn Test of Statement Suggestibility (BTSS, Endres, 1997) were more likely to accept suggestive interview questions about a scene they had experienced. Henry and Gudjonsson (1999, 2003) found relationships between measures of eyewitness free recall and suggestibility, and performance on the Gudjonsson Suggestibility Scale 2 (GSS 2, Gudjonsson, 1997) in both typically developing (TD) children and children with ID. There appeared to be some specificity in these relationships. For example, the GSS measure of free recall related to performance on the free recall element of the eyewitness memory interview; whereas the GSS measure of yield to suggestive questioning ('yield') related to eyewitness suggestibility (e.g. agreeing with misleading yes/no style questions or providing answers to misleading specific questions). One general finding was that the relationships between standardised measures of recall and suggestibility (taken from the GSS) and the more realistic interview-based eyewitness measures of recall and suggestibility tended to be larger and more consistent in children with ID than TD children.

The current study builds on and extends these findings in two key ways. First, a larger age range of children with ID was examined, including 8/9-year olds as well as 12-year olds, to test whether these relationships were age sensitive. Second, a slightly shortened version of the GSS 2 was used, to cater for the less able children included in this study—previous work has used the GSS successfully with 12-year olds with ID, but 8/9-year olds with ID may have found the original GSS too long. The predictions, based on earlier findings (Henry & Gudjonsson, 1999, 2003), were that the GSS free recall measure should relate to eyewitness free recall; and that the GSS suggestibility measures (yield, the extent

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to which individuals accept misleading suggestions; shift, the extent to which individuals change their responses after negative feedback) should relate to eyewitness suggestibility.

SPEED OF INFORMATION PROCESSING

The final cognitive variable included in the current research was speed of information processing. This is a measure that has long been associated with some sort of general intelligence factor or *g* (Jensen, 1998) and with performance on a large range of cognitive tasks, although these relationships tend to be modest (correlations in the region of 0.2 to 0.4: Anderson, 2001; Elliott, 1996). This variable has not been examined before in the context of eyewitness memory in children with ID. It might be of particular relevance because speed of information processing is slower in individuals with ID (e.g. Kail, 1992). Anderson (2001) has suggested that speed of information processing operates as a basic constraint on general intelligence: 'a low IQ represents a pervasive and enduring condition, caused by slow speed of processing' (p. 296). The current study tested whether speed of information processing might be a stronger or weaker predictor of eyewitness recall and suggestibility than IQ or mental age. The predictions were that there would be some positive relationships between eyewitness recall, suggestibility and speed of information processing, but we could not be specific about where these relationships might occur, as there are no previous reports examining this issue.

Therefore, this study had two key aims: (1) to examine the developmental progression of eyewitness recall and suggestibility among children with ID; (2) to investigate the links between a range of standardised cognitive measures and eyewitness memory and suggestibility in children with and without ID. Eyewitness recall and suggestibility were tested using a short video of a crime, hence, this study also tests whether previous relationships between recall, suggestibility and cognitive measures found among children with ID using live staged events generalise to video-presented events (with visual and verbal presentation, Cardone & Dent, 1996). Note that all of the measures of eyewitness performance were independent from the standardised cognitive measures.

The predictions were as follows: (1) there will be limited developmental improvements in eyewitness memory performance in children with ID; (2) these improvements may occur at a slower pace than for TD children; (3) positive relationships between standardised measures of recall and suggestibility and eyewitness recall and suggestibility will be replicated in a video-presentation eyewitness paradigm; (4) speed of information processing will be related to performance on eyewitness memory measures; (5) verbal IQ may relate more strongly to eyewitness recall and suggestibility than non-verbal IQ; and (6) mental age may be a better index of eyewitness recall and suggestibility among children with ID than IQ.

METHOD

Design

A two-factor between-subjects design included the factors of group (ID, TD) and age (8/9 years, 12 years). There were four groups of children: 8/9-year old children with ID; 12-year old children with ID; 8/9-year old typically developing children and 12-year old typically

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developing children. The dependent variables included seven measures of correct, incorrect and confabulated details given by interviewees within an eyewitness memory interview (measures included free recall, general questions, errors, non-leading specific questions, misleading specific questions, correctly leading yes/no questions and misleading yes/no questions).

Participants

There were 34 children with ID, 16 12-year olds and 18 8/9-year olds; and 40 typically developing (TD) children, 20 12-year olds and 20 8/9-year olds (see Table 1 for full details, note that data are missing for GSS free recall and SIP for 10 participants in the ID groups). The children with ID attended special schools for children with intellectual disabilities in England; the controls attended mainstream schools in England. Information on diagnosis was not sought during this study. Therefore, the sample is likely to be heterogeneous with respect to the aetiology of the ID. Children in the two ID groups were matched for non-verbal IQ rather than verbal IQ. This was because the BPVS-II estimates of verbal IQ in the younger ID group were somewhat higher than we have found previously in similar settings using the BAS-II or the WISC-III. Unfortunately, neither of these latter tests was suitable for the younger children with ID as they only go down to mental ages of 5 to 6 years. The majority of 12-year old typically developing children (17 of 20) had participated in one condition of a previous study using the same methodology (Henry & Gudjonsson, 2004) examining the effects of memory trace strength, rather than individual and age differences as was done here. All children from that relevant condition were included in this study.

