

Judgement of Confidence in Childhood Memories

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SUMMARY

Memory judgement processes, based on the characteristics and associations of retrieved memories such as sensory details and supporting memories, are considered as important as retrieval in several autobiographical memory models. Judgement processes have received less research attention than memory characteristics themselves. The present studies examined memory judgement using qualitative analysis of the reasons participants gave for confidence in retrieved childhood memories. For memories they were confident of, participants cited memory phenomenology, especially sensory and affective details, much more frequently than consistency with other autobiographical knowledge. For memories they were not confident of, participants reported lack of consistency with autobiographical knowledge or with others' memories more often than memory phenomenology as reasons for their uncertainty. Participants' comments also revealed several metacognitive beliefs about the relationship between memory characteristics and accuracy. These data are consistent with two-process models of memory judgement associated with true versus false memories. Copyright © 2007 John Wiley & Sons, Ltd.

We rely on memory as a mental map of events from our past, and generally trust that our memory reliably discriminates actual events from ones that are imagined or fictional. However, assumptions about memory source are not always accurate, which is particularly problematic in forensic contexts such as when eyewitnesses confuse memories of an original experience with subsequent events. Most seriously, laboratory research indicates that individuals can produce false memories using imagery or misleading suggestions, and frequently believe such false events to be autobiographical, sometimes even in the face of evidence to the contrary (Heaps & Nash, 2001; Hyman, Husband, & Billings, 1995; Hyman & Pentland, 1996; Loftus, 1997; Mazzoni & Memon, 2003).

In response to this concern, researchers have examined phenomenological differences between memories for actual and imagined events (e.g. Arbuthnott, Geelen, & Kealy, 2002; Johnson, Foley, Suengas & Raye, 1988; Mather, Henkel & Johnson, 1997), and consistently observe differences between these sources. Memories of actual events contain more perceptual, contextual and semantic information than memories for imagined events (Arbuthnott et al., 2002; Henkel & Franklin, 1998; Johnson, Foley, Suengas et al., 1988;

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Lindsay, Johnson, & Kwon, 1991; Mather et al., 1997; McGinnis & Roberts, 1996; Suengas & Johnson, 1988). Actual memories also show increased affect relative to imagined events (Johnson, Foley, Suengas et al., 1988; Mather et al., 1997). Conversely, memories for imagined events may have more reflective or cognitive details related to the processes of imagination or planning (Johnson, Foley, Suengas et al., 1988; but see Arbuthnott et al., 2002; Kealy & Arbuthnott, 2003; Suengas & Johnson, 1988).

Phenomenological characteristics could thus be useful in judging the source of retrieved events and are hypothesized to be central to autobiographical memories (Henkel, Franklin, & Johnson, 2000; Johnson, Hashtroudi, & Lindsay, 1993; Mazzoni & Kirsch, 2002; Mitchell & Johnson, 2000). 'Memories are attributions that we make about our mental experiences based on their subjective qualities, our prior knowledge and beliefs...' (Johnson, 2006, p. 760). However, little research has examined the thought processes involved in such judgement. Although we know that memories from different sources differ phenomenologically, we do not know how or to what degree people naturally *use* these differences to judge the accuracy of their memories. We investigated this issue in the current studies by examining participants' reports of confidence in recalled childhood memories.

Source monitoring

The judgement necessary to discriminate actual memories from other types of recalled stimuli is known as source monitoring. False memories observed in the laboratory typically result from errors in source monitoring—attributing a memory to something other than the original source of the recalled event. The source-monitoring framework (Johnson, 2006; Johnson et al., 1993; Mitchell & Johnson, 2000), the most accepted model of how we make decisions about memory source, specifies two processes that underlie source judgements, a heuristic process based on phenomenological differences between memories from different sources (e.g. perception vs. thought) and strategic consideration of information such as how consistent the recalled event is with other knowledge. The heuristic process is postulated to operate automatically, usually without awareness, whereas the strategic process is more deliberate and involves conscious consideration of information. The balance of these two processes, including whether the strategic process is used at all, depends on evidential criteria in each judgement context such as which types of errors, false alarms or misses, are considered more problematic.

