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Individual Differences in Children's Suggestibility: A Review and Synthesis

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SUMMARY

Over the last decade, there has been a significant growth in the study of individual differences factors predicting children's suggestibility. In this paper, we synthesize the results of 69 studies examining the relationship of demographic factors (socioeconomic status and gender), cognitive factors (intelligence, language, memory, theory of mind, executive functioning, behavioural ratings of distractibility, and creativity), and psycho-social factors (social engagement, self concept/self-efficacy, stress/emotional arousal/state anxiety, maternal attachment styles, parent-child relationship, parenting styles, temperament, and mental health) and children's suggestibility. We found that for cognitive factors, language ability and creativity were fairly consistently related to suggestibility. The highest correlations for psycho-social factors and suggestibility were obtained for measures of self-concept/self-efficacy, maternal attachment, and the parent-child relationship. Implications for future research and mechanisms underlying children's suggestibility are discussed. Copyright © 2004 John Wiley & Sons, Ltd.

In 1997, we wrote a review paper on individual differences in children's suggestibility (Bruck, Ceci, & Melnyk, 1997). Most of the paper focused on external (interviewing) factors that increased or decreased suggestibility specifically among preschoolers. A small section of that paper reviewed the existing literature on 'internal factors' that included cognitive and psycho-social factors. At that writing, there were very few empirical studies examining individual differences in suggestibility; our paper only included 20 references of such studies and most of these focused on the relationship of suggestibility with intelligence and memory. Seven years later, the number of studies in this area has greatly increased and we update our review of the literature. In this paper, we focus on the association of children's suggestibility with cognitive, psycho-social, and to a lesser degree, demographic variables.

Studies of individual difference are important for theoretical and applied purposes. Theoretically, they address issues of mechanisms underlying suggestibility effects. For example, there is on-going debate about the relative importance of social versus cognitive

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factors that underlie suggestibility effects. On the one hand, is argued that the child (or adult) adopts suggestions in order to defer to or comply with the agenda of the questioner. In other words, for social reasons, the child repeats suggestions that she knows to be inaccurate. At the other extreme, there is the view that suggestibility effects reflect cognitive weaknesses. For example, the child may incorporate a suggestion because he forgets the original event, or is confused as to whether he saw the original event or the suggestion. Of course, both factors may underlie suggestibilility effects; for example, social factors may first influence assents to misinformation or misleading questions, but with time the assents may lead to cognitive impairments involving memory changes (see Ceci & Bruck, 1995). We attempted to use results of existing studies to address some of these issues. On the applied side, knowledge of the types of children who are most prone or most resistant to suggestion would be of great importance to the mental health and legal systems. In terms of mental health practitioners, it would alert them to be highly cautious in using certain techniques with children who fit the profile of 'highly suggestible.' In the forensic arena, it would provide the court with important information about the risk that certain suggestive techniques would have in tainting a specific child's testimony.

There are different levels of our analyses in this paper. The major focus is at the descriptive level; the number of studies that yielded significant and nonsignificant effects was compared for a variety of demographic, cognitive, and psycho-social variables. Next, when possible, we attempt to pinpoint some a priori factors (i.e. sample size, suggestibility paradigm, delay between event and interview, age of the child) that may differentiate significant from nonsignificant results. In doing so, our analyses address two conceptual issues in the study of individual differences in children's suggestibility. The first concerns the possibility that social factors may correlate with certain measures of suggestibility whereas cognitive factors might correlate with other measures. If our hypothesis is correct, this would suggest that there are different types of suggestibility, each associated with different psychological mechanisms. In this review paper, we attempted to differentiate four components of suggestibility: (i) *interrogative suggestibility* (how readily one assents to misleading questions or agrees with misinformation about a target event); (ii) *misinformation effects* (the incorporation of false information into later reports about a target event); (iii) *source misattribution* (the inability to explicitly differentiate whether suggested details about a target event actually occurred or whether the details were suggested; this measure serves as an indication of whether the misinformation effect reflects false beliefs); and (iv) *false event creation* (through suggestive techniques, the construction of a narrative of an entire event that never occurred). Based on current theoretical models of the relative importance of social versus cognitive mechanisms underlying suggestibility, we predicted that psycho-social factors (e.g. self-concept, compliance) rather than cognitive factors (e.g. intelligence, memory) would be associated with interrogative suggestibility, especially when there was a short delay between the event and suggestive questioning. We also predicted that misinformation effects and source monitoring errors would be most highly correlated with cognitive rather than social variables. There were no specific predictions as to the types of factors that might predict false event creation.

The second conceptual focus was on age differences and the study of individual differences in children's suggestibility. In the past few years, it has become more apparent that although there may be age differences in children's suggestibility, with preschool children being the most suggestible, suggestibility levels remain high throughout the elementary school years (see Bruck & Ceci, 2004). Given these findings, the examination of potential individual differences in children's suggestibility cannot be limited to skills

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that rapidly develop in the preschool years. For example, even though a number of studies have shown that theory of mind is related to preschoolers' suggestibility levels (e.g. Templeton & Wilcox, 2000; Welch-Ross, 1999; Welch-Ross, Diecidue, & Miller, 1997), this skill that develops by 5 or 6 years of age cannot explain suggestibility at older ages. This raises the possibility that the psychological factors that underlie suggestibility in preschool children may differ from those that underlie suggestibility in older children. Of course, it is also possible that after controlling for age, the same factor is an important predictor of suggestibility across different developmental levels.

Finally, our analyses also focused on the extent to which there is a 'file-drawer' phenomenon with respect to this topic of study. In other words, we asked whether there was a trend to publish only significant findings. This issue was motivated by a personal experience. One of the authors of this paper (LM) had examined individual differences in children's suggestibility as part of her doctoral thesis (Melnyk, 2002). Several psychosocial measures were correlated with various measures of preschoolers suggestibility assessed at two different delays. It was disappointing to find that only 6/91 correlations were significant in the predicted direction. Although parts of the thesis have been published (Melnyk & Bruck, 2004), the individual difference measures were omitted from the manuscript. In order to determine whether this pattern of publication characterized other research in the field, we reviewed as many studies and theses as possible that were not published (or where pieces of studies were not published).

It is important to point out that our review of the literature is not a meta-analysis. At this point of time, this approach was unfeasible because there was simply not enough information available from many of the studies (even the published one) to calculate the necessary statistics.

To foreshadow the analytic adventure that we undertook, there were points of the journey when we thought this was a wasted undertaking; that it was not possible to capture with any precision or consistency individual differences in suggestibility because suggestibility was an independent trait; because of problems with reliability or validity of the measures and because of underspecified predictive models. However, there were also avenues of light; we will show that although not entirely consistent, there are indeed some concepts and skills that may mirror underlying mechanisms of suggestibility in childhood and that deserve future study.

METHOD

Studies included in this review were identified from four different sources. First, we searched PsycINFO (through to April 2004) using the following terms: suggestibility, misinformation and individual differences; we also included combination searches of suggestibility with individual predictors (e.g. intelligence, creativity, etc.). These as well as all other searches were limited to studies of children 17 years and younger. Second, similar searches were conducted using the *Dissertation Abstracts* database. Third, we conducted manual searches of the last three conference programme books for the *Society for Research in Child Development* (1999, 2001, 2003) and the *Society for Applied Research in Memory and Cognition* (1999, 2001, 2003). Finally, e-mails and letters were sent out to authors and thesis advisors of the identified studies. They were asked to list all papers, talks, or unpublished data that were produced in their lab that were relevant to individual differences and children's suggestibility. For each citation, the researcher was

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asked to specify the authors and title of the study, when the study was conducted, the age range of the participants, the individual difference (predictor) variables, suggestibility/memory measures, and a summary of their findings. We also asked whether the study was published or presented at a conference and if so, whether the individual difference measures were included in the publication or report. If available, the respondents were asked to send us a copy of the paper, conference presentation, or thesis.[1]

Inclusion/exclusion criteria

The term 'individual differences' was used to cover a host of variables and experimental designs. We included studies where the measure of suggestibility included: (i) responses to misleading questions; (ii) responses to suggestive techniques, such as changing answers to questions that were repeated or that were accompanied with positive reinforcement; or confabulating details when told to think hard about a non-experienced event; and (iii) answers to direct questions that were asked after misinformation was provided.

We excluded measures that focused solely on children's responses to direct questions that were not preceded by suggestive questions or techniques. These usually take the form of yes/no questions and are sometimes called absent feature questions (e.g. Ornstein, Baker-Ward, Gordon, & Merritt, 1997).

Although we included individual differences measures in the domain of memory, these had to be independent from the suggestibility paradigm or study. Thus we excluded analyses in which suggestibility was correlated with memory of the suggested event or with source attributions of the target event. However, studies were included in which memory of one event was correlated with suggestibility in a second event. We also included studies that examined the association between suggestibility and independent measures of memory (e.g. digit span, memory for pictures). This procedure ensured that our analyses focused on children's general characteristics that predicted suggestibility.

Studies that examined the association of suggestibility across experimental paradigms were also excluded from the database. Such studies focus on issues of stability (e.g. they examined whether suggestibility is a trait) and of reliability of the measures, but these designs do not focus on various psychological mechanisms that underlie children's suggestibility.

Coding the database: Descriptive information

Fifty-eight different citations describing 69 separate studies,[2] representing 4848 children, are included in our final database. For each study, we coded the publication status, age of participants, number of participants, the target event to be remembered, measures of suggestibility, and the delay between event and questioning. The list of studies with the descriptors appears in Table 1. Summaries of the descriptive information are now presented.

Publication status

Just over half (54%) of the data presented in this paper are currently available to consumers of the literature, either in the form of published/in press journal articles or book chapters. With time, more will probably be submitted (and accepted) for publication.

[1]Response rates were almost at ceiling. We are enormously grateful to the researchers who not only replied but sent us material and tirelessly answered our questions.
[2]Six citations include more than one study.

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Table 1. Summary of the research designs

Study	Publication status[a]	Age (years)	*n*	Event	Measure of suggestibility	Delay (days)
Agnew and Powell (2004)	Journal	9–12[b]	142	Interactive	Misinformation	4
Alexander et al. (2002)	Journal	3–7	51	Medical procedure	Misleading Qs	14
Bartlett (2001)	Thesis	9–12	48	Video	Misleading Qs	0
Blackford and Shapiro (1999)	Conference	6–11	30	Video	Misleading Qs Misinformation	0 & 49[c]
Bottoms, Quas, and Davis (in press)	Chapter	7–8	57	Interactive	Misleading Qs	365
Bright-Paul (2004, Study 1)	Thesis	3–6	34	Video	Misinformation Source monitoring	0
Bright-Paul (2004, Study 2)	Thesis	3–7	45	Video	Misinformation Source monitoring	7
Brown (1999, Study 1)	Thesis	6–7	27	Event creation	False reports in 4 sessions	4 weekly sessions
Brown (1999, Study 2)	Thesis	5–6	44	Event creation	False reports in 3 sessions	3 weekly sessions
Bruck, Ceci, Francoeur, and Barr (1995)	Journal	4–6	75	Medical procedure	Misinformation	120–540
Burgess (2000)	Thesis	4–6	40	Interactive	Misleading Qs	0
Burgwyn-Bailes, Baker-Ward, Gordon, and Ornstein (2001)	Journal	3–7	20	Medical procedure	Misleading Qs	4, 60 & 365
Chae (2004)	Thesis	5–6, 7–8	134	Staged	Misleading Qs	7
Chen (2002)	Thesis	4–5, 9–10	30	Video	Misleading Qs	0 & 49
Clarke-Stewart, Malloy, and Allhusen (2004)	Journal	5	70	Interactive	Misleading Qs	270
Crossman (2001)	Thesis	3–6	75	Staged	Misleading Qs	10
Danielsdottir, Sigurgeirsdottir, Einarsdottir, and Haraldsson (1993)	Journal	6, 8, 10, 12	120	Story	Misleading Qs Shift	0
Davis and Bottoms (2002)	Journal	6–7	81	Interactive	Misleading Qs	0
Eisen, Goodman, Qin, and Davis (2002)	Journal	3–17	189	Medical procedure	Misleading Qs	3
Geddie, Fradin, and Beer (2000)	Journal	3–7	56	Interactive	Misleading Qs	10
Goodman, Hirschman, Hepps, and Rudy (1991, Study 1)	Journal	3–8	18	Medical procedure	Misleading Qs	3