Table 1. Details of participants—chronological age, verbal mental age, non-verbal mental age, verbal IQ, non-verbal IQ, speed of information processing (standardised 'T-scores' from the BAS-II, mean 50), plus 'short' GSS 2 measures of free recall, yield and shift

Measure	Children with ID	TD children
	8/9-year olds	
Chronological age	9 yrs 2 m (8m)	9 yrs 1 m (5 m)
Verbal IQ	69.94 (13.14)	101.60 (9.93)
Non-verbal IQ	56.39 (9.79)	102.85 (14.37)
Verbal mental age	5 yrs 5 m (19.5 m)	9 yrs 5 m (18 m)
Non-verbal mental age	5 yrs 1 m (7 m)	9 yrs 6 m (22 m)
Speed of information processing	38.40 (15.95)	56.40 (11.74)
GSS free recall	5.35 (5.64)	13.68 (4.64)
GSS yield	7.50 (3.75)	3.65 (2.52)
GSS shift	6.61 (3.15)	4.60 (2.68)
	12-year-olds	
Chronological age	12 yrs 8 m (9 m)	12 yrs 8 m (12 m)
Verbal IQ	58.94 (14.73)	98.20 (13.77)
Non-verbal IQ	55.56 (9.91)	105.40 (15.79)
Verbal mental age	6 yrs 7 m (25 m)	12 yrs 6 m (24 m)
Non-verbal mental age	6 yrs 3 m (17 m)	14 yrs 0 m (33 m)
Speed of information processing	28.93 (11.46)	58.85 (10.72)
GSS free recall	6.11 (3.26)	16.36 (5.93)
GSS yield	6.56 (2.78)	2.67 (2.14)
GSS shift	7.50 (3.43)	3.50 (2.26)

Note: Standard deviations are given in brackets.

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Ethical approval for the study was obtained from the institution the research was based at and written consent was obtained from parents prior to participation. Before interviewing each child, the investigator asked whether the child would like to participate. The task was very popular and no child refused to take part.

Procedure and materials

All children were tested at their schools in one session. The session was presented to the children as an opportunity to do some 'special work' with the experimenter involving lots of different activities. The session included pattern construction from the British Ability Scales II (BAS II, Elliott, 1996) and the British Picture Vocabulary Scale II (BPVS-II, Dunn, Dunn, Whetton, & Burley, 1997); these were used to estimate non-verbal and verbal IQ for the younger typically developing children and the children with ID. Both of these standardised tests are suitable for children from 2.5 or 3 years old, and provide tables for calculating mental age to 2 years 6 months and 2 years 4 months respectively. The older typically developing children were tested using two scales from the BAS-II (verbal reasoning and non-verbal reasoning) to obtain measures of verbal and non-verbal IQ: note that this test was not used for the less able participants as it does not cover mental age ranges below 5 years.

The eyewitness memory task involved showing children a short video clip (3 minutes) of four children pulling up to a petrol (gas) station in a car, filling the car up with petrol (gas), and driving off without paying. The scene portrayed a minor crime, but there was no aggressive content and the children were polite and clearly worried about their actions (they left a note promising to pay later). The clip was played on a portable computer with each child sitting directly in front of the screen (adjusted to an appropriate viewing angle). No mention was made of there being any need to recall the video clip, the scene was simply incorporated into the series of other activities. After viewing the clip, each child completed the Speed of Information Processing (SIP) sub-test from the BAS-II appropriate to their age or ability as a buffer task. In this task, the child places a mark through one of several circles with the greatest number of small squares inside it (for the younger children and those with ID) or the single digit number of the highest value (for the older CA group). This test takes between three and four minutes to administer.

Next, the experimenter conducted a short, unexpected, interview about the petrol scene. A standard set of written questions was used in the interview and the ordering of questions was based as closely as possible on the recommendations in the *Memorandum of Good Practice on Video Recorded Interviews with Child Witnesses for Criminal Proceedings* (Home Office in conjunction with Department of Health, 1992) and also summarised by Bull (1995) [Note that this document has now been superseded by 'Achieving Best Evidence', Home Office, 2001]. This involved asking the most general questions first and leaving misleading questions (which are not, in fact, recommended) to the end. Questions included free recall, general questions and specific questions, based on research showing that those with ID perform differently depending upon question type (Cardone & Dent, 1996; Dent, 1986). All interviews were tape recorded and transcribed for scoring. The full list of questions appears in the Appendix, and each question type is described below.

Free recall

Children were asked to tell the investigator as much as they could remember about the video they had just viewed. The interviewer gave two follow-up prompts: 'anything else

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you can remember?' and 'one last think?' Every correct piece of information scored one point (e.g. 'There were four (1) children (1) in a car (1) and they wanted to steal (1) some petrol (1)'). Thus, each child obtained a free recall score based upon the sum of points allocated for all correct information recalled. This scoring procedure was based on that used by Rudy and Goodman (1991). Errors, including incorrect details and confabulations, were also scored (different types of errors were combined as numbers were low) and each error also received a score of one point (e.g. 'the little girl sat in a *baby chair* (1 error)', when in fact she did not). Total errors were summed to produce the error score. A sample of 25% of the free recall interview scripts (every fourth interview) from each group of children was rated independently to check inter-scorer reliability. The intra-class correlation, approximately equal to Cohen's weighted kappa (Dunn, 1989) was 0.985, representing very high agreement, therefore, data included ratings by the first rater only.

General questions

Two general questions were asked. They were introduced with, 'Tell me about the people in the video', prior to the two questions which were: 'What did they look like?'; and 'What did they do?' These were to elicit further information with minimal prompting and mirrored a forensic interview where free narratives would be followed up with general questions. Responses were scored as for free recall, but only additional information over and above that provided in free recall was counted. Errors were scored separately and, again, summed. Twenty-five per cent of the scripts were rated independently to check inter-scorer reliability. The intra-class correlation was 0.936, representing high agreement and, again, scores from the first rater only were used.

Specific questions

The 20 specific questions were phrased to require an answer generated by the child, generally one-word (e.g. 'What colour was the car?'—response, 'blue'). Half were non-leading (to the extent that any direct question about a detail can ever be entirely non-leading) and half were overtly misleading, suggesting details that were not present (e.g. 'What colour was the police car?' when there was no police car—responses such as 'black and white' were scored incorrect, whereas responses such as 'there wasn't one' or 'I don't know' were scored correct). Non-leading questions were asked in a block before misleading questions in line with the *Memorandum* guidelines, and there were 10 of each type of question. Specific guidelines on the use of 'don't know' responses were not given, to make the research more comparable to previous work (Henry & Gudjonsson, 1999, 2003).