Heuristic source-monitoring judgements are hypothesized to involve comparison of the quantity and quality of a memory's characteristics with the expectations of memories from different sources. If a memory matches the expected characteristics of a certain source, it is assumed to have originated from that source. For example, if recall of a childhood birthday involves considerable visual, auditory and gustatory detail and an accompanying feeling of excitement, these sensory and affective characteristics would be assumed to correspond to an actual memory rather than an imagined event. This match-to-average-characteristics process is usually quick and assumed to involve little conscious effort. An assumption of the source-monitoring framework is that heuristic source judgement is used most frequently (Johnson, 2006; Johnson et al., 1993), suggesting that most source judgements occur without an individual's awareness. Source misattributions or false memories are hypothesized to arise from this process when the phenomenological qualities of a memory are atypical of their category, such as when imagined memories contain vivid sensory details (e.g. Lampinen, Meier, Arnal, & Leding, 2005).

Strategic judgement processes, employed when source-monitoring criteria are stricter, use information such as supporting memories and relations with other autobiographical events (Johnson, 2006; Johnson et al., 1993; Mitchell & Johnson, 2000). For instance, Ross, Buehler, and Karr (1998) found that participants routinely used consistency of a memory with other autobiographical facts to judge personal memories, and Rubin, Schrauf, and Greenberg (2003) found that the familiarity of a memory's context was a strong correlate of belief that the memory was accurate. Judgement based on this type of information occurs in awareness and is generally slower and more deliberate than consideration of phenomenological characteristics.

Although the claim that source-monitoring judgements most frequently rely on heuristic processes is plausible for most everyday memory judgements, in forensic situations participants are directly asked about their memory accuracy, usually by persons in authority. In these circumstances, it seems unlikely that judgement would proceed entirely at an unconscious level. Thus, according to the assumptions of the source-monitoring framework, strategic information may be more central to forensic source judgements. In laboratory situations, manipulations such as having participants rate the phenomenological characteristics of their memories reduces the rate of misattribution of imagined memories (Mather et al., 1997), hypothetically because it encourages the use of more strategic judgement processes. If this is the case, then directly questioning a person's confidence in his or her memory accuracy should encourage a similar criterion shift, resulting in greater emphasis on consistency with other knowledge than on memory phenomenology.

The informational basis of memory judgements has received less research attention than their accuracy. In one of the few direct tests of this question, Johnson, Foley, Suengas et al. (1988, Study 2) had participants recall one perceived and one imagined event and report how they knew that the memories were from the claimed sources. Responses were categorized as phenomenological (characteristics of the memory itself), supporting memories (e.g. external verification) or reasoning based (e.g. metacognitive beliefs about characteristics). For actual events, participants reported both phenomenological and supporting memories. Characteristics of the target memory were reported as the first response 43% of the time and supporting memories were reported first 38% of the time. This study required explicit discussion of memory source, and the results suggest that phenomenological characteristics and supportive associations were used almost equally in this context. Thus, the assumption that heuristic and strategic judgement processes rely on different sources of information may not be entirely accurate.

Confidence judgement

Another memory judgement is the rememberer's confidence in the accuracy of a recollection. Confidence judgements likely involve some of the same processes as source judgements, because assessing one's confidence that a recalled event actually occurred in the way that it is recalled requires source judgement of various aspects of the memory. Theories of memory confidence (Johnson et al., 1993; Mazzoni & Kirsch, 2002; Rubin et al., 2003) propose that once a memory has been recalled, the rememberer uses the characteristics of that memory to determine whether that memory should be believed. An individual's metacognitive beliefs, as well as the criteria set for a particular judgement, influence how various memory characteristics are used to determine accuracy. Johnson (2006) hypothesized that confidence is influenced by relations among the heuristic (phenomenological) and strategic (plausibility, consistency) evidence associated with a

recalled event, modified by the criteria adopted for a specific memory judgement in a manner similar to source judgement itself. Specifically, Johnson et al. (1993) proposed that criteria setting for memory judgement involves assigning weights to the various characteristics, a process that would be influenced by both metacognitive beliefs and context.