Continues

Table 1. Continued

Study	Publication status[a]	Age (years)	*n*	Event	Measure of suggestibility	Delay (days)
Goodman et al. (1991, Study 2)	Journal	3–4, 5–6	48	Medical procedure	Misleading Qs	3–9
Goodman et al. (1991, Study 3)	Journal	4–7	34	Medical procedure	Misleading Qs	3–9
Goodman et al. (1991, Study 4)	Journal	4–5 , 6–7	22	Medical procedure	Misleading Qs	356
Goodman, Quas, Batterman-Faunce, Riddlesberger, and Kuhn (1997)	Journal	3–10	46	Medical procedure	Misleading Qs	12
Henry and Gudjonsson (1999)	Journal	7–12[b]	71	1. Staged[d] 2. Story	1. Misleading Qs 1. Misleading Qs 2. Shift	0
Henry and Gudjonsson (2003)	Journal	5–12[b]	53 47	1. Staged 2. Story	1. Misleading Qs 2. Misleading Qs 2. Shift	14
Henry and Gudjonsson (2004a)	Journal	10–13[b]	85	1. Staged 2. Story	1. Misleading Qs 2. Misleading Qs 2. Shift	0
Henry and Gudjonsson (2004b)	Unpublished	8–12[b]	64	Video	Misleading Qs Shift	0
Howie and Dowd (1996)	Journal	9	84	Staged	Misleading Qs	7
Imhoff and Baker-Ward (1999)	Journal	4	64	Interactive	Misleading Qs	14
Lee (2004)	Journal	8–18	65	1. Video 2. Story	1. Misinformation 1. Source monitoring 2. Misleading Qs 2. Shift	1
London and Bruck (2004)	Unpublished	4–9	60	Interactive	Misleading Qs Misinformation	10
Marche and Loehr (2004)	Unpublished	8–16	78	Medical procedure	Misleading Qs	50
McFarlane, Powell, and Dudgeon (2002)	Journal	3–5	220	Video	Misleading Qs	1
McKinley-Pace (2000)	Thesis	6–12	55	1. Story 2. Story	1. Misleading Qs 1. Shift 2. Misinformation 2. Source monitoring	28
Melnyk (2002, Study 1)	Thesis	5–8	70	Event creation	False reports in 4 sessions	4 sessions over 10 days
Melnyk (2002, Study 2)	Thesis	5–6	85	Interactive	Misleading Qs Misinformation	40 & 147

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Michel, Gordon, Ornstein, and Simpson (2000)	Journal	4–12[b]	40	Interactive	Misleading Qs	0 & 42
Murch and Slater (1996)	Unpublished	6–10	48	Video	Misleading Qs Misinformation	0 & 14
Oates and Shrimpton (1991)	Journal	4–12	41	Medical procedure	Misleading Qs	4–42
Paterson (2001)	Thesis	7–8	67	Staged	Misleading Qs	94
Payment (2002)	Thesis	6–12	96	Staged	Source monitoring	14
Peters (1991)	Chapter	6–9	64	Interactive	Misleading Qs	0
Principe (1997)	Thesis	4	54	Interactive	Misleading Qs Misinformation	7
Purdy (2001)	Thesis	5–8	28	Video	Misleading Qs Source monitoring	7
Quas et al. (1999)	Journal	3–14	43	Medical procedure	Misleading Qs	240–2070
Quas and Schaaf (2002)	Journal	3–5	72	Interactive	Misleading Qs	14
Ridley, Clifford, and Keogh (2002)	Journal	9	64	Video	Misleading Qs Misinformation	0
Roberts and Powell (1999, Study 1)	Unpublished	5–7	62	Interactive	Misinformation	4–22
Roberts and Powell (1999, Study 2)	Unpublished	5–6	60	Interactive	Misinformation	4–22
Roberts and Powell (1999, Study 3)	Unpublished	5–6	29	Interactive	Misinformation	4–22
Roberts and Powell (in press)	Journal	5–7	125	Interactive	Misinformation	4–22
Roebers and Schneider (2001)	Journal	6–10	105	Video	Misleading Qs Misinformation	21 & 28
Roebers and Schneider (2004, Study 1)	Unpublished	4	67	Video	Misleading Qs Misinformation	0 & 14
Roebers and Schneider (2004, Study 2)	Unpublished	4	65	Video	Misleading Qs Misinformation	0 & 14
Roebers and Schneider (2004, Study 3)	Unpublished	4	66	Video	Misleading Qs Misinformation	0 & 14
Scullin (1997)	Thesis	4	35	Video	Misleading Qs Shift	1–10
Scullin and Bonner (2003)	Conference	3–5	70	1. Staged 2. Video	1. Misleading Qs 2. Misleading QS 2. Shift	10
Scullin, Kanaya, and Ceci (2002)	Unpublished	3–6	45	1. Video 2. Event creation	1. Misleading Qs 1. Shift 2. False reports	1–4

Continues

Table 1. Continued

Study	Publication status[a]	Age (years)	*n*	Event	Measure of suggestibility	Delay (days)
Shrimpton, Oates, and Hayes (1998)	Journal	4–12	249	Medical procedure	Misleading Qs	2–56
Stadfeld (1998)	Thesis	4–5	49	Staged	Misleading Qs	7
Templeton and Wilcox (2000)	Journal	3–6	117	Video	Misinformation	0
Thomsen and Bernsten (in press)	Journal	3–6	39	Staged	Misleading Qs over 6 sessions	6 weekly sessions
Vrij and Bush (2000)	Journal	5–11	97	Video	Misleading Qs	0
Warren, Lane, Snyder-Boggs, and Blevins (1995)	Unpublished	5–6, 9–10, adults	63	Video	Misleading Qs	7
Welch-Ross (1999)	Journal	3–6	51	Story	Misleading Qs Misinformation	7
Welch-Ross, Diecidue, and Miller (1997)	Journal	3–5	42	Story	Misinformation	7
Young, Powell, and Dudgeon (2003)	Journal	5–13[b]	158	Story	Misleading Qs Shift	0

Note: [a]The publication status column includes a thesis citation if the thesis study has not yet been published. Studies classified as unpublished include papers that will be submitted for publication. [b]Sample included typically-developing children, with IQs in the average/above average range, and children with mental retardation. [c]The '&' symbol between the number of days in the delay column indicates repeated interviews. [d]When the study involved more than one event (e.g. a staged event and a story), for clarity, each event and its corresponding measure of suggestibility has been numbered.

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Age of participants

Children ranged from 3 to 17 years across studies. Most studies (84%) included preschoolers: 25 of these studies included only preschoolers, 30 included preschoolers and elementary school-aged children, and three included children from preschool age through to adolescence. Eight studies focused on elementary school-age children only and three studies included children from elementary school-age through to adolescence. Thus although there is a wide age range in the database, most of the participants were preschoolers.

Event

We classified the target event to be recalled (and that was suggested) into six different categories: video (the children saw a video), staged event (the children observed a staged event), interactive (the child participated in a staged interactive event, such as a magic show or play activities in a laboratory), medical procedure (this included hospital visits for facial lacerations, voiding cystourethrogram fluoroscopy procedures, genital examinations, inoculations, etc.), story (the child heard a story), and false event creation. In the last category, there was no target event; rather, a false target event (e.g. finding a monkey in the park) was suggested to the child. The most common presentation of target events was video (28%), interactive (22%), medical procedure (17%) and staged events (15%).[3]

Measures of suggestibility

Measures of suggestibility varied across studies and more than one measure was used in several studies. Often, different names were used for the same construct. For example, the term 'yield' is synonymous with misleading questions and therefore only the latter term is used in the present paper. The term 'shift,' also a measure of interrogative suggestibility, refers to the number of times children changed answers to earlier asked questions when told their first answers were not correct.[4] Studies assessing misinformation effects involved a three-step procedure: (i) children experienced the target event, (ii) they were given misinformation about the event, and (iii) they were then asked to recall the event to examine the degree to which the misinformation tainted their reports. In some of these studies, the misinformation was given in the form of misleading questions (e.g. 'What colour was the hat?' when there was no hat). In such cases, answers to misleading questions in the second phase as well as misinformation effects obtained in the third phase of the procedure were used as dependent measures of suggestibility and both were counted. Some studies included measures of source monitoring. In these cases, children were provided with misinformation and later directly asked whether they actually experienced the misinformation or, simply heard the misinformation. False reports were measured in studies examining false event creation. In this paradigm, there was no presentation of an actual target event; rather, across several suggestive sessions children were asked to try to remember and provide a narrative about a false event that they were told may have occurred. In order of frequency, the most common measures were

[3]In seven studies, more than one target event was used. The second event was routinely a supplemental measure to assess the reliability of suggestibility measures in the first and primary event; therefore, only the frequency of the primary event was counted in our summary statistics. If individual difference analyses were conducted with the supplemental measures, these are reported in the appropriate part of this paper.

[4]Although some researchers combined the measures of yield (i.e. misleading questions) and shift for a measure called 'total suggestibility,' in this paper we did not include the latter measure if the first two scores were analyzed.

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misleading questions (57%), misinformation (23%), shift (11%), source monitoring (6%) and false event creation (4%). Summing together misleading questions and shift, 72% of all measures involved interrogative suggestibility.

Delay between the event and the memory interview

As shown in the last column of Table 1, in 20 of the studies children were questioned for the first time on the same day as the event. At the other extreme, in eight studies, children were questioned from 3 months to 5 years after the target event. There were repeated interviews in 10 studies, which yielded new measures of suggestibility for each session.

Coding the database: Individual difference measures

Individual difference measures were categorized as demographic (socioeconomic status (SES) and gender), cognitive (intelligence, language, memory, theory of mind, executive functioning, behavioural ratings of distractibility, and creativity) or psycho-social (social engagement, self-concept/self-efficiacy, stress/emotional arousal/state anxiety, mother's attachment style, parent-child relationship, parenting style, temperament, and overall mental health of child and mother). Readers may take issue with the nature of some of the classifications (for example, behavioural ratings of distractibility could also be paired with ratings of temperament); however, the data are summarized in table form in such a way that readers can conduct their own analyses.

RESULTS

Summaries of the relationship between suggestibility and each of the demographic, cognitive and psycho-social measures are presented in Tables 2 to 17. Tables 2 and 3 summarize the results for demographic information; Tables 3 to 17 summarize the results for each specific area of cognitive and psycho-social functioning. Because the descriptor variables did not differentiate significant from nonsignificant studies[5] in most analyses,

Table 2. SES and suggestibility

Study	Age (years)	*n*	Results summary
McFarlane et al. (2004)	3–5	220	SES accounted for 2% of variance
Alexander et al. (2002)	3–7	51	No
Clarke-Stewart et al. (2004)	5	70	No
Geddie et al. (2000)	3–7	56	No[a]
London and Bruck (2004)	4–9	60	No
Quas and Schaaf (2002)	3–5	72	No

Note: [a]Significant relationships were obtained for univariate analyses between SES and suggestibility. However once other demographic factors were partialed out (e.g. age, race), the suggestibility-SES relationship was nonsignificant.

[5]For ease of presentation, we refer to studies with significant findings (i.e. studies which reported a significant relationship between the descriptor variable and the measure of suggestibility) as 'significant studies' and similarly, studies with nonsignificant findings (i.e. failed to find a significant relationship) are referred to as 'nonsignificant studies.'

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these are presented in the table and discussed in the text only when relevant. Studies yielding significant relationships are presented first. The results column for these studies contains 'Yes,' and when necessary, other statements about the results. Studies with no significant results are presented next, with 'No' entered into the results cell. Because many studies included several statistics on individual differences, when relevant, the ratio of significant to total statistics is presented in the last column of the table. In the following presentation, the unit of analysis is either the study or the proportion of significant analyses for the individual difference variable under consideration.

Demographic information and suggestibility

Socioeconomic status (SES)

Six studies examined the relationship between suggestibility and SES (see Table 2). All studies included measures of misleading questions. Only one of the six studies (McFarlane et al., 2002) yielded an effect that was maintained after controlling for other background factors. In this study, children from lower SES backgrounds were more suggestible than children from higher SES backgrounds. The size of this effect was quite small (accounting for 2% of the variance) and was obtained in the study with the largest sample size in this set. This suggests that SES effects may only be detected in studies with large ($>$200) samples. It should be noted that although Geddie, Fradin, and Beer (2000) found no significant SES effects, they did report an effect of race that was independent of SES; Caucasian children were less suggestible than were African-American children.

Gender

Of the 20 studies listed in Table 3, four reported significant gender effects.[6] However, there are discrepancies among the results of the four significant studies: McFarlane, Powell, and Dudgeon (2002) reported that girls were more suggestible than boys, yet within the same age range, Crossman (2001) reported that boys (younger than 56 months) were more suggestible than girls. Warren, Lane, Snyder-Boggs, and Blevins (1995) found that on some measures, boys were more suggestible than girls, but the opposite pattern was found among the adult sample. In contrast to these three studies that examined misleading questions, Danielsdottir, Sigurgeirsdottir, Einarsdottir, and Haraldsson (1993) found boys more suggestible on a measure of shift, but not on a measure of misleading questions.

It seems safe to conclude that there are no consistent gender differences across a wide age span in children's suggestibility.

The relationship between cognitive profiles and suggestibility

The individual difference measures in this section include intelligence, language, memory, theory of mind, executive functioning, behavioural ratings of distractibility, and creativity.

Intelligence

Two different analyses were conducted on the existing data. First, we examined studies in which suggestibility levels of children with mental retardation (MR) were directly

[6]These 20 studies do not include all studies that have examined the association between gender and suggestibility. Rather, they reflect the number of studies in our database (see Table 1) that examined gender differences.