Yes/no questions

There were 20 yes/no style specific questions where the response was suggested by the wording of the question (e.g. 'The car didn't break down, did it?'—correct response 'no'). The yes/no questions were more directive then the specific questions described above. Half of the questions were correctly leading and half were misleading. For half of each type of question, the correct response was 'yes'. Responses requiring 'yes' versus 'no' were semi-randomly sequenced such that no more than two consecutive questions required the same answer (to avoid response sets). Correctly leading yes/no questions suggested details that were correct (e.g. 'The children didn't pay for the petrol (gas), did they?'—correct response 'no'). Misleading yes/no questions suggested details that were incorrect (e.g. 'There was no dog in the car, was there?'—correct response 'yes'). Although 'don't know'

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answers were not specifically mentioned, these were sometimes given and were scored separately and counted as errors in the main analyses because they failed to either directly agree or disagree with the statement. This was a rather conservative approach. Correctly leading yes/no questions were posed in a block before misleading yes/no questions to mirror the open-ended questions and scores were out of 10 in each case. Both types of questions were of similar length and used simple language.

The final phase of the session involved administering a slightly shortened version of the Gudjonsson Suggestibility Scale 2 (Gudjonsson, 1997), a measure of interrogative suggestibility with very high inter-rater reliabilities (0.97–0.99) and temporal consistency (0.73–0.93). The reason for shortening the GSS2 was to make the task somewhat easier for the least able participants (the younger children with ID). This was done in the simplest way possible by presenting only the first 80% of the story (comprising 32 of the 40 units of information), followed by the first 80% of the questions (comprising 16 of the 20 questions—4 of these questions were non-leading and 12 were leading, to mirror the original GSS). All questions matched up with story components. In a few cases, wording was altered in minor ways to simplify the vocabulary (e.g. 'bungalow' was replaced with 'house'). The format of the task was as follows. Participants were asked to recall as much as possible from the story (a measure of *free recall*), followed by a series of leading and non-leading questions about the story (most questions were leading and provided a measure of *yield*, the tendency to give in to leading questions). Finally, the participant was told that he or she had made a number of errors on the questions and was asked to answer them again (this provided a measure of *shift*, or changed responses after negative feedback). As recommended in the manual for persons with intellectual disability, the usual delay of one hour between free recall and answering the questions was omitted (this procedure was used for all participants). All free-recall narratives were tape recorded and later transcribed verbatim for scoring. Due to Experimenter error, 10 narratives were omitted from the ID group so GSS free recall data are unavailable for these participants.

RESULTS

Developmental differences in eyewitness recall and suggestibility: the impact of ID

Mean scores on the measures of 'open-ended' recall including free recall, general questions, total errors (errors made during free recall and general questions were summed as the numbers were small), and percentage of accurate information (proportion of correct to incorrect information given during free recall and general questions) are given in Table 2 for each group (ID and TD) and for each age level. Similarly, mean scores for the specific questions (non-leading and misleading) and the yes/no questions (correctly leading and misleading) are presented in Table 3 for each age and ID group.

All eyewitness memory data (seven scores in all; we excluded accuracy as the distribution for accuracy was highly skewed) were subjected to a multivariate analysis of variance (MANOVA) with two between subjects factors: group (ID, TD); and age (8/9 years, 12 years). Only significant effects are reported ($p < 0.05$). The MANOVA revealed overall significant effects of age group, $F(7, 64) = 4.86$, Pillai's Trace $= 0.347$, $p < 0.001$, observed power $= 0.99$; and of ID group, $F(7, 64) = 15.76$, Pillai's Trace $= 0.633$,

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Table 2. Mean scores on each open-ended eyewitness memory measure for 8/9- and 12-year-old children with ID and typically developing (TD) children

Question type/group	Children with ID	TD children
	8/9-year olds	
Free recall	7.17 (5.19)	18.90 (5.89)
General questions	4.28 (3.48)	10.75 (6.94)
Accuracy	92.54%	91.40%
Total errors	0.89 (1.91)	2.50 (1.70)
	12-year olds	
Free recall	13.63 (8.35)	34.50 (11.79)
General questions	5.56 (3.90)	10.25 (6.58)
Accuracy	92.56%	93.94%
Total errors	1.19 (1.11)	2.75 (1.74)

Note: Standard deviations are given in brackets.

$p < 0.001$, observed power = 1. We then examined each individual eyewitness term for age and group effects.

Age effects

In terms of the seven individual eyewitness memory terms, a significant effect of *age* on performance emerged for eyewitness free recall, $F(1, 70) = 32.51$, $p < 0.001$, partial $\eta^2 = 0.32$. Older children recalled more information about the video than younger children. None of the other eyewitness memory measures showed age differences. Although there was no overall interaction between age group and ID group in the MANOVA, the individual terms revealed an interaction between these factors for free recall, $F(1, 70) = 5.58$, $p < 0.05$, partial $\eta^2 = 0.07$. *t*-Tests demonstrated that the improvement in free recall with age was significant for the TD children, $t(38) = 5.29$, $p < 0.001$; and for the children with ID, $t(32) = 2.74$, $p < 0.05$. However inspection of the means reveals that the improvements in free recall for TD children were larger than for those with ID. No other individual eyewitness memory measures showed an interaction between age and ID group.

Table 3. Mean scores on each of the specific and yes/no eyewitness memory questions for 8/9- and 12-year-old children with ID and typically developing (TD) children

Question type/group	Children with ID	TD children
	8/9-year olds	
Non-leading specific	4.06 (2.13)	6.20 (1.20)
Misleading specific	3.44 (3.24)	5.05 (2.31)
Correctly leading yes/no	8.94 (0.87)	8.25 (1.29)
Misleading yes/no	2.67 (2.28)	5.45 (2.46)
	12-year olds	
Non-leading specific	4.63 (2.22)	7.10 (1.41)
Misleading specific	4.19 (2.74)	5.65 (2.16)
Correctly leading yes/no	9.00 (1.37)	8.10 (1.52)
Misleading yes/no	3.00 (2.03)	6.55 (1.47)

Note: Standard deviations are given in brackets.