As discussed above, the informational source for strategic memory judgements may involve the deliberate consideration of phenomenological characteristics, as well as evidence such as consistency and supporting memories (Johnson, Foley, Suengas et al., 1988). However, Rubin et al. (2003) observed greater use of supporting memories in ratings of belief, a judgement similar to confidence. Ratings of belief in memory accuracy were predicted by ratings of setting familiarity and narrative coherence, and not by sensory characteristics. Thus, it is not clear whether both phenomenological characteristics and supporting memories underlie confidence and strategic memory judgements, or whether phenomenological characteristics are relevant only for heuristic judgement processes.

Rationale of the present studies

To investigate information underlying confidence judgement, we expanded the method of Johnson, Foley, Suengas et al. (1988; see also Gardiner, Ramponi, & Richardson-Klavehn, 1998), requesting reasons for confidence in the source of retrieved childhood memories. Qualitative studies of personal memories were frequent in earlier decades (e.g. Brewer, 1988a; Linton, 1975; Thompson, 1982; Wagenaar, 1986; White, 1982), whereas indirect tests such as that used by Rubin et al. (2003) are more frequent in recent research. Indirect tests are informative about the types of information that vary with belief ratings, but they cannot indicate whether people spontaneously use particular memory characteristics in their deliberate judgements (which would be the situation in forensic contexts). Furthermore, indirect tests limit the types of information to those queried in the specific memory characteristic questions, rather than tapping information that is spontaneously used in considering memory confidence.

In contrast, qualitative analysis of participants' reports of confidence in their memories can indicate the types of information individuals naturally use in judging memory accuracy, as their attention is not drawn to particular memory features by explicit questions nor limited to information presented in the questions. To provide more detailed data than Johnson, Foley, Suengas et al. (1988), we categorized participants' reports using a wider range of possible information sources, discriminating clearly between sensory and other phenomenological characteristics, and various types of supporting memory such as autobiographical consistency and social verification. Given the importance of metacognitive beliefs in weighting of various characteristics, we also examined metacognitive beliefs reported by participants.

Although explicit reports of memory source and accuracy are subject to issues associated with introspection such as social demand, we reasoned that the types of evidence verbalized by participants would provide important clues to natural memory judgement, despite the difficulties associated with introspection. This procedure, of course, limits the data to conscious processes, as participants were required to verbalize the basis of their judgements. There is ample evidence in memory research that participants are not aware of many factors influencing their judgements (e.g. Johnson, Foley, & Leach, 1988; Tversky & Kahneman, 1974; Whittlesea, 2004; Whittlesea, Masson, & Hughes, 2005). However, the factors that individuals explicitly evoke to explain their confidence judge-

ments are relevant to witness belief and persuasive communication, and are thus worthy of examination in their own right.

If participants use evidence such as supporting memories, consistency with autobiographical knowledge and external verification as the primary basis of strategic memory judgements, these characteristics should be reported more frequently. However, if phenomenological characteristics of the memories also underlie strategic memory judgements, these characteristics will also be frequently mentioned. Alternatively, if phenomenological characteristics primarily influence heuristic memory judgements, participants would be less aware of the significance of these features to their reasoning, and would thus report them infrequently.

STUDY 1

We used a variation of the Galton-Crovitz cuing technique (Crovitz & Schiffman, 1974; Galton, 1879) to elicit four autobiographical memories from each participant. This technique involves presenting a random word and asking participants to produce a memory of an event associated with the word. We constrained the usual open-ended nature of retrieval slightly by asking participants to produce only childhood (prior to age 12) and specific (as opposed to generic) memories.

Method

Participants and design

Thirty-one undergraduate and graduate students at the University of Regina were recruited either from the undergraduate psychology participant pool or from signs posted in the University. Participants were given either bonus credits in introductory psychology classes or five dollars for their participation. Participants' ages were not collected, but all were young adults.