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Table 3. Gender and Suggestibility

Study	Results summary
Crossman (2001)	Under 56 months, boys were more suggestible than girls
Danielsdottir et al. (1993)	Boys were more affected by 'shift' instruction than girls No differences on misleading questions
McFarlane et al. (2002)	Girls more suggestible than boys (accounted for 2% of the variance)
Warren et al. (1995)	Boys were more suggestible than girls on some measures, but adult women were more suggestible than men on some measures
Alexander et al. (2002)	No
Burgwyn-Bailes et al. (2001)	No
Chae (2004)	No
Clarke-Stewart et al. (2004)	No
Davis and Bottoms (2002)	No
Imhoff and Baker-Ward (1999)	No
London and Bruck (2004)	No
Murch and Slater (1996)	No
Quas et al. (1999)	No
Quas and Schaaf (2002)	No
Ridley et al. (2002)	No
Roebers and Schneider (2001)	No
Roebers and Schneider (2004, Study 1)	No
Roebers and Schneider (2004, Study 2)	No
Vrij and Bush (2000)	No
Young et al. (2003)	No

compared to those of age-matched peers typically-developing (TD) children of average (or above average) intelligence (see Table 4a). Second, we examined results of studies in which intelligence and suggestibility measures were correlated for samples of TD children (see Table 4b). Five of the samples in Table 4b served as TD control groups in Table 4a.

The studies listed in both tables included either full scale IQ scores from comprehensive intelligence tests, such as the Wechsler Intelligence Scale for Children III (WISC-III; Wechsler, 1991) or the Stanford-Binet Intelligence Scales, 4th edition (Thorndike, Hagen, & Sattler, 1986). More commonly, abbreviated forms of these batteries were administered to the children. (If only a vocabulary test was administered, this was categorized as a measure of verbal ability and included in the section on verbal ability and suggestibility.) In some studies, a nonverbal IQ test, such as the Raven's Progressive Matrices (Raven, Court, & Raven, 1986) or the Culture Fair Intelligence Test (Cattell & Cattell, 1950/1960), was administered.

For the between-group analyses (Table 4a), most studies included children 9 years and older. For all but one study, TD children and children with MR were matched for chronological age. Only one of the studies used a misinformation paradigm; all other studies focused on misleading questions. The results are highly consistent; across all studies, children with MR made more errors on closed misleading questions than their age-matched peers. Generally, there were no differences in errors on open-ended misleading questions. There was one exception, Agnew and Powell (2004) found that TD children incorporated relatively more of the suggestions in free recall than did children with MR.

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Table 4a. Intelligence and suggestibility: Between-group studies comparing children with mental retardation to typically-developing children

Study	Groups (*n*), mean IQ[a]	Age (years)	IQ measure[b,c]	Event/Measure	Results summary	Proportion of significant predicted correlations
Agnew and Powell (2004)	MR-mild (58) = 63 MR-moderate (22) < 55 TD (62) > Average	9–12	WASI	Interactive/Open misleading Qs Interactive/Closed Qs	TD > MR MR > TD	12
Henry and Gudjonsson (1999)	MR (28) = 60 TD (19) = 101	MR: 11–12 TD: 7–12	WISC-III	Staged/Open misleading Qs Staged/Specific misleading Qs Story/Misleading Qs Story/Shift	No MR > TD No No	1/4
Henry and Gudjonsson (2003)	MR-mild (30) = 66 MR-moderate (17) = 45 TD (25) = 105	MR: 11–12 TD: 5–12	BAS-II	Staged/Open misleading Qs Staged/Specific misleading QS Story/Misleading Qs Story/Shift	No MR-moderate > TD MR-moderate > MR-mild > TD MR-moderate > TD	3/4
Henry and Gudjonsson (2004a)	MR-mild (22) = 60 MR-moderate (26) = 46 TD (37) = 105	10–13	BAS-II	Staged/Open misleading Qs Staged/Specific misleading	No MR-moderate > MR-mild > TD	1/2
Henry and Gudjonsson (2004b)	MR (24) = 57 TD (40) = 103	8–12	BAS-II: Non-verbal IQ	Video/Open misleading Qs Video/Specific misleading Qs	No MR > TD	1/2
Michel et al. (2000)	MR (20) = 58 TD (20) = 109	MR: 4–13 TD: 9–14	PPVT-R	Medical procedure/Misleading Qs	MR > TD	1/1
Young et al. (2003)	MR-mild (75) = 61 TD (83) = 108	MR: 6–13 TD: 5–12	WASI: Vocabulary and block design	Story/Misleading Qs Story/Shift	MR > TD No	1/2

Note: [a]MR = children with mental retardation; TD = typically-developing children (i.e. children with IQs in the average/above average range). Some *n*s differ from those listed in Table 1 because TD children matched to the children with MR on mental age were not included in Table 4a. [b]WASI = Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999); WISC-III = Wechsler Intelligence Scale for Children, 3rd Edition (Wechsler, 1991); BAS-II = British Ability Scales-II (Elliott, 1996); PPVT-R = Peabody Picture Vocabulary Test-Revised (Dunn and Dunn, 1981). [c]In this and other tables, when a subtest of a scale/test was the individual differences measure, the scale/test is identified and followed by the specific subtest used in the study; for example, 'BAS-II: Non-verbal IQ' means that the measure was the British Ability Scales-II non-verbal IQ subscale.

Table 4b. Intelligence and suggestibility: Correlations for typically-developing children

Study	Age (years)	IQ measure[a]	Event/Measure	Results	Proportion of significant predicted correlations
Brown (1999, Study 1)	6–7	WISC-III: Information and vocabulary subtests	Event creation/False reports	Yes; deniers had higher verbal scores than children who gave peripheral details	1/12
Chae (2004)	5–6, 7–8	KEDI-WISC: Verbal IQ (vocabulary and similarity subtests) KEDI-WISC: Performance IQ (block design subtest)	Staged/Misleading Qs	Yes; verbal IQ for young children Yes; performance IQ for older children	2/4
Geddie et al. (2000)	3–7	WPPSI-R (short form)	Interactive/Misleading Qs	Yes	1/1
McFarlane et al. (2002)	3–5	WPPSI-R: Information subtest	Video/Misleading Qs	Yes	1/1
Scullin (1997)	4	WPPSI-R: Picture completion and information subtests	Video/Misleading Qs Video/Shift	Yes—Misleading Qs No—Shift	1/4
Young et al. (2003)	5–13	WPPSI-R: Vocabulary and block design subtests	Story/Shift Story/Misleading Qs	Yes—Shift No—Misleading Qs	1/2
Crossman (2001)	3–6	WPPSI-R: Vocabulary and picture completion subtests	Staged/Misleading Qs	No	0/1
Eisen et al. (2002)	3–17	Raven's Progressive Matrices	Medical/Misleading Qs	No	0/1
Henry and Gudjonsson (1999)	7–12	WISC-III	Staged/Open misleading Qs Staged/Specific misleading Qs Story/Misleading Qs Story/Shift	No	0/4
Henry and Gudjonsson (2003)	5–12	BAS-II	Staged/Open misleading Staged/Specific misleading	No	0/2
Henry and Gudjonsson (2004a)	10–13	BAS-II	Staged/Open misleading Qs Staged/Specific misleading Qs	No	0/2
Henry and Gudjonsson (2004b)	8–12	BAS-II: Non-verbal IQ	Video/Open misleading Qs Video/Specific misleading Qs	No	0/2
London and Bruck (2004)	4–9	Stanford-Binet Intelligence Scale IV (short form)	Interactive/Misleading Qs Interactive/Misinformation	No	0/2
Roebers and Schneider (2001)	6–10	Culture Fair Intelligence Test	Video/Misleading Qs Video/Misinformation	No	0/4
Scullin et al. (2002)	3–6	WPPSI-R: Picture completion subtest	Event creation/False reports Video/Misleading Qs Video/Shift	No	0/3

[a]WISC-III = Wechsler Intelligence Scale for Children, Third Edition (Wechsler, 1991); KEDI-WISC = Korean Educational Development Institute—Wechsler Intelligence Scale for Children (Korean Educational Development Institute, 1986); WPPSI-R = Wechsler Preschool and Primary Scale of Intelligence—Revised (Wechsler, 1989); Raven's Progressive Matrices (Raven, Court, & Raven, 1986); BAS-II = British Ability Scales-II (Elliott, 1996); Stanford-Binet Intelligence Scale, 4th edition (Thorndike, Hagen, & Sattler, 1986); Culture Fair Intelligence Test (Cattell & Cattell, 1950/1960).

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They reasoned that this reflected memory differences; the normal control children were better able to remember the suggestions than were the children with MR.

In contrast to the results of the between-group analyses that included a wide range of IQ scores, when only TD children were included (Table 4b), there were few correlations between IQ and suggestibility. Specifically, significant relationships between IQ and suggestibility were obtained in six of the 15 studies and for seven of 45 correlations—that is, higher IQ was associated with lower levels of suggestibility.

The one variable that seemed to differentiate significant from nonsignificant studies was age. As shown in column 2 of Table 4b, all but one of the significant studies included children under the age of 8; in contrast, all seven of the nine nonsignificant studies included children over the age of 8. Thus, perhaps correlations between suggestibility and intelligence are obtained in samples of young but not older TD children.

To summarize, although IQ is an important factor for accounting for suggestibility difference in samples that include children with normal and low IQs, it is not a reliable predictor of suggestibility for children with normal IQs.

Language abilities

Twelve studies included predictors of language abilities (see Table 5). These studies included a variety of tests to assess vocabulary, receptive language, and expressive language. In most cases, there was only one measure per study of language ability, although a few studies used more detailed batteries to comprehensively evaluate children's language skills. Except for the children in the study by Danielsdottir and colleagues (1993), all of the children were preschoolers.

There are two major findings. First, vocabulary was not associated with suggestibility except in one of the six studies. Even for the one significant study (Danielsdottir et al., 1993), only one of eight correlations was significant. Second, significant relationships between language and suggestibility were obtained for preschoolers if a comprehensive language battery was used as a measure of verbal abilities. In four separate studies (three conducted in German and one in English), children with more advanced language skills (on expressive and productive tests) were more resistant to suggestion than children with less advanced skills. Although significant correlations were obtained when suggestibility was measured by interrogative (i.e. misleading questions or shift) and by misinformation paradigms, the rates of significant correlations were higher for misinformation measures (100% of all correlations involving misinformation and language batteries were significant) than for interrogative suggestibility measures (50% of all correlations were significant). When single measures of language were used, such as mean length of utterance or a single rating scale, no significant effects were obtained.

Memory

Two separate analyses were carried out on the studies examining the relationship of memory and suggestibility. First, the relationships between traditional measures of memory and suggestibility were examined. Second, the correlation between children's suggestibility for one event and the accuracy of their memory for an independent event was assessed.

As shown in Table 6a, eight studies included traditional measures of memory assessments (e.g. span, paired associates learning). In some studies, children were given comprehensive standardized memory test batteries such as the Test of Learning and Memory (TOMAL; Reynolds & Bigler, 1994) or the Wide Range Assessment of Memory

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Table 5. Language abilities and suggestibility

Study	Language measure[a]	Measure of suggestibility	Results summary	Proportion of significant predicted correlations
Clarke-Stewart et al. (2004)	Adaptive Language Inventory Preschool Language Scale—Revised	Misleading Qs	Yes Yes	2/2
Danielsdottir et al. (1993)	WISC-III: Vocabulary subtest	Misleading Qs Shift	Yes, for 12 year olds No	1/8
Roebers and Schneider (2004, Study 1)	SFK	Misleading Qs Misinformation	Significant univariate correlations at 2 delays	4/4
Roebers and Schneider (2004, Study 2)	SFK	Misleading Qs Misinformation	Significant univariate correlations with misinformation at 2 delays	2/4
Roebers and Schneider (2004, Study 3)	SFK	Misleading Qs Misinformation	Significant univariate correlations with misinformation at 2 delays	2/4
Bruck et al. (1995)	PPVT-R	Misinformation	No	0/1
Burgwyn-Bailes et al. (2001)	PPVT-R	Misleading Qs	No (at 3 different delays)	0/3
Crossman (2001)	PPVT-III	Misleading Qs	No	0/1
Imhoff and Baker-Ward (1999)	Mean length of utterances (from separate interview)	Misleading Qs	No	0/1
Paterson (2001)	BPVS II: Receptive vocabulary	Misleading Qs	No	0/1
Scullin et al. (2002)	WPPSI-R: Vocabulary subtest	Misleading Qs Shift False reports	No	0/3
Young et al. (2003)[b]	VBS: Communication domain	Misleading Qs Shift	No	0/2

Note: [a]Adaptive Language Inventory (Feagans, Fendt, & Farran, 1995); Preschool Language Scale—Revised (Zimmerman, Steiner, & Pond, 1979); WISC-III = Wechsler Intelligence Scale for Children, 3rd edition (Wechsler, 1991); SFK = *Sprachentwicklungstest für Kinder* (German language battery; Grimm, 2001); PPVT-R = Peabody Picture Vocabulary Test—Revised (Dunn & Dunn, 1981); PPVT-III = Peabody Picture Vocabulary Test, 3rd edition (Dunn & Dunn, 1997); BPVS II = British Picture Vocabulary Scale II (Dunn, Dunn, Whetton, & Burley, 1997); WPPSI-R = Wechsler Preschool and Primary Scale of Intelligence—Revised (Wechsler, 1989); VBS = Vineland Adaptive Behaviour Scales (Sparrow, Balla, & Cicchetti, 1984). [b]Although the study included data for typically-developing children and children with mental retardation, only the typically-developing children's data are reported.