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Effects of ID

The effects of ID group were more marked. All seven eyewitness memory measures showed a main effect of *ID group*: free recall, $F(1, 70) = 71.04$, $p < 0.001$, partial $\eta^2 = 0.50$; general questions, $F(1, 70) = 18.40$, $p < 0.001$, partial $\eta^2 = 0.21$; errors, $F(1, 70) = 15.76$, $p < 0.001$, partial $\eta^2 = 0.19$; non-leading specific questions, $F(1, 70) = 31.76$, $p < 0.001$, partial $\eta^2 = 0.31$; misleading specific questions, $F(1, 70) = 6.29$, $p < 0.05$, partial $\eta^2 = 0.08$; correctly leading yes/no questions, $F(1, 70) = 7.01$, $p = 0.01$, partial $\eta^2 = 0.09$; and misleading yes/no questions, $F(1, 70) = 42.09$, $p < 0.001$, partial $\eta^2 = 0.38$.

In general, those with ID performed less well than the TD children. To summarise: (1) the recall of the event by those with ID was significantly poorer on measures of what might be described as 'unbiased' recall (free recall, general questions, and non-leading specific questions); (2) children with ID were significantly more suggestible than typically developing children on both types of 'biased' questions (misleading specific and misleading yes/no questions); (3) children with ID obtained higher scores than TD children on correctly leading yes/no questions (they were more likely to agree with the suggestion offered); and (4) children with ID gave fewer items of incorrect information during open-ended recall (see Table 2).

Although accuracy scores were not formally analysed, it is apparent from Table 2 that all groups obtained high scores. Therefore, as in previous studies (Henry & Gudjonsson, 1999, 2003), overall accuracy during open-ended recall was uniformly high for groups of children varying in terms of age or the presence of an intellectual disability.

In terms of the predictions, developmental improvements in eyewitness performance were, indeed, modest for both groups, being confined to free recall. The pace of developmental improvement in free recall was slower in the ID group, as predicted.

Individual differences in recall and suggestibility

In order to examine the role of individual differences in eyewitness recall and suggestibility for the two groups, correlations between the seven eyewitness memory measures and the cognitive variables (verbal IQ, non-verbal IQ, GSS free recall, GSS yield, GSS shift, speed of information processing and age) were calculated. As already noted the BPVS-II estimates of verbal IQ in the younger ID group were somewhat higher than found previously in similar settings using the BAS-II or the WISC-III. This discrepancy is hard to explain, but the results were virtually identical when the analyses were run excluding two individuals with ID in the younger group who had outlying BPVS scores. Table 4 gives the correlations in full. As a large number of correlations were carried out, significance values of $p < 0.01$ (one-tailed) were required. Correlations are reported separately for children with and without ID so as not to rule out finding different patterns of relationships between these groups.

Children with ID

For children with ID, age was significantly related to performance on eyewitness free recall (0.51), reflecting the main finding that older children recalled more than younger children. Children with higher verbal IQ's were less suggestible on misleading yes/no questions (0.44); and children with higher non-verbal IQ's recalled more information during free recall (0.41).

Those with faster SIP performed better on two measures of unbiased eyewitness recall: free recall (0.49); and non-leading specific questions (0.56). Similarly, those with higher

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Table 4. Correlations between cognitive variables (GSS free recall, yield, shift, speed of information processing [SIP], verbal IQ, non-verbal IQ, age) and eyewitness questions

	GSS free**	GSS yield	GSS shift	SIP*	Non-verbal IQ	Verbal IQ	Age
Free recall	**0.64***	−0.11	0.21	**0.49***	**0.41***	0.20	**0.51***
	0.44*	**−0.38***	−0.22	0.16	0.17	0.09	**0.73***
General	0.47	−0.03	0.10	0.42	0.28	0.20	0.27
	0.37	0.00	−0.12	0.19	0.24	**0.44***	−0.02
Errors (free + general)	−0.21	0.21	−0.07	−0.24	0.12	−0.12	0.10
	0.43*	−0.31	−0.26	0.25	0.14	**0.38***	0.21
Non-leading specific	**0.57***	−0.09	0.30	**0.56***	0.17	0.38	0.23
	0.40*	−0.27	−0.25	−0.01	0.14	0.14	0.27
Misleading specific	−0.06	**−0.74***	0.09	0.16	−0.14	0.33	0.13
	0.01	−0.16	−0.23	−0.12	−0.11	−0.05	0.07
Correctly leading yes/no	0.09	0.22	−0.30	−0.01	0.06	−0.14	0.17
	−0.09	0.02	0.05	−0.16	0.10	0.04	−0.11
Misleading yes/no	0.46	−0.21	0.08	0.33	0.13	**0.44***	0.08
	0.37	**−0.39***	**−0.46***	**0.51***	0.28	0.20	0.26

*$p < 0.01$ (in bold).
**Data from 10 participants with ID missing.
Note: Higher scores on GSS yield/shift denote higher suggestibility; higher scores on eyewitness measures denote greater accuracy/lower suggestibility. Line 1 gives correlations for the ID group, line 2 gives correlations for the TD group.

GSS free recall scores did better on eyewitness free recall (0.64) and non-leading specific questions (0.57). GSS yield scores were strongly related to performance on misleading specific questions (0.74), an indication that the 'real-life' and standardised measures of suggestibility were related. GSS shift showed no relationships with any of the eyewitness memory variables. Repeating the correlations, controlling for age and IQ (verbal and non-verbal IQ were run separately) did not alter the pattern of results, but significance values were somewhat reduced.

In terms of the predictions, limited evidence for links among IQ, age and the eyewitness memory variables was found. There was no evidence to support the specific notion that verbal IQ would be a better predictor of eyewitness performance than non-verbal IQ. As predicted, SIP was related to some aspects of eyewitness performance, notably, measures of unbiased recall. The predicted *specific* links between GSS free recall and eyewitness free recall on the one hand, and between GSS suggestibility and eyewitness suggestibility on the other, were found. This result replicates previous findings using live acted scenes (Henry & Gudjonsson, 1999, 2003) and extends them to a video-presented scene.

TD children

For children in the TD group, age was strongly positively related to performance on eyewitness free recall (0.73), again reflecting the main analysis. Children with higher verbal IQ's produced more information in response to general questions (0.44), but also obtained higher error scores for open-ended recall (0.38). Children with faster SIP were less suggestible on misleading yes/no questions (0.51).