Materials and procedure

Both concrete and abstract cue words were used in the Galton-Crovitz procedure, in case confidence was influenced by the nature of the retrieval cue. Each participant received four cue words (from among lake, tree, bicycle, recess, style, effort, truth and hope). Cue words were randomly selected for each participant with the constraint that two concrete and two abstract cues were given. If a participant indicated that they were unable to retrieve a memory associated with a given word, a different word of the same type (concrete or abstract) was given.

For each retrieval participants were asked to speak aloud, describing their thought processes, and to alert the experimenter when they had a specific memory in mind. If participants were silent for several seconds, the experimenter probed by asking what was going through their mind, or how they were attempting to retrieve a memory. For ethical reasons, participants were not asked to discuss the event itself, although most participants also recounted details of their recalled event. Once a specific memory was identified, the experimenter asked participants how confident they were that the event was something they had actually experienced, rather than an event they had imagined or were told about, and to identify the reasons for their confidence. Participants were then asked if they had discussed the event since it occurred, whether they thought they had changed or added any details to

their recollection as a result of discussion, how old they were in the recalled event and how they determined their age.¹ The experimenter used a set of guidelines for questioning the participant (see Appendix A) and participants' responses to the questions were tape recorded.

Results

The primary purpose of this study was to determine the types of information participants were aware of using to judge confidence in their memories. Prior to presenting participants' confidence reports, however, retrieval strategies are briefly discussed. Recall strategies and retrieval time were expected to differ by cue type, and therefore these elements of the data were examined separately for concrete and abstract cues. Once participants had retrieved a specific memory, subsequent decision processes (e.g. confidence) were not expected to (and did not) differ by cue type, therefore we collapsed across cue type for this analysis. As in other studies employing think-aloud protocols (e.g. Wedman, Wedman, & Folger, 1996) or qualitative data (e.g. Brewer, 1988b), quantitative analysis was generally limited to descriptive statistics, using frequencies and percentages to document trends in the data, although inferential analyses were also conducted whenever possible.

In total, 15 recall failures occurred, 4 for concrete cues and 11 for abstract cues (11% of cues given). Greater failure with abstract cues is consistent with previous findings that specific memories are harder to retrieve using abstract cues (Williams, Healy, & Ellis, 1999). Three participants were able to recall only three memories, resulting in a total of 121 memories. Furthermore, due in part to experimenter error, six of the recalled memories were general rather than specific events. General events were either episodic (e.g. *'for the beginning little bit of grade three I kind of looked like a tom boy'*) or generic (e.g. *'It basically happened every lunch hour or every recess we had'*.) non-specific memories (Blagov & Singer, 2004). Preliminary analysis indicated that these non-specific memories did not greatly differ from specific memories with respect to confidence judgement, and thus we included these six memories in confidence analyses, but did not include them in the analysis of retrieval times or strategies.

Retrieval times

Using the audiotapes of each interview, the time to access each memory was timed from when the cue word was uttered until the participant said 'I've got one' or began to describe a specific memory. This interval frequently included descriptions of generic memories prior to a specific memory being accessed (see Table 1), as well as prompts given by the experimenter, and so should be considered cautiously. Timing was conducted with a stopwatch and was rounded to the nearest second. Retrieval times were generally faster for concrete than for abstract cues. The range of retrieval times for concrete cues was 2–160 seconds ($M = 37$, $SD = 24$), whereas that for abstract cues was 3–216 seconds ($M = 52$, $SD = 40$). This difference approached significance, $t(28) = 1.996$, $p = .056$, using a paired samples t -test.

¹The age estimation results are not reported, as they did not add significantly to previous evidence (e.g. Linton, 1975; Thompson, Skowronski, & Lee, 1988). Estimated ages ranged from 3 to 14 years, with a mean of 8.9 years ($SD = 1.9$), and for almost all events (81.6%), participants deduced their age from other information associated with the memory, such as personal milestone events (e.g. moving, tornado), school grade, personal characteristics in the recalled event (e.g. height, hair length), the age of their companions (e.g. siblings, classmates), their activity in the recalled event (e.g. tree climbing) or the setting of the event (e.g. house, school yard).