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Table 6a. Suggestibility and standardized memory tests

Study	Event	Memory measure[a]	Measure of suggestibility	Results summary	Proportion of significant predicted correlations
Brown (1999, Study 1)	Event creation	Picture memory	False reports	False reporters remembered more than those who did not report event	1/1
Lee (2004)	Video and story	Children's Memory Scale: Verbal paired associates task	Misinformation	Yes; good performance on paired associates and poor source monitoring	1/4
		CVLT: Long delayed cued recall score	Source monitoring	No	
McKinley-Pace (2000)	Story and story	WRAML: 9 subtests and 3 subtotal scores	Misleading Qs	Misleading Qs correlated with sound-symbol and number/letter subtests and with the verbal memory index	3/48
			Shift	No	
			Misinformation	No	
			Source monitoring	No	
Henry and Gudjonsson (2003)[b]	Staged and story	TOMAL: Verbal and nonverbal scales	Misleading Qs	No	0/6
			Shift		
			Misleading Qs		
Bartlett (2001)	Video	WISC-R: Digit span subtest	Misleading Qs	No	0/1
Brown (1999, Study 2)	Event creation	Picture memory	False reports	No	0/1
Clarke-Stewart et al. (2004)	Interactive	Woodcock-Johnson—Revised: Memory for sentences	Misleading Qs	No	0/1
Eisen et al. (2002)	Medical procedure	Stanford-Binet Intelligence Scale IV: Memory for sentences	Misleading Qs	No	0/2
		WISC-III: Digit span			

Note: [a]Children's Memory Scale (Cohen, 1997); CVLT = California Verbal Learning Test (Delis, Kramer, Kalplan, & Obler, 1994); WRAML = Wide Range Assessment of Memory and Learning (Adams & Sheslow, 1990); TOMAL = Test of Learning and Memory (Reynolds and Bigler, 1994); WISC-R = Wechsler Intelligence Scales for Children—Revised (Wechsler, 1974); Woodcock-Johnson Revised (Woodcock & Johnson, 1989, 1990); Stanford-Binet Intelligence Scale, 4th edition (Thorndike et al., 1986); WISC-III = Wechsler Intelligence Scale for Children, 3rd edition (Wechsler, 1991). [b]Although the study included data for typically-developing children and children with mental retardation, only the typically-developing children's data are reported.

Table 6b. Suggestibility and event memory

Study	Age (years)	Event	Measure of suggestibility[a]	Results[b]	Proportion of significant predicted correlations
Henry and Gudjonsson (1999)	7–12[c]	1. Staged	Accuracy (2)—Misleading Qs (1)	Neg for younger children	1/4
		2. Story	Accuracy (1)—Misleading Qs (2)	Pos for younger	1/8
			Accuracy (1)—Shift (2)	No	0/8
Henry and Gudjonsson (2003)	5–12[c]	1. Staged	Accuracy (2)—Misleading Qs (1)	Pos	1/4
		2. Story	Accuracy (1)—Misleading Qs (2)	Neg	1/8
			Accuracy (1)—Shift (2)	Pos	1/8
Henry and Gudjonsson (2004a)	10–13[d]	1. Staged	Accuracy (2)—Misleading Qs (1)	Neg	1/2
		2. Story	Accuracy (1)—Misleading Qs (2)	Pos	1/4
			Accuracy (1)—Shift (2)	No	0/4
McKinley-Pace (2000)	6–12	1. Story	Accuracy (2)—Misleading Qs (1)	No	0/2
		2. Story	Accuracy (2)—Shift (1)	Neg	1/2
Scullin et al. (2002)	3–6	1. Video	Accuracy (2)—Shift (1)	Pos for 5-year-olds	1/6
		2. Interactive	Accuracy (2)—Misleading Qs (1)	No	0/6
		3. Event creation	Accuracy (1)—False reports (3)	No	0/12

Note: [a]The numbers in brackets indicate which measures correlated; for example, in the first row, "Accuracy (2)—Misleading Qs (1)" means that memory accuracy for the second event (here, the story) was correlated with susceptibility to misleading questions from the first event (here, the staged event). [b]Neg = Negative correlation (high accuracy on event recall and low suggestibility); Pos = Positive correlation (high accuracy on event recall and high suggestibility). [c]Although the study included data for typically-developing children and children with mental retardation, only the typically-developing children's data are reported. [d]Data from typically-developing children and children with mental retardation were combined.

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and Learning (WRAML; Adams & Sheslow, 1990); these batteries include verbal and nonverbal memories subtests and yield a number of different summary scores. The remaining studies included measures of memory for digits, sentences or pictures.[7]

The general pattern for this data set was that traditional memory tests did not correlate with measures of suggestibility; only five of the 65 correlation coefficients were significant and these correlations were obtained in only three of eight studies. Two of the studies produced the interesting finding that good performance on memory tests was associated with high rates of event creation (Brown, 1999, study 1) or source monitoring (Lee, 2004). However, these patterns were not replicated in similar studies by Brown (1999, study 2), where there were no significant correlations, and by McKinley-Pace (2000) who failed to detect significant relationships between memory and source monitoring.

In the next set of analyses, we examined the degree to which children's event memory correlated with their suggestibility. One of the previous consistent findings in the suggestibility literature is that children's memory of an event is negatively correlated with their suggestibility for that same event (e.g. Marche, 1999; Marche & Howe, 1995; Pezdek & Roe, 1995). These relationships, however, may be task specific. In other words, these data do not directly assess whether children with good event memory (as measured for event 1) also show low levels of suggestibility (as measured for event 2).

We identified five studies that contained that relevant correlational data. Children in these studies took part in two separate tasks that produced measures of accurate recall (e.g. free recall, responses to non-leading questions) and suggestibility (answers to misleading questions). A summary of correlations between Accuracy in Task 1 and Suggestibility in Task 2, as well as correlations between Accuracy in Task 2 and Suggestibility in Task 1 are shown in Table 6b. Results that are consistent with the hypothesis that high event accuracy is correlated with low rates of suggestibility are labelled 'Neg' (as in negative correlations). Results are labelled 'Pos' (positive) when high suggestibility in one task is correlated with high accuracy in the second task.

As shown in Table 6b, there were a total of 78 relevant correlations, nine of which were significant. However, five of these were in the nonpredicted direction; that is, children who produced highly accurate answers in one situation were most suggestible in another situation. Thus, only 4/78 correlations confirmed the target hypothesis.

To summarize, to date, it appears as though children's suggestibility is not related to event memory competence.

Theory of mind

Briefly, theory of mind refers to a cognitive capacity that allows us to know that others may have different feelings, intentions, beliefs, and feelings than oneself. Much of the research shows that this skill develops rapidly in preschool children so that by the age of 5 most children come to understand that two people can hold conflicting beliefs about the world (Astington, 1993). The parallel developmental increases in theory of mind and of reduction of suggestibility within the same age range have motivated a number of investigations of their direct association in preschoolers. The basic premise is that once children come to appreciate that another person can hold a belief that is different from one's own, then one can more easily reject it (as in misinformation). However, some

[7]Measures of working memory were not included in this section but were examined with measures of executive functioning, as shown in Table 11.

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investigators posit a different relationship, such that once one understands that another person can hold another belief different from one's own, one can come to accept it (knowing that it is wrong) for the sake of social niceties.

The results of 11 studies assessing theory of mind and suggestibility are summarized in Table 7. The age range in the listed studies was between 3 and 6 years. Four of the studies found no relationship, five found that suggestibility decreased as theory of mind increased, and two studies found that increases in suggestibility were associated with increases in theory of mind. In general, a significant relationship was most likely to occur when theory of mind was correlated with misinformation; few significant correlations occurred with interrogative suggestibility measures.

Inspection of the results of the two studies that yielded positive correlations between increases in suggestibility and theory of mind raise concerns about the reliability of these findings. First, Templeton and Wilcox's (2000) results are based upon correlations in a sample of 3 to 6 year olds. These must be interpreted against the following findings: (a) most 3 and 4 year olds failed the theory of mind task and (b) the 6 year olds were the most suggestible. Because the youngest children uniformly failed the theory of mind task, there can be no significant correlations with suggestibility. Thus the correlation for the whole sample reflects the finding that that 6 year olds who performed best (relative to their younger peers) on theory of mind tasks also were the most suggestible. The latter finding that 6 year olds were more suggestible than their younger peers is a rare and perhaps an unreliable finding. Next, Welch-Ross's (1999) major finding was that children who passed theory of mind tasks did not show suggestibility effects when the suggestions were delivered by an unfamiliar interviewer, but their suggestibility increased when interviewed by a familiar interviewer (who read the child a story and then gave misleading information). In contrast, children who failed theory of mind tasks were equally suggestible when suggestions were delivered by familiar versus unfamiliar interviewers. However, it should be noted that this pattern of results was obtained in only one of four analyses. In addition, the more common finding that theory of mind should be associated with resistance to misinformation with unfamiliar suggestive interviewers was found in only one of the four analyses, failing to replicate her previous work (i.e. Welch-Ross et al., 1997).

In general, there are two major problems with the hypothesis that theory of mind is a mechanism that accounts for young children's suggestibility. The fact that theory of mind has been used to predict both increases and decreases in children's suggestibility limits its theoretical power. Also, at best theory of mind can account for individual differences up to about age 6 when children have presumably developed a full-fledged theory of mind; but they nonetheless continue to be suggestible. Tests of executive functioning offer hope of filling this developmental void.

Executive functioning

Executive functioning refers to a broad category of skills that underlies goal-directed behaviour. It is sometimes defined as the way people monitor their thoughts and actions. Research on the correlates of suggestibility has primarily focused on constructs or tasks of inhibitory control, attentional flexibility, working memory, and meta-cognitive skills, all of which overlap to some degree. One of the common theoretical themes or predictions of studies in this area is that suggestibility and executive function tasks should be correlated because both involve keeping track of the original events while ignoring (inhibiting) or

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Table 7. Theory of mind and suggestibility

Study	Theory of mind tasks (Summed for total score)	Measure of suggestibility[a]	Results summary[b]	Proportion of significant predicted correlations
Bright-Paul (2004, Study 1)	False belief Pretend-real Aspectuality Representational change Inference neglect Source of belief	Misinformation Source monitoring	Yes—misinformation No—source monitoring	1/2
Bright-Paul (2004, Study 2)	Same as above	Misinformation Source monitoring	Yes with misinformation; longer delays increase the effect; shorter delays decrease the effect No—source monitoring	1/2
Sculllin and Bonner (2003)	False belief	1. Misleading Q 2. Misleading Qs 2. Shift	1. No—misleading Qs 2. Yes—misleading Qs 2. No—shift	1/3
Templeton and Wilcox (2000)	False belief	Misinformation	Yes; high suggestibility and high theory of mind correlated but see comment in text	1/1
Thomsen and Bernsten (in press)	False belief	Misleading Qs	Yes	1/1
Welch-Ross (1999)	False belief See-know	Misleading Qs Misinformation	No Yes; high misinformation and high theory of mind with familiar interviewer but see comment in text	1/4
Welch-Ross et al. (1997)	Appearance-reality False belief Real-pretend	Misleading Qs Misinformation	Yes (no after memory partialed) Yes	2/2
Crossman (2001)	Appearance-reality False-belief Real-pretend	Misleading Qs	No	0/1
Principe (1997)	False-belief	Misleading Qs Misinformation	No	0/2
Quas and Schaaf (2002)	False-belief Appearance-reality	Misleading Qs	No	0/1
Roebers and Schneider (2004, Study 3)	False-belief Appearance-reality	Misleading Qs Misinformation	No	0/2

Note: [a]This study involved two events. The measures of suggestibility and corresponding results summaries are numbered to indicate whether they relate to the first or second event. (This is also the case in Table 8). [b]Unless otherwise indicated, significant results indicate that good performance on theory of mind tasks correlates with low levels of suggestibility.

disposing of subsequent misleading information which is discrepant with the original memory of the event.

The most common measures used in the current studies (see Table 8) were Stroop-like or conflict tasks (such as the day/night task, conflict hand movements tasks, and go no-go tasks) where children are asked to make responses that are in conflict with the stimulus; these tasks require inhibitory control. Measures of attentional control or flexibility include the Wisconsin Card Sorting Task (WCST; Heaton, 1981), the Continuous Performance Task (CPT; Rosvold, Mirsky, Sarason, Bransome, & Beck, 1956), and the Kansas Reflection-Impulsivity Scale for Preschoolers (KRISP; Wright, 1971). Some researchers have focused on metacognitive skills using either a metamemory task, or tasks that require conscious attention to resolution of ambiguity. Finally, some researchers have focused on working memory as another important component of executive functioning.[8]

Significant associations between executive functioning and suggestibility were obtained in nine of the 18 studies listed in Table 8; however, one of these studies (Quas & Schaaf, 2002) produced a significant correlation in the non-predicted direction and two of the correlations were nonsignificant after other significant predictors were controlled (Roebers & Schneider, 2004, study 2; Scullin & Bonner, 2003). Overall, there were significant univariate associations in the predicted direction for 14% of all the correlations.