GSS free recall was significantly positively related to three eyewitness memory variables: free recall (0.44); errors (0.43); and non-leading specific questions (0.40). Those

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with higher GSS free recall scores recalled more in the eyewitness task, but made more errors in open-ended recall. Those with higher GSS yield scores (indicating higher suggestibility) showed poorer free recall (−0.38) and greater suggestibility on the misleading yes/no questions (−0.39). Children with higher GSS shift scores (indicating a higher tendency to alter answers) showed poorer performance on misleading yes/no questions (−0.46). Therefore, both GSS measures of suggestibility, yield and shift, were moderate predictors of (different aspects of) eyewitness suggestibility in TD children.

With respect to the predictions, there was some evidence to suggest that verbal IQ was a better predictor of eyewitness performance than non-verbal IQ in the TD group (two significant relationships vs. none); SIP showed a significant relationship with one aspect of eyewitness performance; and somewhat specific relationships between the GSS and eyewitness measures were found.

Controlling for age and *non-verbal* IQ in the TD group had little effect on the pattern of results: it somewhat reduced the significance of the correlations (and that between eyewitness free recall and GSS free recall was no longer significant). Controlling for age and *verbal* IQ reduced significance levels more. Here, all but two correlations (SIP and shift respectively with closed misleading questions) became non-significant. This implies that some of the cognitive and GSS variables shared variance with verbal IQ and/or age, although sample sizes are insufficient for formal multiple regression analyses.

Mental age

One final issue concerns whether research on individual differences should include mental age as a variable to either augment the analyses or perhaps replace IQ. Previous work has generally not used mental age as a predictor (e.g. Henry & Gudjonsson, 1999, 2003). However, it is of interest to know whether mental age might be a useful indicator of eyewitness memory performance, particularly for those with ID, as it is an estimate of developmental level.

To examine this, correlations between the eyewitness memory variables and verbal and non-verbal mental age are included in Table 5. Of note is the fact that, for children with ID, verbal and/or non-verbal mental age showed significant relationships with five out of the seven measures of eyewitness memory performance (only two such relationships were found with IQ). Verbal mental age showed more relationships than non-verbal mental

Table 5. Correlations between verbal mental age, non-verbal mental age and each eyewitness memory question type for those in the ID and TD groups

Mental age variables/eyewitness memory questions	Verbal MA ID group	Non-verbal MA ID group	Verbal MA TD group	Non-verbal MA TD group
Free recall	**0.54***	**0.52***	**0.68***	**0.62***
General	0.39	**0.41***	0.30	0.15
Errors (Free + general)	−0.07	0.04	**0.44***	0.20
Non-leading specific	**0.56***	0.22	0.32	0.28
Misleading specific	**0.45***	0.06	0.02	−0.02
Correctly leading yes/no	−0.26	−0.04	−0.06	0.02
Misleading yes/no	**0.49***	0.10	**0.39***	0.34

*$p < 0.01$ (in bold).

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age (four vs. two). For the typically developing children, verbal mental age also showed more significant relationships with eyewitness memory performance than non-verbal mental age (three vs. one).

This implies that, for children with ID, in particular, forensic assessments that describe a child's *mental age* may provide a better indicator of likely eyewitness memory performance than chronological age and/or IQ.

DISCUSSION

The first aim of this study was to examine developmental trends in eyewitness memory performance in children with ID, and whether improvements, if found, would keep pace with any concomitant improvements found in TD peers. Developmental improvements were confined to eyewitness free recall, where both groups showed a significant increase in the amount of information recalled. However, this improvement was significantly larger for the TD children than it was for the children with ID. This implies that children with ID showed a slower rate of development in the free recall component of their eyewitness memory performance compared with TD peers between the age of 8/9 and 12 years, although it must be noted that longitudinal data in support of this conclusion would provide stronger evidence. Longitudinal evidence for slow development in auditory memory span has, in fact, been provided by Hulme and Mackenzie (1992) for children with severe intellectual disabilities. In the current study, verbal and non-verbal mental age were 14 months greater at 12 years than 8/9 years in the children with ID, so some differences in mental age were apparent. However, the difference in mental ages between the TD 8/9- and 12-year olds was considerably higher and in line with expectations (i.e. $3\frac{1}{2}$ years). The slower development in mental age for the ID group might explain why the improvement in free recall was slower.

Differences in performance between those with and without ID were far more striking than age differences. Those with ID obtained lower scores than typically developing children on free recall, general questions, non-leading specific questions, misleading specific questions and misleading yes/no questions. Compared to studies including just one age group (12-year olds) of children with ID (Henry & Gudjonsson, 1999, 2003), the current study, which included two age groups (8/9, 12 years), found stronger evidence for ID/TD differences in eyewitness recall and suggestibility. The only questions answered better by children with ID were correctly leading yes/no questions; children with ID were more likely than TD children to agree with the interviewer and obtain the correct answer. Taken as a whole, therefore, the results of this study demonstrated that: (1) age was far less important as a factor affecting eyewitness memory performance than intellectual disability; and (2) using a wider range of ages in the sample of children with ID resulted in greater performance differences between them and typically developing peers.

The second aim of the research was to examine individual differences in eyewitness memory among children with ID in more depth than had previously been done. Several aspects of the current work were novel: (1) measures of both verbal and non-verbal intelligence were included to test for possible differences between their respective relations with the eyewitness measures; (2) assessments of verbal and non-verbal mental age were included to examine whether they might be a more helpful description of performance for children with ID; (3) speed of information processing was introduced as an additional

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predictor variable, given its links with at least some aspect of general intelligence or *g* (Jensen, 1998); (4) a slightly shortened version of the Gudjonsson Suggestibility Scale 2, judged to be easier for younger children with ID, was introduced; and (5) a video-presented scene instead of a live acted scene tested the generalisability of previous findings.