Table 1. Frequency of recall sequences for concrete and abstract cues, Study 1

| Strategy (cue→) | Concrete | Abstract | Example |
|----------------------------|----------|----------|--|
| Specific | 16 | 10 | 'When I heard bicycle, I remember when I learned to ride a bicycle' 'Effort... The first incident that pops into my mind right away is doing a run in elementary school' |
| Generic→specific | 32 | 14 | 'When I think of tree I think of my cottage. And when I think of my cottage I think of the time it burnt' |
| Associate→specific | 5 | 11 | 'Summer time, vacation, beach, swimming, fishing... I've got a memory' 'Truth or dare... honesty... getting caught being dishonest... truth... exploring... OK, I've got one' |
| Picture→specific | 4 | 0 | 'When you said tree, first I had a visual image of trees, and I started to scan other trees... There's a specific tree that was very much a part of my childhood... so' |
| Recent→specific | 0 | 5 | 'Incidents are going through my mind but nothing from that age. I'm remembering more recent incidents. ... Oh, now I can think of something' |
| Situation→generic→specific | 1 | 17 | 'Truth... Probably something with friends because when we were little you always have little fights. Something with next door neighbours maybe. Well, we played that one game... but I don't remember any specific time... OK, I've got one' |
| Total | 58 | 57 | |

Data coding

Participants' comments for each event were transcribed and retrieval strategies, reasons for confidence and metacognitive beliefs were coded by two of the authors. Inter-coder agreement in classifying participants' verbal reports of confidence as very high, high, medium or low (see below) was 100%. After initial classification of confidence reports, the results were combined into five general categories by mutual discussion. For most memories, more than one reason was given and all reasons were included in the analyses. Inter-coder reliability for categorization of reasons, determined prior to discussion of the disputed cases, was high (0.90), as was classification of metacognitive beliefs (0.94). Disagreements were resolved by reexamination of the disputed cases.

Recall strategies

Examples and frequencies of recall strategies are shown in Table 1.

Concrete words. There were four sequences of recall identified for the concrete cue words. Most frequently (55.2%) the cue evoked a generic memory that led immediately to a specific memory. This process typically occurred quickly, but sometimes participants interspersed a remembered scene between the cue and the generic memory ('I'm picturing the playground and kids, how much fun we had. OK, I have a memory'). Cues also frequently (27.6%) evoked a specific memory immediately. Less frequently, participants

generated associates to the cue word (8.6%) or the cue word was pictured before a specific memory was retrieved (6.9%).

Abstract words. Similar recall sequences were observed for abstract cues. Retrieving a generic memory first was also frequent (24.6%) with abstract cues (*'I'm remembering the house we lived in when I was a kid. And I'm trying to think of something that I hoped for... I'm remembering the addition that was put on the house... the new basement. I remember wishing that the girls could have a bedroom down in the new basement'*). Direct retrieval of a specific memory from the cue (17.5%) and generation of associates of the cue word which were used to evoke specific memories, with or without intervening generic memories (19.3%) were also observed. The latter strategy was used much more frequently for abstract than for concrete cues. As can be seen in the examples here and in Table 1, recall was generally more effortful than with concrete cues, requiring several generic memories or associates to be generated prior to retrieving a specific memory.

The most frequently reported (29.8%) strategy for abstract cues included an additional step: The cue was used to generate general situations, which elicited one or more generic memories before specific memories were retrieved. In a few cases, specific memories were identified directly from the review of general situations, bypassing generic memories (*'Effort... trying or working... exerting effort to chores... school, homework, OK I have one'*). These general situations were either scenes (e.g. going to the lake, being in a store) or semantic categories (e.g. school, extracurricular activities).

The final process was reported only with abstract cues: Retrieval of recent specific memories that were then used to cue specific childhood memories (8.8%). For some events of this type, an associate to the cue was generated prior to retrieving the recent memory (*'Style makes me think of magazines, and that makes me think of dancing... and it makes me think of the exam I did last year... I remember my first dance I did on stage'*).