Examination of Table 8 shows that significant correlations did not cluster on one type of test or skill; rather, significant predictors included Stroop tasks, working memory, comprehension monitoring, source monitoring (independent of the suggestibility paradigm), retroactive inhibition, tapping conflict, and Wisconsin Card Sorting tasks. However, significant relationships between suggestibility and these same tasks were not obtained in other studies, even when these were carried out in the same laboratory (e.g. Roberts & Powell, 1999, in press). Significant correlations occurred with equal frequency for interrogative suggestibility measures (misleading questions and shift) and misinformation/source monitoring measures. Delays between events and interviews were fairly long in most studies, whether significant or not.

Despite the preponderance of negative findings, one interesting finding was reported by Bottoms, Quas, and Davis (in press) who administered working memory tasks to children who were suggestively interviewed about an event that had occurred a year previously. Half of the children were questioned in a supportive manner, whereas the other children were interviewed in a non-supportive manner. Bottoms et al. found that working memory only predicted suggestibility for children in the non-supportive group (r values > -0.40), indicating that those children low in working memory capacity made more errors. They concluded that when interviewed in a supportive manner, children with low working memory capacity may be able to overcome some of the negative consequences of their cognitive deficit whereas if they are interviewed in a suboptimal environment, working memory deficits will lead to other types of memory deficits. This is an interesting model to examine individual differences because it presupposes that perhaps certain cognitive factors impact suggestibility as a function of the characteristics of the interview.

Finally, as noted in the 'Age' column of Table 8, most of the studies included children 7 years and younger, and most of these children were preschoolers. This raises the possibility that executive function skills may not be significant correlates in this set of studies because of the relatively young ages of the children. Perhaps there would be more

[8]As will be seen, if these working memory measures were all placed in the memory classification, it would not change the conclusions.

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Table 8. Executive functioning and suggestibility

Study	Age (years)	Executive functioning measure[a,b]	Measure of suggestibility	Results summary	Proportion of significant predicted correlations
Alexander et al. (2002)	3–7	Stroop	Misleading Qs	Yes	1/1
Bottoms et al. (in press)	7–8	Working memory (counting span with distractors task)	Misleading Qs	Yes when interviewer is unsupportive No when interviewer is supportive	1/2
Payment (2002)	6–12	Story inconsistency Picture ambiguity Sentence ambiguity Stroop McCarthy Scales of Children's Abilities: Verbal fluency Luria-Nebraska Children's Battery: Motor sequencing	Source monitoring	Yes for Grade-3 children No No No No No	1/18
Principe (1997)	4	Source monitoring KRISP: Impulsivity	Misleading Qs Misinformation	Yes No	1/4
Quas and Schaaf (2002)	3–5	KRISP: Impulsivity	Misleading Qs	Yes for 3 year olds but not in predicted direction No for 5 year olds	0/2
Roberts and Powell (1999, Study 2)	5–6	Tapping conflict Stroop	Misinformation	Yes No	1/2
Roberts and Powell (in press)	5–7	Retroactive inhibition Proactive inhibition Tapping conflict Stroop	Misinformation	Yes No No No	1/4
Roebers and Schneider (2004, Study 2)	4	Working Memory Test Battery for Children	Misleading Qs Misinformation	No Yes (but nonsignificant when control for language skills)	1/4

Continues

Table 8. Continued

Study	Age (years)	Executive functioning measure[a,b]	Measure of suggestibility	Results summary	Proportion of significant predicted correlations
Scullin and Bonner (2003)	3–5	WCST	1. Misleading Qs	Yes (but nonsignificant when theory of mind scores are controlled)	1/3
			2. Misleading Qs	No	
			2. Shift	No	
Brown (1999, Study 1)	6–7	WCST	False reports	No	0/1
Brown (1999, Study 2)	5–6	WCST	False report	No	0/2
		Working memory (word span task)		No	
Clarke-Stewart et al. (2004)	5	Continuous Performance Task	Misleading Qs	No	0/1
Geddie et al. (2000)	3–7	Metamemory	Misleading Qs	No	0/1
Lee (2004)	8–16	WCST	Misinformation	No	0/6
		Working memory (backward digit span)	Source monitoring	No	
			Misleading Qs + Shift[c]	No	
Roberts and Powell (1999, Study 1)	5–7	Tapping conflict task	Misinformation	No	0/2
		Stroop		No	
Roebers and Schneider (2004, Study 1)	4	Composite score of 5 inhibitory control tasks: Go no-go, Stroop (2 tasks), movement suppression, conflict hand movements	Misleading Qs Misinformation	No	0/2

Note: [a]All Stroop tasks were based on the day/night task (Gerstadt, Hong, & Diamond, 1994); counting span with distractors task (Case, Kurland, & Goldberg, 1982); comprehension monitoring task based on Markman (1979); picture ambiguity task based on Ironsmith and Whitehurst (1978); sentence ambiguity task based on referential communication task developed by Bearison and Levey (1977); McCarthy Scales of Children's Abilities (McCarthy, 1972); Luria-Nebraska Children's Battery (Golden, 1981); KRISP = Kansas Reflection-Impulsivity Scale for Preschoolers (Wright, 1971); WCST = Wisconsin Card Sorting Task based on Heaton (1981); Working Memory Test Battery for Children (Pickering & Gathercole, 2001); word span task based on Siegel and Ryan (1989); Continuous Performance Task (Rosvold, Mirsky, Sarason, Bransome, & Beck, 1956); metamemory task (Kreutzer, Leonard, & Flavell, 1975); tapping conflict task (Luria, 1973); go no-go task (Perner, Lang, & Kloo, 2002); movement suppression task (Carlson and Moses, 2001); conflict hand movements task (Hughes, 1998). [b]When applicable, we have specified the type of task used to assess working memory. [c] Scores from misleading questions and shift measures were added to create a single 'total suggestibility' score.

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significant correlations in samples of older children who are still in the process of executive function growth.

To summarize, although the executive functioning studies are based on a number of theoretically grounded principles, the results have provided little illumination on the cognitive mechanisms of children's suggestibility.

Behavioural ratings of distractibility

To create proxy measures of executive functioning, researchers have examined the predictive power of parents' or teachers' ratings of children's distractibility, reflectiveness, and persistence. The assumption is that children who are distractible will not effectively process information and therefore will confuse actual experiences with suggested misleading information or may impulsively assent to misleading questions.

Results of 10 studies included parent and teacher ratings of distractibility, persistence, activity, and attentiveness. Many of these predictor variables were composite scores of specific subscales of temperament scales. These included the activity and/or persistence subscales of the Temperament Assessment Battery for Children (TABC; Martin, 1988), the effortful control and inhibitory control scales of the Children's Behaviour Questionnaire (Rothbart, Ahadi, & Hershey, 1994), the Conners' Teachers Rating Scale—Revised (Conners, 1997), the activity subscale of the Emotionality, Activity, and Sociability Questionnaire (EAS; Buss & Plomin, 1984), and the Distractibility subscale of the Carey Temperament Scales Behavioural Style Questionnaire (CTS; McDevitt & Carey, 1996). In one study, teachers were simply asked to rate a child's attentiveness and reflectiveness.

As shown in Table 9, only two of the 10 studies and two of the 29 correlations yielded significant results. In concert with the results from the executive function tasks, these data indicate that there is no specific relationship between suggestibility and distractibility at least for children in the age range examined (most were 7 years old and younger).

Creativity

Six studies included measures of children's creativity, cognitive flexibility, and imagination. As can be seen in Table 10, some measures involved parent and teacher ratings, others involved direct assessments of children's creativity, and in some studies, children were asked questions about their own fantasy life. It should be noted that all the children in these studies were between the ages of 5–8.

Interestingly, positive associations were found in all of the studies. Imaginative and creative children were more likely to be suggestible and to elaborate their false beliefs. Significant associations were found for false event creation measures as well as for misleading question and misinformation measures.

This seems to be a fruitful avenue to continue to explore. Of particular interest is whether creativity will be a consistent predictor when the outcome measure is misinformation or source monitoring, which only occurred twice in this data set. In other words, it might be that when children come to understand that they are meant to 'make something up' (as was true in three of the six studies in this group), the creative children have an easier time meeting the demands of the task; and perhaps this facility may make these children more prone to memory impairment, as is suggested by the one significant correlation found by Melnyk (2002, study 2). However, if children were simply asked to remember details of an event after misinformation, perhaps creativity would play a lesser role as suggested by the results of the Purdy (2001) study.

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Table 9. Behavioural ratings of distractibility and suggestibility

Study	Age (years)	Measure of distractibility[a]	Measure of suggestibility	Results	Proportion of significant predicted correlations
Melnyk (2002, Study 2)	5–6	CTRS: Hyperactivity and inattention subscales (teacher-rated)	Misinformation	Yes; hyperactivity with misinformation at 147 day test	1/5
			Misleading Qs	No	
Purdy (2001)	5–8	CTS: Distractibility (parent-rated)	Source monitoring	Yes for children in low pressure interviews	1/4
			Misleading Qs	No	
Alexander et al. (2002)	3–7	CBQ: Effortful control (parent-rated)	Misleading Qs	No	0/1
Blackford and Shapiro (1999)	6–11	TABC: Activity and persistence (parent-rated)	Misleading Qs Misinformation	No	0/4
Brown (1999, Study 1)	6–7	Attentiveness and reflectiveness (teacher-rated)	False reports	No	0/2
Burgwyn-Bailes et al. (2001)	3–7	TABC: Activity and persistence (parent-rated)	Misleading Qs	No	0/6
Clarke-Stewart et al. (2004)	5	CBQ: Inhibitory control (parent-rated)	Misleading Qs	No	0/1
Geddie et al. (2000)	3–7	TABC: Activity and persistence (parent-rated)	Misleading Qs	No	0/2
Imhoff and Baker-Ward (1999)	4	TABC: Activity and persistence (parent-rated)	Misleading Qs	No	0/2
Scullin (1997)	4	EAS: Activity (teacher-rated)	Misleading Qs Shift	No	0/2

Note: [a]CTRS = Conners' Teachers Rating Scale-Revised (Conners, 1997); CTS = Carey Temperament Scales Behavioural Styles Questionnaire (McDevitt & Carey, 1996); CBQ = Children's Behaviour Questionnaire (Rothbart, Ahadi, & Hershey, 1994); TABC = Temperament Assessment Battery for Children (Martin, 1988); EAS = Emotionality, Activity, and Sociability Temperament Questionnaire (Buss & Plomin, 1984).

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Table 10. Creativity and suggestibility

Study	Age (years)	Event	Measure of creativity[a]	Measure of suggestibility	Results summary	Proportion of significant predicted correlations
Brown (1999, Study 1)	6–7	Event creation	Creativity assessment (teacher-rated)	False reports	Yes; imaginative children more likely to elaborate false reports	1/1
Brown (1999, Study 2)	5–6	Event creation	Creativity instrument	False reports	Yes (2/5 subtests significant)	2/5
Clarke-Stewart et al. (2004)	5	Interactive	Story telling	Misleading Qs	Yes; children with most complex narratives were most suggestible	1/1
Melnyk (2002, Study 1)	5–8	Event creation	Fantasy Questionnaire	False reports	Yes; younger children only	1/2
Melnyk (2002, Study 2)	5–6	Interactive	Fantasy Questionnaire	Misinformation Misleading Qs	Yes in 40 day test No	1/5
Purdy (2001)	5–8	Video	Imagination assessment (parent- and child-rated)	Misleading Qs Source monitoring	Yes for high pressure interviews No	1/4

Note: [a]Creativity instrument based on Wallach and Kogan (1965); Story telling (Clarke-Stewart & Beck, 1999); Fantasy Questionnaire (LeBaron, Zelzer, & Fanurik, 1988).

The relationship between psycho-social factors and suggestibility

The analyses in this section address common assumptions and important predictions concerning the degree to which suggestibility reflects social compliance which in turn may reflect basic personality dimensions, self-concept, and perhaps more basic child-rearing variables. We admit that the classification schemes that follow are more ambiguous than those that guided the analysis of the cognitive variables. Some of the psycho-social variables straddle categories, and in some cases, it could be argued that a new category should be formed. As already mentioned, our presentation is set up to be as transparent as possible so that dissatisfied or interested readers can conduct their own analyses.

Social engagement

The behaviours or dimensions included in this section include approachability, withdrawal (shyness), and compliance. Most of these variables were based on parents' or teachers' ratings of aspects of the child's behaviour (e.g. shyness); in some cases the scales were constructed for the specific study, but in other cases, the measures are subscales of Temperament instruments. In a few studies, children's 'yea-saying' or providing answers to silly questions (e.g. 'Is red heavier than yellow?') were used as measures of compliance. In one study, toddler's compliance to the examiner's commands was used as a predictor of suggestibility 3 years later (Clarke-Stewart, Malloy, & Allhusen, 2004, personal communication).

As shown in Table 11 although six of the 16 studies produced significant results, there were only significant correlations for nine of the 49 calculations and one of these correlations was in the non-hypothesized direction. Clarke-Stewart et al. (2004, personal communication) found that high compliance at 2 years of age was associated with low suggestibility at 5 years of age, whereas the common hypothesis is that highly compliant children should be more suggestible. No specific factors (age, event, measure of suggestibility) differentiated significant from nonsignificant studies.