This study replicated and extended the findings of previous studies using a video-presented scene (Henry & Gudjonsson, 1999, 2003). In particular, there were correlations between the eyewitness free recall measure and the Gudjonsson Suggestibility Scale 2 (GSS2) free recall measure. A similar relationship emerged between GSS free recall and performance on non-leading specific questions. These relationships were apparent for both the ID and TD groups, indicating that GSS free recall, which is a simple measure of story recall, may have utility in predicting individual performance on measures of relatively 'unbiased' recall in eyewitness interviews. The correlation between eyewitness free recall and GSS free recall was reasonably large in the group of children with ID (0.64), accounting for nearly 41% of the variance in performance. Taken together with the finding that the accuracy of free recall was very high, one could venture that in forensic contexts: (1) free recall should be accurate in children with ID; and (2) the amount of free recall may be moderately well predicted by performance on a simple test of story recall (from the GSS2). Broader measures of verbal memory (e.g. the Test of Memory and Learning, Reynolds & Bigler, 1994) may also be valuable as predictors of eyewitness free recall performance as they incorporate measures of story recall, among other measures (see Henry & Gudjonsson, 2003).

There were also correlations between the GSS measures of suggestibility (yield and shift) and the measures of suggestibility taken from the eyewitness memory interview (namely scores on misleading specific questions and scores on misleading yes/no questions); again, replicating and extending previous findings (Henry & Gudjonsson, 1999, 2003). For children with ID, the correlation between GSS suggestibility and eyewitness suggestibility was quite high (0.73), indicating that nearly 50% of the variance in performance on misleading specific questions could be accounted for by the GSS yield measure. This implies that 'yield', one of the GSS measures of interrogative suggestibility, has utility in predicting individual performance in terms of resistance to misleading questions. It must be emphasised that, for those with ID, yield predicted performance on *specific* misleading questions; whereas for the TD children, scores on both yield and shift predicted performance on *yes/no* misleading questions (to a somewhat lower degree).

Therefore, the current study has replicated and extended previous findings showing that the GSS demonstrates at least some degree of specificity in terms of how its component measures (free recall, yield and shift) relate to eyewitness memory performance (Finnila et al., 2003; Henry & Gudjonsson, 1999, 2003). In other words, the GSS free recall measure tends to relate to performance on unbiased measures of eyewitness recall (e.g. the free recall element of the eyewitness memory interview, unbiased specific questions); whereas the GSS yield measure (and to some extent GSS shift) relates more often to performance on suggestive questioning incorporated in eyewitness memory interviews (e.g. agreeing with misleading yes/no questions or providing answers to misleading specific questions). The exception to this general pattern was that eyewitness free recall was also related to GSS yield in the TD group.

Two important caveats must be considered in interpreting results of this nature, however. First, relationships between the eyewitness memory measures and the GSS measures may be present because both the eyewitness scene and the GSS story adopt a similar format—that is exposure to a story/video followed immediately by an interview about the

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story/video. The second caveat is that although relationships between standardised measures and eyewitness measures of recall and suggestibility have been fairly consistent in the studies that have examined them to date (e.g. Finnila et al., 2003; Henry & Gudjonsson, 1999, 2003), there have been some variations in their size and exact specificity (see Gudjonsson & Henry, 1999, 2003). Therefore, although the GSS may be a helpful indicator as to the likely suggestibility of individual witnesses in forensic contexts, there appears to be some evidence that these relationships may be stronger in children with ID as opposed to TD children. There is also some variation between studies in exactly what form these relationships take (e.g. whether standardised measures of suggestibility relate to performance on misleading specific questions or misleading yes/no questions; and, in the case of the GSS, whether these relationships are found only with the 'yield' measure, or whether they are found additionally with 'shift'). Further, correlations between eyewitness memory measures and the GSS measures are often modest. This means that, in forensic contexts, although one could gain an *impression* of the likely levels of recall and suggestibility in an individual witness from looking at GSS scores, it is still entirely possible that a reliable witness could score poorly on this test.

Strong and consistent relationships between IQ and performance on the eyewitness memory measures were not predicted, based on the previous research reviewed earlier. However, a new hypothesis was that verbal IQ might show stronger links with eyewitness recall and suggestibility than non-verbal IQ. In TD children, verbal IQ showed two significant relationships with eyewitness performance (performance on general questions and errors); whereas non-verbal IQ showed none. This provided some support for the prediction that verbal IQ would relate more strongly to eyewitness performance than non-verbal IQ. However, there was no such supportive evidence in the group of children with ID. Verbal and non-verbal IQ, respectively, showed only one relationship with eyewitness recall each: verbal IQ was related to performance on misleading yes/no questions; and non-verbal IQ was related to performance on free recall. Therefore, as expected on the basis of previous literature, *within* each of the ability groups, IQ showed only a modest number of relationships with the eyewitness memory variables. There was some evidence to support the prediction that verbal IQ would relate more strongly to eyewitness performance than non-verbal IQ, but only in the TD sample.

The link between IQ and suggestibility in children with ID has been consistent. Other experimental studies have found it (Henry & Gudjonsson, 1999, 2003), and it emerged as a key conclusion from a recent review on individual differences in children's suggestibility (Bruck & Melnyk, 2004). Therefore, IQ may offer a useful indicator of suggestibility in populations of children with ID. Whether there is any explanation for the fact that, in children with ID, verbal IQ was related to a measure of biased recall, whereas for TD children verbal IQ was related to aspects of unbiased recall is not clear. However, relationships between IQ and individual measures of eyewitness performance were certainly less striking *within* the ability groups than *between* the ability groups, where IQ was a significant factor for nearly every eyewitness question type.

Additional analyses were included of the relationships between verbal/non-verbal *mental age* and eyewitness memory performance, as these have not been examined before. Results indicated that there were consistent relationships between many aspects of eyewitness memory performance and mental age. This was certainly more true for the ID group, where five of the seven eyewitness measures showed significant relationships with one or other of the mental age measures. Verbal mental age appeared to be the stronger predictor in terms of absolute number of significant relationships, giving some additional

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support for the specific link between verbal measures of ability and eyewitness performance in the ID group. In general terms, IQ may provide an indicator of facility for learning and problem-solving, whereas mental age provides an estimate of developmental level. In forensic contexts, developmental level, particular for those with ID, may be a better estimate of likely eyewitness recall and suggestibility than either age or IQ.