Confidence

Following retrieval, participants were asked how confident they were that the recalled event had actually occurred (as opposed to being imagined or related by someone else). Participants reported being 'very confident', '100% confident', 'absolutely confident' or the like for 62 events (51.2%) and 'confident', 'pretty confident', or 'know it happened' for 46 events (38.0%). For the remaining events, seven responses (5.8%) were 'quite confident' or 'fairly confident' and six responses (5.0%) were 'less confident' or 'not very confident'.²

Participants were then asked what led to that level of confidence. Participants mentioned several reasons for most memories (mean of 2.13 reasons per memory), resulting in a total of 258 reasons. Reasons were sorted into three general categories: memory phenomenology, supporting memories and reasoning. Table 2 shows the frequency of each

²Confidence ratings were also requested from some participants as the first 16 participants tested almost exclusively reported being 'very confident' in their recollections. The last 15 participants thus also completed four confidence ratings for each memory, selected from a series of ratings used by Rubin et al. (2003). Using 7-point Likert scales, these participants rated the degree to which they could actually remember their memories, rather than just knowing they happened (Remember); the extent that their memories were accurate, rather than being distorted by beliefs, motives and expectations (Accurate); whether they could be persuaded their memory was wrong (Persuasion); and whether they were confident enough in their recollection to testify in a court of law (Testify). These ratings were consistent with the qualitative descriptions, with overall mean ratings of 5.64 (SD = 0.9) for the Remember and Accurate questions. Ratings of the Persuasion and Testify questions were slightly lower, with a combined overall mean of 4.77 (SD = 0.8). Ratings did not differ by reasons given for confidence, with overall means of 5.62 for phenomenological reasons versus 5.36 for supporting memories ($F < 1$).

Table 2. Frequency of reasons given for confidence in the accuracy of a memory (total = 258), and the number of participants (*N*) who reported the reason at least once, Study 1

| Reason | Frequency | % | <i>N</i> |
|-----------------------------|-----------|------|----------|
| Memory phenomenology | 160 | 62.0 | 31 |
| - Clarity of emotion | 51 | 19.8 | 27 |
| - Visual detail | 38 | 14.7 | 21 |
| - Other sensory detail | 32 | 12.4 | 18 |
| - Overall clarity of memory | 33 | 12.8 | 22 |
| - Speed of recall/fluency | 6 | 2.3 | 5 |
| Supporting memories | 78 | 30.2 | 28 |
| - Nature of event | 21 | 8.1 | 14 |
| - External verification | 26 | 10.1 | 17 |
| - Consistency | 27 | 10.5 | 16 |
| - Rehearsal | 4 | 1.6 | 4 |
| Reasoning-based | 20 | 7.8 | 12 |
| - Metacognitive belief | 20 | 7.8 | 12 |

reason and the number of participants who mentioned each reason at least once across the four memories.

By a considerable margin (62.0% of reasons), participants most frequently reported using memory phenomenology as the basis of their confidence. To confirm this impression, the frequency of phenomenological reasons (emotional, visual or sensory detail, memory clarity and fluency) were collapsed and compared with the frequency of all other reasons (nature of the event, external verification, consistency with other autobiographical memories, rehearsal and metacognitive belief) using a paired *t*-test.³ This analysis indicated a significant difference, $t(30) = 2.864$, $p = .008$ (mean frequency = 5.16 for phenomenological vs. 3.19 for other reasons). Specifically, participants reported being certain of the source of their memories due to the clarity of the recalled emotions (19.8%), visual details (14.7%), other sensory details (12.4%) or the overall memory (12.8%). Confidence based on the speed of recall (2.3%) was also included in this category. Metacognitive beliefs were generally used in combination with these phenomenological details to discount other possible sources of the memory (e.g. *'I'm 100% confident. I think I'm so confident because of the feeling I had. I can remember that feeling. Without actually experiencing it, I don't think I would have that'.*).

