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A comparison of adults' and children's metacognition for yes/no recognition decisions☆

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ABSTRACT

Basic metacognitive development research suggests that metacognitive abilities develop before adolescence. However, this research has not used tasks that require the discrimination of seen from unseen stimuli, an important element of real-world recognition tasks such as eyewitness identification. We tested the idea that children would be less able to monitor and control the accuracy of their memories in such a task. We used a word-pair recognition task to compare children's (109 8–12 year olds) and adult's (102 first-year psychology students) ability to adaptively make, monitor, and control the reporting of yes/no recognition decisions about familiar stimuli in a task with no demand effects. We found that adults were substantially better at discriminating old from new stimuli, but no evidence of an age difference in metacognitive ability. Although these results do not explain children's poor metacognition in eyewitness identification, they suggest potential steps to improve children's identification performance.

The usefulness of memory reports in many real-world situations depends not only on successful memory retrieval, but also on metamemory. Specifically, people are faced with such decisions as when to terminate an unsuccessful memory search, whether or not to report a retrieved answer, and how much faith they can put in the veracity of a memory. Importantly, while many memory processes continue to develop across childhood (e.g., working memory, Dempster, 1981), the developmental literature suggests basic metamemory processes are in place during the primary school years (Butterfield, Nelson, & Peck, 1988; Schneider & Lockl, 2008). Indeed, children as young as 8 years old were able to successfully discriminate correct from incorrect memories in both recognition (Roebers, 2002) and recall (Roebers & Howie, 2003) tasks. Further, children also have also shown the ability to monitor and control their recall and recognition decisions by improving accuracy with the use of a *not sure* option (Koriat, Goldsmith, Schneider, & Nakash-Dura, 2001; Roebers & Fernandez, 2002; Roebers & Schneider, 2005). In contrast, evidence from eyewitness identification, an important real-world memory task, has consistently shown deficits, relative to adults, in discrimination of correct from incorrect decisions (Brewer & Day, 2005; Keast, Brewer, & Wells, 2007) and use of *not sure* (Brewer, Keast, & Sauer, 2010). Although there are many potential explanations of this deficit (e.g., the complexity of the lineup decision task and stimuli or the perceived demand effects), one obvious reason has gone largely unexplored; specifically, eyewitness identification requires discrimination of seen from unseen stimuli (as well as the choice of the best-matching stimulus from the array). Interestingly, the majority of metamemory research has been conducted using recall or multiple-choice recognition tasks. Here we provide the first direct examination of this issue in a non-eyewitness task. Specifically, we conducted a single experiment comparing the memory and metamemory performance of adults and children in a recognition task that required participants to distinguish between previously seen and unseen stimuli.

What do we know about children's metamemory in tasks involving seen–unseen discrimination? As this question has only been investigated in eyewitness identification research, it can be reframed as asking what we know about children's eyewitness identification metamemory. First, there seems little doubt that children are less able than adults to monitor the accuracy of their lineup decisions. Specifically, they are substantially more overconfident than adults in their decisions and their confidence is less useful in discriminating correct from incorrect lineup decisions (Brewer & Day, 2005; Keast et al., 2007). This contrasts starkly with the evidence for adults that demonstrates, at least for positive identifications, consistent confidence–accuracy calibration and resolution (Brewer & Wells, 2006; Sauer, Brewer, Zweck, & Weber,

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2010). This poor monitoring flows through into the effectiveness of metacognitive control. Weber and Perfect have demonstrated that, when explicitly offered the option of responding *don't know*, adults are able to substantially improve the accuracy of identifications from lineups (Perfect & Weber, 2012; Weber & Perfect, 2012). In contrast, the benefit for children offered such an option, along with clear instructions and incentives for its use, is inconsistent at best (Brewer et al., 2010; Pozzulo & Lindsay, 1997). Thus, children appear relatively unable to distinguish identification decisions with a strong memorial basis from those that are relatively weak. However, these data do not speak to whether this metamemorial deficit is due to the nature of the eyewitness identification task or reflects the development of metamemorial ability.