Relationships between speed of information processing and eyewitness performance had not been examined before. As predicted, SIP did show some positive relationships with the eyewitness memory variables. In children with ID, faster SIP related positively to two aspects of unbiased eyewitness recall (free recall, non-leading specific questions). Perhaps faster cognitive operations (e.g. faster encoding and storage) allowed those with ID to assimilate the scene more rapidly and fully, and, hence provide more accurate and detailed responses to straightforward (i.e. unbiased) questions. In TD children, SIP was related to suggestibility in response to misleading yes/no questions. Perhaps most of the typically developing children may have had fast enough rates of processing to assimilate the basic facts about the scene (i.e. over some baseline level), whereas those with even faster rates of processing were able to switch attention to more subtle features in the scene which aided them in resisting misleading questions. Although the interpretation of these results remains speculative at present, relationships between SIP and eyewitness memory performance warrant further study.

In summary, differences in recall and suggestibility between groups of children with ID and typically developing children were far more marked than age differences between 8/9- and 12-year olds. The aspect of eyewitness performance that developed within this age range was free recall, with improvements being slower for children with ID than TD children. In terms of individual differences, this study replicated evidence for links between several cognitive measures, eyewitness recall and suggestibility in children with and without ID, extending these findings to a different eyewitness task and additional cognitive variables such as SIP. Finally, evidence was provided that measures of mental age may be better predictors of eyewitness recall and suggestibility in children with ID than either verbal or non-verbal IQ.

It must be noted, however, that compared to real forensic contexts, the eyewitness interview was very soon after seeing the event, the interview took place in a familiar environment (the child's school) and the atmosphere of the interview was friendly and encouraging. In forensic contexts, longer delays between witnessing an event and being interviewed, as well as a range of additional internal and external pressures are likely to be implicated, and these may impact on the predictive ability of the individual difference variables. It is also possible that those with ID may find it more difficult to cope with the uncertainty, expectations and pressures of a more stressful or traumatic interview than TD children, thus, further affecting how individual difference variables may impact on recall and suggestibility.

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REFERENCES

Agnew, S. E., Powell, M. B. (2004). The effect of intellectual disability on children's recall of an event across different question types. *Law and Human Behavior, 28*, 273–294.

Anderson, M. (2001). Annotation: Conceptions of intelligence. *Journal of Child Psychology and Psychiatry, 42*, 287–298.

Borkowski, J. G., Peck, V. A., & Damberg, P. R. (1991). Attention, memory and cognition. In J. L. Matson, & J. A. Mulick (Eds.), *Handbook of mental retardation* (2nd ed., pp. 479–497). New York: Pergamon.

Bruck, M., & Ceci, S. J. (1999). The suggestibility of children's memory. *Annual Review of Psychology, 50*, 419–439.

Bruck, M., & Melnyk, L. (2004). Individual differences in children's suggestibility: A review and synthesis. *Applied Cognitive Psychology, 18*, 947–996.

Bruck, M., Ceci, S. J., & Melnyk, L. (1997). External and internal sources of variation in the creation of false reports in children. *Learning and Individual Differences, 9*, 289–316.

Bull, R. (1995). Innovative techniques for the questioning of child witnesses, especially those who are young and those with a intellectual disability. In M. S. Zaragoza, J. R. Graham, G. C. N. Hall, R. Hirschman, & Y. S. Ben-Porath (Eds.), *Memory and testimony in the child witness* (pp. 179–194). London: Sage Publications Ltd.

Burack, J. A., & Zigler, E. (1990). Intentional and incidental memory in organically mentally retarded, familial retarded, and nonretarded individuals. *American Journal on Mental Retardation, 94*, 532–540.

Burgwyn-Bailes, E., Baker-Ward, L., Gordon, B. N., & Ornstein, P. A. (2001). Children's memory for emergency medical treatment after one year: The impact of individual difference variables on recall and suggestibility. *Applied Cognitive Psychology, 15*, S25–S48.

Cardone, D., & Dent, H. (1996). Memory and interrogative suggestibility: The effects of modality of information presentation and retrieval conditions upon the scores of people with learning disabilities. *Legal and Criminological Psychology, 1*, 165–177.

Chae, Y., Ceci, S. J. & (2005). Individual differences in children's recall and suggestibility: The effect of intelligence, temperament, and self-perceptions. *Applied Cognitive Psychology, 19*, 383–407.

Danielsdottir, G., Sigurgeirsdottir, S., Einarsdottir, H. R., & Haraldsson, E. (1993). Interrogative suggestibility in children and its relationships with memory and vocabulary. *Personality and Individual Differences, 14*, 499–502.

Dent, H. R. (1986). An experimental study of the effectiveness of different techniques of questioning mentally handicapped child witnesses. *British Journal of Clinical Psychology, 25*, 13–17.

Dunn, G. (1989). *Design and analysis of reliability studies: The statistical evaluation of measurement errors*. New York: Oxford University Press.

Dunn, L. M., Dunn, L. M., Whetton, C., & Burley, J. (1997). *The British Picture Vocabulary Scale II*. Windsor, Berkshire: NFER-Nelson.

Elischiberger, H. B., & Roebers, C. M. (2001). Improving young children's free narratives about and observed event: The effects of nonspecific verbal prompts. *International Journal of Behavioral Development, 25*, 160–166.

Elliott, C. D. (1996). *British Ability Scales II Administration and Scoring Manual*. Windsor, Berkshire: NFER-Nelson.

Endres, J. (1997). The suggestibility of the child witness: The role of individual differences and their assessment. *The Journal of Credibility Assessment and Witness Psychology, 1*, 44–67.

Finnila, K., Mahlberg, N., Santtila, P., Sandnabba, K., & Niemi, P. (2003). Validity of a test of children's suggestibility for predicting responses to two interview situations differing in their degree of suggestiveness. *Journal of Experimental Child Psychology, 85*, 32–49.

DOI: 10.1002/acp

Geddie, L, Fradin, S., & Beer, J. (2000). Child characteristics which impact accuracy of recall and suggestibility in preschoolers: Is age the best predictor? *Child Abuse and Neglect, 24*, 223–235.

Gordon, B. N., Jens, K. G., Hollings, R., & Watson, T. E. (1994). Remembering activities performed versus those imagined: Implications for testimony of children with mental retardation. *Journal of Clinical Child Psychology, 23*, 239–248.