In contrast, reasons related to supporting memories were reported less frequently (30.2% of reasons). Three supporting categories were reported approximately equally: consistency with other autobiographical knowledge (10.5%), external verification (e.g. physical evidence or verification by others; 10.1%) and the nature of the event (e.g. unique or milestone events; 8.1%). Metacognitive beliefs (7.8%; e.g. *'I wouldn't have imagined that'.* *'Others couldn't have told me'*) were also reported. In some cases, metacognitive beliefs about what was possible to imagine were mentioned in concert with supporting memories. For instance, several participants (13 participants; 18 events) reported confidence in their recollection because the recalled event was a central or unique event in their life, and therefore had been the object of subsequent reflection. Some of the reported events (26 events; 10%) were associated with either physical evidence, such as scars or the

³As participants generally offered more than one reason per memory and contributed four separate memories, the same participants contributed to both categories of reason, enabling the paired *t*-test analysis.

existence of an object central to the recollection, or social evidence, such as subsequent discussions with others who shared the event.

For the six cases in which participants reported less confidence about the memory, they cited lack of clarity or social verification as the reasons for their uncertainty. For most of these recollections (five events), participants reported recalling the feeling associated with the event clearly, but were not sure whether they were recalling the context and details accurately. (*I'm less confident in this one. I really remember being afraid of this program. But I don't have as a clear a picture in my mind. I've talked about it so much that I've probably distorted it. Mostly, it's probably correct, but it's that the details aren't as sharp*.).

Metacognitive beliefs

Although metacognitive beliefs were not often given independently as reasons for confidence (7.8% of reasons), such beliefs were implicit in several of the other categories. For example, the statement *'I think just the feeling that I felt . . . I know that it happened because I felt that way.'*, implies a belief that feelings arise only through actual experience, even though this belief is not explicitly stated. Beliefs about the meaning of various memory characteristics for memory veridicality are interesting in their own right so we conducted further analysis of both stated and implied metacognitive beliefs in participants' reports. As can be seen in Table 3, many participants reported confidence in the accuracy of their recollections because of the presence of remembered sensory or affective details. This suggests that the content and characteristics of retrieved memories were taken to be reliable evidence for memory accuracy. However, imagined and vicariously experienced events can also be associated with vivid sensory and affective phenomenology under some conditions (e.g. Arbuthnott, 2005; Lampinen et al., 2005; Sheen, Kemp, & Rubin, 2001), so

Table 3. Frequency and examples of categories of explicit and implicit metacognitive beliefs about memory veridicality (total = 40)

| Category | Frequency | Example |
|------------------------------|-----------|---|
| Phenomenology | | |
| -Sensory clarity | 11 | <i>'... the intangibles, like the smell in the air, or whether it was warm or cool. Stuff that wouldn't normally be part of a memory that you were told'</i> <i>'Mainly because I have very strong visual pictures of it. And there's just a lot of detail about it'</i> |
| -Affect intensity or clarity | 12 | <i>'My confidence . . . is because it's a natural feeling, it's not a thought, it's something that you can feel'</i> |
| Other sources disconfirmed | 6 | <i>'There's not really anything that makes me believe it didn't happen'</i> <i>'nobody told me it happened because nobody else knew'</i> |
| Fluency of retrieval | 5 | <i>'They went through so fast that I don't think I would have had time had time to fabricate that image . . . I can actually see it . . . I don't think it would have been possible to create it that quickly'</i> <i>'I can remember every single action that happened, I don't even even have to think about it'</i> |
| Self-beliefs | 2 | <i>'Just knowing myself, I don't really fantasize or make stories up'</i> |
| Age | 2 | <i>'Probably because it's more recent than say age 5 or 6'</i> |
| Type of event | 2 | <i>'I'm confident because nothing like that has happened before or after'</i> |

judgement based on these factors may be less accurate than judgements based on factors such as autobiographical consistency and external verification.

Five participants expressed confidence in their recollections due to the speed and fluency of memory retrieval, assuming that anything that came to mind quickly must represent retrieval rather than construction or creation. The absence of reflective effort at the time of retrieval was taken to indicate retrieval of a veridical memory (e.g. '*...I didn't really have to think about who was there, everybody was just kind of there*'). This assertion seems consistent with Whittlesea's (2004; Bernstein, Whittlesea, & Loftus, 2002; Whittlesea & Williams, 1998) contention that ease of retrieval influences memory judgement.