Self concept/self-efficacy

Self-concept/self-efficacy measures were obtained through parent, teacher, or child ratings on various instruments. We included Davis and Bottom's (2002) use of the Resistance Efficacy Scale (Bandura, 1982, 1997) because it is the child's self-evaluation of independence in various situations.

Six of the nine studies that included self-concept or self-efficacy measures reported significant findings (see Table 12); for all but one calculation (Burgwyn-Bailes, Baker-Ward, Gordon, & Ornstein, 2001), higher self-concept was associated with lower levels of suggestibility. The major measure of suggestibility used in these studies was misleading questions; thus, there is little opportunity to observe potential correlations with misinformation. Also, with the exception of Burgwyn-Bailes et al., 2001),[9] this effect was obtained for older children and not for preschoolers. For example, Davis and Bottoms (2002) found that children who felt confident about telling an adult he or she was wrong succumbed to few misleading questions, if the children were older than 6.5 years and if they were interviewed by a supportive interviewer. In other words, the supportive interviewer increased older children's feelings of self-efficacy which in turn lowered

[9]As will be noted, results of this study are sometimes inconsistent. In part this might be due to the small sample size ($n = 20$) which lacks sufficient power to produce significant correlations and might produce unreliable effects when other variables are controlled for.

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Table 11. Social engagement and suggestibility

Study	Measures of social engagement[a]	Measure of suggestibility	Results summary	Proportion of significant predicted correlations
Brown (1999, Study 1)	Extroversion (teacher-rated) Risk-taking (teacher-rated) Compliance (teacher-rated)	False reports	Yes; higher for deniers Yes; higher for assenters No	2/3
Clarke-Stewart et al. (2004)	Bayley Scales of Infant Development: Compliance (observer-rated at 2 years)	Misleading Qs	Yes; high compliance at 2 years was related to low suggestibility at 5 years	0/1
McKinley-Pace (2000)	RCMAS: Social concern indices Gudjonsson Compliance Scale, revised for parents Gudjonsson Compliance Scale, revised for children	Misleading Qs Shift Misinformation Source monitoring	No Yes, with RCMAS Yes, with parent-rated compliance No	2/12
Roebers and Schneider (2001)	Shyness (teacher-rated)	Misleading Qs Misinformation	Yes Yes	2/2
Scullin (1997)	EAS: Shyness (teacher-rated)	Misleading Qs Shift	No Yes	1/2
Purdy (2001)	CTS: Approachability (parent-rated) DICE: Compliance (child-rated and parent-rated)	Misleading Qs Source monitoring	No Yes; less suggestible children made more source monitoring errors in high-pressure interviews	1/8
Alexander et al. (2002)	CBQ: Surgency, including shyness (parent-rated)	Misleading Qs	No	0/1
Burgwyn-Bailes et al. (2001)	TABC: Approach/withdrawal (parent-rated)	Misleading Qs	No	0/3
Chae (2004)	EAS (Korean adaptation): Shyness (teacher-rated)	Misleading Qs	No	0/1
Crossman (2001)	Shyness (teacher-rated) Compliance (teacher-rated) Answers to conflicting questions	Misleading Qs	No No No	0/3
Imhoff and Baker-Ward (1999)	TABC: Approach/withdrawal (parent-rated)	Misleading Qs	No	0/1
Geddie et al. (2000)	TABC: Approach/withdrawal (parent- and teacher-rated)	Misleading Qs	No	0/1

Continues

Table 11. Continued

Study	Measures of social engagement[a]	Measure of suggestibility	Results summary	Proportion of significant predicted correlations
Lee (2004)	CSDS	Misleading Qs	No	0/3
		Shift	No	
Melnyk (2002, Study 2)	CSDC	Misleading Qs	No	0/6
	Answers to bizarre questions		No	
Young et al. (2003)	CTI: Shyness subscale (teacher-rated)		No	0/2
			No	

Note: [a]Gudjonsson Compliance Scale (Gudjonsson, 1989); RCMAS = Revised Children's Manifest Anxiety Scale (Reynolds & Richmond, 1978); EAS = Emotionality, Activity, and Sociability Temperament Questionnaire (Buss & Plomin, 1984); CTS = Carey Temperament Scales Behavioural Style Questionnaire (McDevitt & Carey, 1996); CBQ = Children's Behaviour Questionnaire (Rothbart et al., 1994); TABC = Temperament Assessment Battery for Children (Martin, 1988); CSDS = Children's Social Desirability Scale (Crandall, Crandall, & Katkovsky, 1965); CSDC = Comprehensive Social Desirability Scale for Children (Walsh, Tomlinson-Keasey, & Klieger, 1974); DICE = Dissociation-Imagination-Compliance Event Checklist (Shapiro & Purdy, 2004); bizarre questions based on Hughes and Grieve (1980) and Pratt 1990); CTI = Child Temperament Inventory (Buss & Plomin, 1984).

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Table 12. Self concept/self-efficacy and suggestibility

Study	Age (years)	Measure of self-concept[a]	Measure of suggestibility	Results summary	Proportion of significant predicted correlations
Burgwyn-Bailes et al. (2001)	3–7	Children's Self-View Questionnaire	Misleading Qs	Yes; high achievement motivation and low suggestibility Self-perception of social avoidance and low suggestibility	1/27
Chae (2004)	5–6, 7–8	PCSA	Misleading Qs	Yes for older children only	1/2
Davis and Bottoms (2002)	6–7	Resistance Efficacy Scale	Misleading Qs	Yes in supportive interviews for children over 6.5 years	1/4
Howie and Dowd (1996)	9	BASE (teacher-rated)	Misleading Qs	Yes	1/1
Murch and Slater (1996)	6–10	LAWSEQ	Misleading Qs Misinformation	Yes	2/2
Vrij and Bush (2000)	5–11	Academic self-esteem (teacher-rated)	Misleading Qs	Yes	1/1
Crossman (2001)	3–6	Academic self-esteem (teacher-rated)	Misleading Qs	No	0/1
Melnyk (2002, Study 2)	5–6	PCSA (child- and teacher-rated)	Misleading Qs Misinformation	No	0/5
Stadfeld (1998)	4–5	CISE	Misleading Qs	No	0/1

Note: [a]Children's Self-View Questionnaire (Eder, 1990); PCSA = Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (Harter & Pike, 1984); Resistance Efficacy Scale (Bandura, 1982, 1997); BASE = Behavioural Academic Self-Esteem Scale (Coopersmith & Gilberts, 1982); LAWSEQ = Lawrence Self-Esteem Questionnaire (Lawrence, 1981); academic self-esteem (Vrij & Bush, 2000); CISE = Children's Inventory of Self-Esteem (Campbell, 1987).

suggestibility. This pattern was not found for the younger children. Either this age difference that separates significant from nonsignificant studies could reflect the greater stability of self-esteem with age, or it could reflect the greater reliability of self-esteem scales for older children.

Stress/emotional arousal/state anxiety

As shown in Table 13, 15 studies included examinations of the effects of children's emotional arousal during the target event on their later suggestibility. In 12 of these studies, children underwent a variety of stressful medical procedures (e.g. voiding cystourethrogram fluoroscopy, venopuncture, inoculation, facial laceration repair) and later answered suggestive questions about the procedure. During these medical procedures, stress ratings or anxiety levels were assessed and then correlated with the children's later memories. In some of these studies, the suggestibility of children who underwent stressful procedures was compared to the suggestibility of children who did not undergo the same procedures. In two studies that did not involve a medical procedure, stress/mood was manipulated during the presentation of a target event; the children were later suggestively questioned about the event. Only two of the 15 studies (Bruck, Ceci, Francoeur, & Barr, 1995; Ridley, Clifford, & Keogh, 2002) examined misinformation effects; the remaining studies examined responses to misleading questions.

Significant associations between stress/emotional arousal and suggestibility were obtained for eight of the 15 studies. However, for half of the significant studies, the relationship was positive such that high arousal/stress was associated with high suggestibility, whereas for the other half of the significant studies the relationship was negative, with high stress/arousal associated with low suggestibility.

It is not apparent what accounts for these different patterns of results. The distribution of significant and nonsignificant positive relationships, as well as significant negative relationships, is similar across studies involving medical procedures. The ages of the children were similar across these studies as were the delays between the stressful event and the suggestive interviews.

Only two studies experimentally manipulated children's level of stress/arousal in a randomized design. In both of these studies, there were significant positive relationships between stress/emotional arousal and suggestibility. For example, Burgess (2000) showed 77 preschool children a video. At the end of the video, the child was asked to help the cartoon character in such a way that the child could get a prize. Next, there was a mood induction manipulation. To elicit happiness, the child got a prize when she touched a picture of the prize on the TV. To elicit anger, the child did not get the prize when she touched the target picture. To elicit sadness, the target picture was never presented so there was no way to help the cartoon character deliver the prize. Analysis of videotapes of the children's emotional expressions during this part of the experiment verified that the children usually showed the appropriate emotion. Immediately after the mood induction phase, the children were asked misleading questions about the original video. When children were sad, they were more suggestible than when they were angry or happy. In Peters' study (1991), children either heard a fire alarm (high stress group) or a loud radio (low stress group) while performing a card-sorting task. Their memory for the event was later tested. Children in the high-stress group were more suggestible than children in the low-stress group.

To summarize, although there are a number of studies on the relationship between stress and suggestibility, the findings are inconsistent in that half of the studies failed to show any

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Table 13. Stress/emotional arousal/state anxiety and suggestibility

Study	Age (years)	Event	Measure of state/emotional arousal[a,c]	Results summary[b]
Burgess (2000)	4–6	Interactive	Mood induction: Happy, angry, or sad	Yes; children with negative emotions more suggestible than those with positive emotions. Sad children were the most suggestible
Goodman et al. (1991, Study 1)	3–8	Medical procedure	Stress vs. no stress groups	Yes—negative
Goodman et al. (1997)	3–10	Medical procedure	Rating	Yes—positive
Marche and Loehr (2004)	8–16	Medical procedure	Coloured Analog Scale and Facial Affective Scale	Yes—negative
			STAIC (modified version)	Yes—negative
Quas et al. (1999)	3–14	Medical procedure	Emotion Reaction Questionnaire (parent-rated)	Yes—positive
Peters (1991)	6–9	Interactive	Stress vs. no stress groups	Yes—positive
Shrimpton et al. (1998)	4–12	Medical procedure	Venopuncture vs. no venopuncture	Yes—negative
Ridley et al. (2002)	9	Video	STAIC: 'How I Feel' questionnaire	Yes—negative
Bruck et al. (1995)	4–6	Medical procedure	Rating	No
Burgwyn-Bailes et al. (2001)	3–7	Medical procedure	Child anxiety (parent-and physician-rated	No
Eisen et al. (2002)	3–17	Medical procedure	Rating	No
Goodman et al. (1991, Study 2)	3–6	Medical procedure	Rating (inoculated vs. non-inoculated)	No
Goodman et al. (1991, Study 3)	4–7	Medical procedure	Rating	No
Goodman et al. (1991, Study 4)	4–7	Medical procedure	Rating	No
Oates and Shrimpton (1991)	4–12	Medical procedure	Procedure vs. no procedure comparisons	No

Notes: [a]'Rating' refers to a non-standardized scale that was used to rate the child's stress, emotion, and/or arousal during the target event. For other cells the name of the scale used to rate arousal during the event is provided. [b]Positive denotes high stress was associated with high suggestibility; negative denotes high stress was associated with low suggestibility. [c]Coloured Analog Scale and Facial Affective Scale (McGrath et al., 1996); STAIC = State-Trait Anxiety Inventory for Children (Spielberger, 1979; Spielberger, Edwards, Lushene, & Montuori, 1970; Spielberger, Edwards, Lushene, Montuori, & Platzek, 1973); Emotion Reaction Questionnaire (Quas et al., 1999).

significant relationships and the nature of the relationship changed across the significant studies. In part, we suspect this is due to the fact that in many of these studies either the event itself varied across children in the same study (e.g. studies involving medical procedures) and in some studies the event itself did not produce enough emotion to influence suggestibility. To date, studies that have greater experimental control over the event and that also involve manipulation of emotional states avoid such problems and have yielded significant results.

Mother's attachment styles

Following the lead of Goodman, Hirschman, Hepps, and Rudy (1991), a number of researchers have examined the association between maternal romantic attachment style and their children's suggestibility concerning a stressful event. Previous work in this domain has shown that there are individual differences in adult attachment styles that are similar to the attachment patterns described by Ainsworth (see Fraley & Shaver, 2000, for a review). These independent dimensions are called anxiety (fear of abandonment in close relationships) and avoidance (discomfort with close relationships). Individuals low on both of these scales are classified as secure. The original premise for studying the relationship between mothers' attachment styles and their children's memory (of stressful events) was that anxious mothers might transmit fear to their children or that avoidant mothers might be less comforting or willing to discuss the stressful events with their children. This in turn might affect children's encoding as well as retrieval of the target events. In contrast, mothers with supportive attachment styles (to romantic partners) might promote processing styles that are conducive to accurate recall. It is also assumed that mothers' romantic attachment style is correlated with mother-child attachment style. In other words, mothers' romantic attachment is used as a proxy measure for mother-child attachment.