Gudjonsson, G. H. (1988). The relationship of intelligence and memory to interrogative suggestibility: The importance of range effects. *British Journal of Clinical Psychology, 27*, 185–187.

Gudjonsson, G. H. (1997). *The Gudjonsson Suggestibility Scales Manual*. Hove, East Sussex. Psychology Press.

Henry, L. A., & Gudjonsson, G. H. (1999). Eyewitness memory and suggestibility in children with mental retardation. *American Journal on Mental Retardation, 104*, 491–508.

Henry, L. A., & Gudjonsson, G. H. (2003). Eyewitness memory, suggestibility and repeated recall sessions in children with mild and moderate intellectual disabilities. *Law and Human Behavior, 27*, 481–505.

Henry, L. A., & Gudjonsson, G. H. (2004). The effects of memory trace strength on eyewitness recall in children with and without intellectual disabilities. *Journal of Experimental Child Psychology, 89*, 53–71.

Home Office in conjunction with Department of Health. (1992). "*Memorandum of Good Practice on Video Recorded Interviews with Child Witnesses for Criminal Proceedings*". London: HMSO.

Home Office in conjunction with Department of Health, Crown Prosecution Service, Lord Chancellor's Office, The National Assembly for Wales. (2001). *Achieving best evidence in criminal proceedings: Guidance for vulnerable or intimidated witnesses, including children*. London: Crown Copyright.

Hulme, C., & Mackenzie, S. (1992). *Working memory and severe learning difficulties*. Hove, U.K.: Lawrence Erlbaum Associates.

Jensen, A. (1998). *The g factor*. Westport: Praeger.

Kail, R. (1992). General slowing of information-processing by persons with mental retardation. *American Journal on Mental Retardation, 97*, 333–341.

McFarlane, F., Powell, M. B., & Dudgeon, P. (2002). An examination of the degree to which IQ, memory performance, socio-economic status and gender predict young children's suggestibility. *Legal and Criminological Psychology, 7*, 227–239.

Michel, M. K., Gordon, B. N., Ornstein, P. A., & Simpson, M. A. (2000). The abilities of children with mental retardation to remember personal experiences: Implications for testimony. *Journal of Clinical Child Psychology, 29*, 453–463.

Milne, R., & Bull, R. (1998). Interviewing children with and without a LD (mental retardation). *Paper Presented at the American Psychology and Law Conference*, Los Angeles.

Pear, T. H., & Wyatt, S. (1914). The testimony of normal and mentally defective children. *British Journal of Psychology, 6*, 387–419.

Quas, J. A., Qin, J., Schaaf, J. M., & Goodman, G. S. (1997). Individual differences in children's and adults' suggestibility and false event memory. *Learning and Individual Differences, 9*, 359–390.

Reynolds, C. R., & Bigler, E. R. (1994). *Test of memory and learning* (TOMAL). Austin, Texas: Pro-ed.

Roebers, C. M., & Schneider, W. (2001). Individual differences in children's eyewitness recall: The influence of intelligence and shyness. *Applied Developmental Science, 5*, 9–20.

Rudy, L., & Goodman, G. S. (1991). Effects of participation on children's reports: Implications for children's testimony. *Developmental Psychology, 27*, 527–538.

Weiss, B., Weisz, J. R., & Bromfield, R. (1986). Performance of retarded and nonretarded persons on information-processing tasks: Further tests of the similar structure hypothesis. *Psychological Bulletin, 100*, 157–175.

Westcott, H. (1991). The abuse of disabled children: A review of the literature. *Child: Care, Health and Development, 17*, 243–258.

Westcott, H. L., & Jones, D. P. H. (1999). Annotation: The abuse of disabled children. *Journal of Child Psychology and Psychiatry, 40*, 407–506.

Williams, C. (1995). *Invisible victims: Crime and abuse against people with learning disabilities*. London: Jessica Kingsley Publishers.

DOI: 10.1002/acp

Wilson, C., & Brewer, N. (1992). The incidence of criminal victimisation of individuals with an intellectual disability. *Australian Psychologist, 27*, 114–117.
Young, K., Powell, M. B., & Dudgeon, P. (2003). Individual differences in children's suggestibility: A comparison between intellectually disabled and mainstream samples. *Personality and Individual Differences, 35*, 31–49.

APPENDIX: FULL LIST OF EYEWITNESS MEMORY QUESTIONS

Free Recall

Tell me everything you can remember about the video.
Anything else?
One last think?

General Questions:

Tell me about the people in the video. What did they look like? What did they do?

Open-ended non-leading questions:

What colour was the car the children were driving?
How many children were in the car?
What did they ask the little boy in the back to pretend?
What clothes was the petrol man wearing?
Who did they say was paying for the petrol?
What colour was the handle on the petrol nozzle?
What was the name of the boy that was driving?
What did they say their dad was doing?
What colour was the man on the phone's car?
What did the big girl throw out of the window?

Open-ended misleading questions:

What colour was the little boy's hat?
Who was eating some food in the car?
What was the petrol man's name?
What did the very little girl say?
Where did the big girl put her handbag?
What colour was the police car?
How much money did the children have?
Who did the man on the phone get cross with?
What colour were the big girl's boots?
What toy did the children have in the back?

Closed correctly leading questions:

The big girl had hair to her shoulders, didn't she?
The children didn't pay for the petrol, did they?

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There was a motorbike getting petrol, wasn't there?
The petrol man wasn't skinny, was he?
The big girl's name was Kate, wasn't it?
The car didn't break down, did it?
The man on the phone didn't look at them, did he?
The petrol man asked who was paying, didn't he?
It wasn't raining, was it?
The big girl wore a jean jacket, didn't she?

Closed misleading questions:

The big girl closed the car door properly, didn't she?
The car wasn't very old, was it?
The petrol man said he would tell their parents, didn't he?
There was no dog in the car, was there?
The petrol man didn't have a car picture on his hat, did he?
The big boy said they were running away, didn't he?
The children all had blond hair, didn't they?
The petrol man wasn't carrying anything, was he?
The big boy didn't wear a blue shirt, did he?
There was a queue at the petrol station, wasn't there?

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