Here, we tested the idea that children's deficit reflects metamemorial development; Specifically, that it is associated with the relatively slow development of the ability to assess uncertainty. Children's ability to make certainty judgments appears to develop ahead of their ability to appropriately assess uncertainty (Roebers & Howie, 2003; Roebers, von der Linden, & Howie, 2007; Roebers, 2002). In other words, children are less able to accurately assess the amount of doubt they should have about the accuracy of a decision. We suggest that it is this inability that underpins children's relatively poor metacognitive performance in identification tasks. In lab-based metamemory studies children are typically asked to recognise a studied item from an array of options (Butterfield et al., 1988; Roebers, 2002) or to recall (e.g., Roebers & Fernandez, 2002; Roebers & Howie, 2003; Roebers & Schneider, 2005) a studied item. In both cases, discrimination between correct and incorrect can be achieved by a sole focus on certainty. Specifically, in a multiple-choice task, the amount of certainty in the chosen option relative to the next best option is likely to provide a good index of the accuracy of the decision. Similarly, the indicators of certainty in the accuracy of a recalled item (e.g., the fluency with which it came to mind) provide a good reflection of accuracy. However, tasks involving seen and unseen stimuli (e.g., the lineup) present a clearly distinct situation. In this context, the extent to which one stimulus matches better than the others is an insufficient basis for confidence. The individual must also take into account the extent to which this absolute level of match could be observed for a stimulus that was not previously seen. This is best demonstrated by the class of models that most successfully describe confidence in two-choice tasks (see, e.g., Baranski & Petrusic, 1998). When applied to recognition, these models demonstrate that realistic confidence judgments must be based on the balance of evidence favouring old versus new decisions (Merkle & Van Zandt, 2006; Van Zandt, 2000). Thus, failure to consider uncertainty, or the evidence that a stimulus could be new, would lead to confidence judgments that poorly reflect the accuracy of the decision. Therefore, we posit that this requirement to not only choose a good match, but also make a yes/no decision about whether or not the best match was actually seen, underlies children's poor metamemory performance in eyewitness identification tasks.

Evidence for children's failure to appropriately consider uncertainty is provided by children's poor performance at the lineup task itself. This performance is most notably characterised by children's tendency to make too many positive identifications (Beal, Schmitt, & Dekle, 1995; Parker & Ryan, 1993; Pozzulo & Lindsay, 1998). The neglect of uncertainty could cause false alarms in two ways. First, a participant may fail to appreciate the extent to which an unseen stimulus may appear familiar and, therefore, accept too little a stimulus-memory match as evidence of previous exposure. In other words, a lenient decision criterion could be adopted. Second, recent evidence suggests that the information people use to make memory judgments is malleable; either directly through instruction (Lane, Roussel, Starns, Villa, & Alonzo, 2008) or indirectly as the result of feedback (Palmer, Brewer, & Weber, 2010). Thus, participants who neglect to consider uncertainty, or are less able to consider it accurately, may have less diagnostic memorial evidence available as the basis for a memory decision. Either mechanism, or indeed a combination of the two, could produce the pattern of increased false alarms to target-absent lineups and the frequently higher rate of foil identifications in target-present lineups displayed by children relative to adults. Thus, we suggest that the assessment of the extent to which an item's match to memory is indicative of prior exposure could be the key ability in which children are less developed than adults.

As basic studies in metacognitive development have not focussed on this issue, a sensible first step was to examine children's ability (relative to adults') to make, monitor, and control yes/no recognition decisions. Importantly, to ensure that we were providing a reasonable assessment of these abilities, we chose a task that gave the children the best possible chance of succeeding. Thus, we used a task that involved the simplest possible yes/no decision and used simple stimuli that are well known to children. Specifically, a group of adults and a group of children (8–12 years old) studied a list of words commonly known and easily read by 5–7 year-old children (Cox, 2006). Their memory was tested by presenting single-word trials in which participants were simply asked to indicate whether or not that word was studied. To examine monitoring ability, we asked participants to rate their confidence that they had made an accurate decision. Finally, to examine metacognitive control we gave half of our participants the option to respond *don't know* rather than give answers about which they were unsure. Importantly, this task gave us the ability to examine children's memory and metacognitive abilities in a task without the demands and complexities of eyewitness identification, any of which may be a particular problem for children and be the source of, or a contributor to, their poor performance. If children's inability to monitor uncertainty does affect metamemory in a seen/unseen memory task, we expected that, relative to adults, the children would be less able to: (i) set an appropriate yes/no decision criterion, (ii) distinguish correct from incorrect recognition decisions, or (iii) adaptively use a *don't know* response option.

1. Method

1.1. Participants and design

One hundred and nine child participants (83 male and 26 female) ranging in age from 8.19 to 12.07 years old ($M = 10.46$, $SD = 0.84$) were recruited from independent schools around Adelaide. As a comparison group 102 first year psychology students (27 male and 75 female), ranging in age from 18 to 59 years old ($M = 24.08$, $SD = 9.18$) participated for course credit. Participants in each age group were allocated randomly to complete the study under free- or forced-report conditions. We used a 2 (age group: child, adult) × 2 (report option: free-report; forced-report) between-subjects design.

1.2. Materials

The word-pair recognition task was completed on a computer. We selected age-appropriate stimuli by taking 84 English words from those identified as frequently used and consistently able to be read by children from 5 to 7 years old (below our age range) in the Dolch Wordlist of nouns and sight words (Cox, 2006). These words were designated randomly as either a cue, a target, or a target-replacement, resulting in 28 stimulus triplets. All triplets were checked to ensure no forwards or backwards association existed between any of the words. In the study phase participants were presented with the cue and target words printed on the screen. In