The findings of six studies that have examined the relationship between maternal attachment styles with children's suggestibility are summarized in Table 14. As can be seen, researchers have examined the predictiveness of maternal attachment style to study children's memories for a range of events (not just stressful medical procedures). The studies include a wide age range of children and the delays between the target event and the suggestive questioning were substantial, ranging from 10 days to several years. Answers to misleading questions served as the measure of suggestibility in all studies.

In five of the six studies, insecure and/or avoidant mothers had the most suggestible children. Although this relationship was found for boys in Crossman's (2001) study, the opposite pattern was found for girls in the same study; namely, lower suggestibility rates in girls were associated with higher insecure mothers. Only one of the six studies failed to obtain a significant relationship between insecure maternal attachment and children's suggestibility. The findings of Bottoms et al. (in press) are interesting because these suggest a mechanism or set of conditions for which maternal attachment may be particularly effective. In this study, 81 children engaged in a structured play event in a laboratory. After this activity, a supportive interviewer (the interviewer built rapport with the child, used a warm and friendly voice, gazed and smiled at the child often, and assumed a relaxed body position) questioned half the children and a neutral non-engaging interviewer questioned the other children. Bottoms et al. hypothesized that children of insecurely attached mothers would also demonstrate some of these same characteristics and thus might be more apprehensive and experience more stress during the interview than children of securely attached mothers. Consequently, they predicted that children of

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Table 14. Mother's attachment style and suggestibility

Study	Age (years)	Event	Measure of mother's attachment style[a]	Results summary[b]	Proportion of significant predicted correlations
Bottoms et al. (in press)	7–8	Interactive	RQ	Yes, in nonsupportive interviewing condition No, in supportive interviewing	1/2
Clarke-Stewart et al. (2004)	5	Interactive	Mothers' fearful-avoidant attachment scale	Yes	1/1
Crossman (2001)	3–6	Staged	RQ	Yes for boys, but insecure mothers had less suggestible girls	1/2
Goodman et al. (1997)	3–10	Medical procedure	CRQ	Yes	1/1
Quas et al. (1999)	3–14	Medical procedure	RQ	Yes; 2/20 correlations were significant	2/20
Alexander et al. (2002)	3–7	Medical procedure	Composite score from RQ and RSQ	No	0/1

Notes: [a]RQ = Relationship Questionnaire (Bartholomew & Horowitz, 1991); Mothers' fearful-avoidant attachment scale based on Hazan and Shaver (1987); Close Relationships Questionnaire (Hazan & Shaver, 1987); RSQ = Relationship Scales Questionnaire (Griffin & Bartholomew, 1994). [b]Unless indicated, all significant associations indicate that insecure and/or avoidant mothers have more suggestible children.

insecure mothers might have the most difficulty contradicting the interviewer and resisting suggestions. As a result, supportive interviewers would be most beneficial for these children and this in turn would result in decreases in suggestibility. This is the pattern of results obtained in that study.

In summary, the patterns of correlations for five of the six studies suggest that there is a consistent relationship between maternal relationship styles and their children's suggestibility. We suspect that perhaps these correlations underestimate the effect of mother-child attachment because the predictor only measures mothers' romantic attachment styles with romantic partners. Surprisingly, as reviewed in the next section, few studies directly examined association of parent-child attachment with suggestibility.

Parent-child relationships

Only two studies have examined the associations between parent-child relationships and children's suggestibility. In the most comprehensive of the studies, Clarke-Stewart et al. (2004) tested 70 children who were a subsample of a large longitudinal NICHD (National Institute for Child Health and Development) study of early child care and who had been followed from birth to at least 5 years of age. At 54 months of age, the children came to the laboratory and participated in a number of different activities. Nine months later (ages ranged from 58 to 69 months), their memory for this play period was assessed. Some children received a very suggestive interview whereas others received a mildly suggestive

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interview. For purposes of data analysis, the authors calculated *z*-scores for each of the groups and then combined them for the correlational analyses.

The quality of children's attachment relationships with their parents and parents' supportiveness of their children were assessed at various time periods throughout this longitudinal study. At 15 months, children's proximity contact-seeking behaviour and attachment security with their mothers were rated. At 17 months, children's attachment with their fathers and fathers' positive behaviour towards the children were assessed following a 3-hour dinner- and bedtime observation visit to each child's home. At 36 months, fathers' positive attitude towards their children was measured. Finally, at 54 months, maternal sensitivity during problem-solving and play interactions with their children was categorized as supportive, hostile, or respectful of autonomy.

The best predictors of children's suggestibility at 5 years were fathers' positive behaviour at 17 months, fathers' positive attitude at 36 months and attachment to mother at 15 months. Attachment to father and maternal sensitivity scores were not correlated with suggestibility.

In the second study (Melnyk, 2002, study 2), children who were participants in a magic show were later provided with false information about some of the events. The degree to which they incorporated misinformation into their reports was assessed approximately 6 weeks and 21 weeks after the event. Various psycho-social measures were correlated with measures of suggestibility. One of the significant findings was that children's high ratings of maternal support were related to low levels of suggestibility at the second memory test (but there was no relationship at the first memory test).

Clearly more work is required to examine the association of parent-child attachment and children's suggestibility.

Parenting styles

The associations of suggestibility with maternal attachment style and with parent-child interaction may also be related to parenting styles. The four studies that examined this relationship are listed in Table 15. Although all studies in this group used similar measures to tap authoritative, traditional, and permissive styles of parenting, included children of the same age range (3 to 7 year olds), and used misleading questions as the suggestibility measure, the results were not consistent.

Crossman (2001) found that authoritative mothering was associated with high suggestibility. However, Burgwyn-Bailes et al. (2001) found that permissive parenting was associated with suggestibility (only in young preschoolers),[10] and Imhoff and Baker-Ward (1999) found no relationships using this same scale. The findings of Clarke-Stewart et al. (2004) that traditional parenting by fathers but not mothers was associated with children's suggestibility are also inconsistent with the above findings. However, it should be noted that in the latter study, parental ratings were obtained when the children were 15 months of age and children's measures of suggestibility were obtained when they were 5 years of age.

Temperament

Eight studies included measures of temperament and suggestibility (see Table 16). The temperament measures focused on dimensions of adaptability, ease of management and emotionality. Significant correlations were found in three studies but overall only 3/38

[10]See footnote 9.

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Table 15. Parenting styles and suggestibility

Study	Event	Parenting style measure[a]	Results summary	Proportion of significant predicted correlations
Burgwyn-Bailes et al. (2001)	Medical procedure	PM (mother- or father-rated)	Progressive parental values associated with high suggestibility (but only for younger children at 1/3 time periods)	1/6
Clarke-Stewart et al. (2004)	Interactive	PM (father-rated at 15 mos)	Fathers' traditional values and authoritarianism related to high suggestibility at 5 years	1/2
		PM (mother-rated at 15 mos)	Mothers: No	
Crossman (2001)	Staged	Parental Authority Questionnaire (mother-rated)	Authoritative parenting related to high suggestibility	1/1
Imhoff and Baker-Ward (1999)	Interactive	PM (mother- or father-rated)	No	0/1

Note: [a]PM = Parent Modernity Scale (Schaefer & Edgerton, 1984); Parental Authority Questionnaire (Buri, 1991).

correlations were significant. Chae (2004) found that high emotionality was correlated with high suggestibility in a sample of Korean children; however, after controlling for age the relationship was nonsignificant. Chen (2002) and Scullin (1997) found, unexpectedly, that high emotionality was related to low suggestibility scores. Thus temperament, as measured in this section, does not correlate with children's suggestibility.

Mental health

This final section contains analyses of children's and mother's mental health. The dependent variables include general measures of children's mental health as indicated by parent ratings, researcher ratings, and psychiatric assessments. Other scales reflect more specific problems, such as anxiety or dissociation. We also include the results of two studies that examined indices of parents' mental health.

As shown in the seven studies listed in Table 17a, there is little support for the hypothesis that children's behavioural symptoms are associated with suggestibility. Most of the correlations were nonsignificant. The one noteworthy exception was the Eisen, Goodman, Qin, and Davis (2002) study; the children in this sample were at risk for mental health problems as they were selected from a clinic that specialized in assessment of abused children. Perhaps there was not enough variability in mental health status in most of the other studies of non-clinical children to obtain significant correlations. That is, studies that do not include a significant number of children with behavioural problems may not be able to detect the relationship due to floor effects. Thus in order to examine the association between certain symptoms and suggestibility, future studies should focus on the comparison between clinical samples of children with specific mental health problems

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Table 16. Temperament and suggestibility

Study	Age (years)	Measure of temperament[a]	Measure of suggestibility	Results summary	Proportion of significant predicted correlations
Chae (2004)	5–6 7–8	EAS (Korean version): Emotionality (teacher-rated)	Misleading Qs	Yes; high emotionality with high suggestibility (nonsignificant after controlling for age)	1/1
Chen (2002)	4–5 9–10	TABC: Emotional-intensity (parent-rated)	Misleading Qs	Yes; high emotionality with low suggestibility (older children only)	0/2
Scullin (1997)	4	EAS: Emotionality (teacher-rated)	Shift Misleading Q	Yes; high emotionality related to low shift scores No	0/3
Alexander et al. (2002)	3–7	CBQ: Surgency, negative affect, effortful control (parent-rated)	Misleading Qs	No	0/3
Blackford and Shapiro (1999)	6–11	TABC: Adaptability, ease of management, emotional intensity (parent-rated)	Misleading Qs Misinformation	No No	0/6
Burgwyn-Bailes et al. (2001)	3–7	TABC: Adaptability, ease of management, emotional intensity (parent-rated)	Misleading Qs	No	0/18
Geddie et al. (2000)	3–7	TABC: Adaptability, ease of management, emotional intensity (parent- and teacher-rated)	Misleading Qs	No	0/3
Imhoff and Baker-Ward (1999)	4	TABC: Adaptability, ease of management, emotional intensity (parent-rated)	Misleading Qs	No	0/3

Note: [a]EAS = Emotionality, Activity, and Sociability Temperament Questionnaire (Buss & Plomin, 1984); TABC = Temperament Assessment Battery for Children (Martin, 1988); CBQ = Children's Behaviour Questionnaire (Rothbart et al., 1994).

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Table 17a. Child's mental health and suggestibility

Study	Age (years)	Measure of mental health[a]	Measure of suggestibility	Results summary	Proportion of significant predicted correlations
Eisen et al. (2002)	3–17	Overall mental health (clinician-rated) CDC: Dissociation (parent-rated) CPAS: Dissociation (child-rated) or ADES: Dissociation (adolescent-rated)	Misleading Qs	Yes—Better functioning, lower suggestibility No No No	1/3
McKinley-Pace (2000)	6–12	RCMAS: Physiological anxiety, worry/oversensitivity	Misleading Qs Shift Misinformation Source monitoring	No Yes No No	1/4
Purdy (2001)	5–8	DICE: Dissociation (child-report and parent-report)	Misleading Qs Source monitoring	Yes; high dissociation with high suggestibility in high-pressure interviews No for low pressure interviews	1/4
Bartlett (2001)	9–12	SPAIC: General anxiety RCMAS: General anxiety	Misleading Qs	No	0/2
Burgwyn-Bailes et al. (2001)	3–7	STAIC (modified): Trait anxiety (parent-rated)	Misleading Qs	No	0/3
Clarke-Stewart et al. (2004)	5	Psychological problems exhibited by child at 30 mos (psychiatrist-rated)	Misleading Qs	No	0/1
Crossman (2001)	3–6	Social Competence and Behaviour Evaluation Scale for Preschoolers	Misleading Qs	No	0/1

Note: [a]CDC = Child Dissociative Checklist (Putnam, 1985); CPAS = Children's Perceptual Alteration Scale (Evers-Szostak and Sanders, 1992); ADES = Dissociative Experiences Scale for Adolescents (Armstrong, Putnum, Carlson, Libero, & Smith, 1997); RCMAS = Revised Children's Manifest Anxiety Scale (Reynolds & Richmond, 1978); DICE = Dissociation-Imagination-Compliance Event Checklist (Shapiro & Purdy, 2004); SPAIC = Social Phobia and Anxiety Inventory for Children (Beidel, Turner, & Morris, 1995); STAIC = State-Trait Anxiety Inventory for Children (Spielberger, 1979; Spielberger et al., 1970, 1973); Social Competence and Behaviour Evaluation Scale for Preschoolers (LaFreniere and Dumas, 1996).

Table 17b. Mother's mental health and suggestibility

Study	Age (years)	Measure of mental health[a]	Results summary	Proportion of significant predicted correlations
Clarke-Stewart et al. (2004)	5	Rosenberg Self-Esteem Scale (mother's self-esteem)	Yes; Mothers with low self-esteem had suggestible children	1/1
Alexander et al. (2002)	3–7	NEO-FI Personality Inventory (mothers' personality)	No	0/1

Note: [a]Rosenberg Self-Esteem Scale (Rosenberg, 1965); NEO-FI Personality Inventory (Costa & McCrae, 1992).

(e.g. general anxiety) and children with no problems. This method has not been used yet in this field of study.

Finally, as shown in Table 17b, one of two studies found a correlation between children's suggestibility and their mother's mental health. In this one case, mothers with poor self-esteem had more suggestible children (Clarke-Stewart et al., 2004).

CONCLUSIONS AND DISCUSSION

In this review we presented and summarized results of 69 studies, and more than 500 analyses on individual differences in children's suggestibility. The first purpose of this review was to provide a tally of the proportion of studies and proportion of analyses within these studies that yielded significant relationships between demographic, cognitive, and psycho-social factors with suggestibility. This information is summarized in Table 18.

The results for the demographic variable analyses are straightforward; the preponderance of the analyses were nonsignificant showing that neither SES nor gender are systematically related to suggestibility across a wide age range of children. In the future, it is recommended that gender be included as a factor in the analysis of suggestibility studies only if there is a primary theoretical motivation for its inclusion.

The summaries for the cognitive and psychosocial variables show that although 40% to 50% of the studies cited produced significant results in the predicted direction, closer inspection of the actual analyses within each paper showed that across the data set only 16% of all correlations were significant. Thus even though the abstract of a specific study might state that significant relationships were obtained, inspection of the data sometimes showed that the significant relationship was more often the exception than the rule.

Inspection of Table 18 also allows a comparison of the rates of significance for cognitive versus social variables in predicting suggestibility effects. There were 83 analyses of unique cognitive factors across the 69 studies (this is because one study could for example examine the independent effects of intelligence and creativity on suggestibility). There were 68 analyses of social variables. A chi-square analysis conducted on the frequency of significant, nonsignificant, and inconsistent (unpredicted) results for cognitive and social domains was significant, $\chi(2) = 7.95$, $p < 0.02$. This reflects the fact that there were more inconsistent findings for the social than the cognitive analyses. There was no difference, however, in terms of the significant predicted results. When the number of individual significant calculations were counted (last column of Table 18), there were also no differences in the proportion of significant correlations for cognitive and social factors.

Next we examined the degree to which specific types of cognitive or social factors might predict suggestibility in children. As shown in Table 18, there were seven different categories of cognitive variables; in addition, the memory and language categories were further subdivided. The two categories with the most consistent relationships with suggestibility (both in terms of proportion significant studies and analyses) were 'language' and 'creativity.' Language-suggestibility relationships were obtained only when global, comprehensive assessments of children's language ability were included; single measures of vocabulary did not yield significant results. Because these language results focus on the younger children, it is not known if language abilities also account for suggestibility in elementary-school-aged or older children. Creativity was associated with high levels of suggestibility in samples of 5 to 8 year old children. The preponderance of studies in this category focused on false event creation and the results suggest that it is the

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Table 18. Summary of significant studies and analyses

Individual difference factor	Number of studies	% of significant studies[a]	% of significant analyses[b]
Demographic factors			
SES	6	17	
Gender	20	15 (5)	
Cognitive factors			
Intelligence (typically-developing children only)	15	60	22
Language			
Vocabulary only	6	17	6
Language batteries	4	80	59
Other	2	0	0
Memory			
Traditional/standardized tests	8	38	9
Event memory	5	80(80)	5(6)
Theory of mind	11	64	38
Executive functioning	16	50 (7)	15 (2)
Distractibility	10	20	7
Creativity	6	100	39
Cognitive total	83	49 (2)	17
Psycho-social factors			
Social engagement	15	27 (13)	17 (2)
Self-concept/self-efficacy	9	67	18 (2) [35][c]
Stress/emotional arousal/state anxiety	15	27 (27)	
Mother's attachment style	6	67 (17)	22 (3) [57]
Parent-child relationship	2	100	50
Parenting styles	4	50 (25)	20 (10)
Temperament	8	13 (25)	3 (6)
Mental health			
Child	7	3	17
Mother	2	50	50
Psycho-social total	68	40 (15)	17

Note: [a]Proportions represent the percentage of studies containing significant correlations in the predicted direction. The percentage of studies containing significant correlations in the nonpredicted direction is presented in parentheses. [b]The percentage of correlations computed for each study that were significant in the predicted direction. The percentage of correlations computed for each study that were significant in the nonpredicted direction is presented in parentheses. For the variables of SES, gender, and stress these numbers are not presented mainly because there was often only one analysis per study. [c]The numbers in square parentheses represent adjusted values after removing studies with 20 calculations or more.

more creative children who provide more elaborative narratives of suggested events. The theory of mind studies produced a mixed picture and the numbers presented in Table 18 may over-estimate the effect. This is because when significant relationships were obtained, some (as predicted) found that high suggestibility levels were associated with high theory of mind performance, whereas other studies found that low suggestibility was associated with high theory of mind.

The remaining categories of cognitive variables yielded relatively low numbers of significant correlations. Of particular surprise was the finding that event memory in one setting was not a good predictor of suggestibility in a second setting; even when there were significant relationships, half of these showed that good event memory was correlated with high suggestibility. These results suggest that previous findings that good memory for the details of an event is associated with low levels of suggestibility (e.g. Marche, 1999;

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Marche & Howe, 1995; Pezdek & Roe, 1995) reflect context-specific factors rather than cognitive profiles of individual children. Finally, IQ is not a significant predictor of suggestibility within the normal population; however, it does predict suggestibility when children with MR are added to the sample; children with MR are more suggestible than TD children with normal intelligence, particularly on close ended-questions.

As shown in Table 18, we created eight categories of psycho-social variables; the mental health category was further subdivided into studies of children and studies of mothers. The highest correlations with suggestibility were obtained for measures of self-concept, maternal attachment style, and parent-child relationships. (The mental health category for mothers was omitted from the top-scoring list because there were only two studies, each yielding a different pattern of results.) Thus children with poor self-concept, poor supportive relationships with fathers or mothers, and with mothers who were insecurely attached in their romantic relationships were at risk for being suggestible. Although none of the studies directly modelled the causal pathway to suggestibility, based on these significant findings we propose the following for future study. The common finding of maternal attachment-suggestibility relationship may in fact represent the mother's style of interaction with adult partners that also characterizes her interactions with her child. Children raised by secure and supportive parents may develop positive self-concepts, which in turn may make them resistant to suggestions that are inconsistent with their own experiences.

For the remaining categories of psycho-social predictors, the frequency of significant studies or significant calculations within these studies was either low or else characterized by inconsistent/unpredicted results. The pattern of inconsistent results is best exemplified by the emotional arousal (stress) factor. The pattern of results is as perplexing today as it was a decade ago (Ceci & Bruck, 1993). At that time, there was a debate about the nature of the relationship between stress and suggestibility: whether high stress was related to low suggestibility or whether high stress was related to high suggestibility. More than 10 years later, the number of studies has doubled and yet the results are just as inconsistent. Half the studies show no effects of stress on suggestibility even when children were exposed to quite stressful conditions; 25% of the studies showed a high stress-low suggestibility relationship, while 25% showed the reverse effect.

The second focus of the present analysis was to determine if different measures of suggestibility might be associated with specific cognitive and psycho-social factors. Of specific interest was the degree to which misinformation and source monitoring effects might aggregate with cognitive variables, whereas interrogative suggestibility measures that were collected on the same day as the target event might aggregate with psycho-social factors. The analyses were conducted at the level of the individual correlations (last column of Table 18) and not at the level of the study. Before presenting the data, it should be noted that the low frequency of the co-occurrence of specific types of individual difference factors (cognitive vs. social) with specific types of suggestibility measures limits the extent of our analyses. For example, there were only 20 studies in which suggestibility was tested on the same day as the event, and only six of these included measures of social factors. The following is a summary of the results of these analyses.

First, misinformation and source-monitoring effects correlated with cognitive factors in 23% of all calculations (the baseline was the total number of misinformation/source monitoring measures that were entered into correlations with cognitive factors); this proportion did not differ from the 16% of significant correlations between misinformation/source monitoring measures and social factors. Thus factors such as self-esteem or

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mother's romantic attachment were as likely to correlate with misinformation/source monitoring effects, as were measures of intelligence or memory.

We predicted that social factors would correlate with interrogative suggestibility especially at short delays. We reasoned that children would have good memories of the target event about which they were questioned. Therefore they would provide knowingly false answers to misleading questions for social reasons (e.g. compliance). There were six relevant studies to test this hypothesis; for three (50%) of the studies, social factors predicted suggestibility. However, the same rate was found for the 15 studies (of being asked misleading questions on the same day as the target event) that included cognitive predictors; eight of these 15 studies (53%) contained significant effects. Thus children's assents to misleading questions after very short delays are not only predicted by social factors (such as self-concept, attachment) but also by cognitive factors (in this case most of the cognitive factors consisted of global measures of language or theory of mind).

If the focus on interrogative suggestibility is extended to all studies regardless of delay, there is no specific pattern of correlation with social or cognitive factors. Measures of interrogative suggestibility correlated with cognitive factors in 12% of all calculations (the baseline was the total number of misleading question and shift measures that were entered into correlations with cognitive factors); this proportion did not differ from the 15% of significant correlations with social factors.

A third objective of our review was to determine if there were different patterns of individual differences in suggestibility as a function of children's age. Unfortunately because studies of many of the factors (e.g. executive functioning) included a very limited age range, we could not reliably address this issue. We did however note some trends that deserve future consideration. In our summary of the self-concept/self-efficacy data, we noted that nonsignificant studies tended to include younger children, whereas the significant studies included older children. It is possible that these trends reflect actual developmental phenomena, but it is also possible that the instruments may be more reliable for older than for younger children. We also found that the few studies with significant IQ-suggestibility correlations included younger children than studies with nonsignificant IQ-suggestibility correlations.

Finally, we posited that there might be a file-drawer phenomenon in the reporting of individual differences in children's suggestibility. We examined the percentage of significant calculations for each paper listed in Table 1 as a function of their publication status (published/in press vs. unpublished). There was no difference in publication status as a function of the percentage of significant correlations per study. After carefully reviewing this literature, our conclusion is that within published papers, there is a bias to highlight positive results and to pay little attention to the nonsignificant findings but there is no bias in terms of actual publications rates for studies containing significant versus nonsignificant results.

There are several caveats that need to be raised about our results. First, in this paper, we only reported the number of significant findings; we did not report the effect sizes of the significant effects. We omitted this because in many cases there were insufficient data.

Second, as we noted in the method section, we did not use statistical methods to construct our categories of cognitive and psycho-social factors, but relied on our own judgments. Thus, it is highly possible that some or all of the categories are highly correlated, reflecting a few basic dimensions of skills or behaviour. We recognize this as a limitation of the present analysis. It is also a limitation of some studies where there has not been an attempt at data reduction.

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Third, many of our analyses are not properly balanced due to the nature of the data set. We have already mentioned how this problem marred our attempt to examine how individual differences many change as a function of age, how individual differences may vary as a function of delay between the target event and questioning, etc. Because of this imbalance, we were unable to explore whether there were unique predictors of false event implantations. This is another topic that deserves future research.

Finally, most of the reviewed studies were correlational in nature. Many of the studies primarily focused on suggestibility effects and individual difference measures were added as a secondary interest. These studies nonetheless provide important exploratory information that should be used in the planning of future theoretically driven studies in this area.

The results of our summary of the literature have several theoretical and applied applications. On the theoretical side, this review raises concerns about the degree to which the existing studies provide any insight into the psychological mechanisms underlying suggestibility effects in children. A pessimistic view is that this is a fruitless enterprise; the few significant findings (16% of all correlations) represent outliers and are not reliable markers of individual differences. If this is so, then one might conclude that either the relevant psychological constructs that correlate with suggestibility have not been found, or else that suggestibility is an elusive trait that is quite independent of most cognitive and psycho-social profiles. A more optimistic view is that though infrequent, the current findings point to logical aggregates of cognitive/psycho-social variables that deserve future research. Furthermore, one could argue that the present literature demonstrates the complexity of suggestibility, that it is not related to a single cognitive or psycho-social domain, but may in fact be related to a combination of the two.

The implications of this literature for the forensic arena should be clear. With the exception of children with MR, the scientific evidence suggests that one cannot, at present, identify individual children who are most at risk for heightened suggestibility. Even when effects are found, these are not large and would not reliably identify or suggest to the court that a specific child's profile indicates high or low suggestibility. Even when predictors are combined (which was rarely carried out in the studies in this paper), the significance levels are still not high enough to warrant individual identification. For example, Clarke-Stewart et al. (2004) entered the best single predictors of suggestibility into a multiple regression analysis. The predictors were children's language to adults, adaptive/inhibitory control, father's support (measured in infancy) and mother's attachment avoidance. Statistically, the results were impressive; the combination of these variables accounted for 32% of the variance in children's answers to misleading questions about an event that had occurred 9 months previously. However, without going into more detail, it is apparent that these results would be very difficult to translate into the courtroom. For now, as scientists, the most we can tell the court is that suggestive interviewing techniques have a high risk of tainting children's testimony; we cannot provide them with reliable information about the types of children whose reports are most likely to be tainted by suggestive interviewing.

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