A few reports indicated that the age at which a memory was formed or the type of event recalled influenced the likelihood of memory accuracy. Specifically, participants commented that memories of events that occurred later in childhood were likely to be accurate. This could reflect knowledge of infantile amnesia for earlier memories, or the influence of recency in this young adult population (e.g. '*it wasn't so long ago, I was older so ...*'). Similarly, participants were aware that novel or significant events were more likely to be accurately recalled than more familiar events (e.g. a one-time dance recital vs. a weekly dance class).

Another belief evident in six reports was that veridical memory is the default, to be affirmed if no other likely source can be identified (e.g. '*I know I haven't seen pictures of it, and I know that nobody else knew about it except me and my cousin, so I know that it's not something that somebody told me*'). Therefore, the assumption is that the recalled details must reflect actual memory unless another source is explicitly recalled, suggesting that belief in memory truth is the default assumption (Gilbert, 1991). Alternatively, this may reflect implicit knowledge about social sources of memory error such as reminiscence with others who were also at an event (Niedzwinska, 2003), vivid descriptions of familiar events given by friends (Arbuthnott, Arbuthnott, & Ylloja, 2003) or other social influences (Hoffman, Granhag, Kwong See, & Loftus, 2001).

The final type of metacognitive belief reflected beliefs about oneself, such as whether or not one fantasizes or the difficulty of imagery construction ('*I have a difficult time constructing in my memory something like that [sensory details]*'). If the details of a memory were not consistent with a participant's self-image regarding their use of imagery, such memories were judged to be accurate memories.

Most of these metacognitive beliefs seem to reflect awareness of verified memory phenomena (e.g. effects of infantile amnesia, event distinctiveness, social sources of memory confusion), and thus could reflect the influence of knowledge on confidence judgements. However, such beliefs could also potentially result in source misattributions, especially those related to the source of phenomenological characteristics. Distinctive events or vivid sensory phenomenology are also possible to imagine, as is evident in fictional productions such as novels and films, although our participants seemed relatively unaware of this.

Discussion of events

Participants were asked whether or not they had ever discussed their recalled events with others, and whether they thought their recollections had been influenced by such discussion. This question was included to explore whether participants were aware of the effects of such discussion on memory accuracy. The experimenter neglected to ask this question for eight of the events. Of the remaining 113 events, participants reported that 49 (43%) had not subsequently been discussed, and that they could not recall discussion for an

additional four (3.5%) events (e.g. *'We could have reminisced about it at one time, but I don't specifically remember doing so. I think what I recalled is probably what actually did happen. Because I don't actually remember ever discussing it'*). Of the 60 (53%) events that had been discussed, participants reported that the discussion had likely changed their memories for 28 events (47% of the discussed events).

For the reported changes, participants thought that the conversation likely altered the details of their memory (e.g. *'I'm pretty sure we've discussed it when we've been reminiscing before. It's possible that I've added details, but I think I remembered it all myself'*). In many cases, they thought that they likely exaggerated details such as pain (e.g. *'I probably exaggerated my pain a bit'*), danger (e.g. *'it might not have been as dangerous as I initially said it was'*) or altered details to make a better story (e.g. *'I probably added things to make it funnier, to make a good story'*). These results indicate that participants were aware that post-event discussion can alter memories, at least to some degree.

Discussion

The purpose of this study was to examine the evidence participants were aware of using to judge confidence in recall of a childhood memory. The source-monitoring framework and other autobiographical memory models posit different information underlying heuristic and strategic memory judgement (Johnson, 2006; Johnson et al., 1993; Johnson, Foley, Suengas et al., 1988; Mazzoni & Kirsch, 2002; Mitchell & Johnson, 2000; Rubin et al., 2003), with strategic judgement relying primarily on supporting evidence such as autobiographical consistency and plausibility. In contrast to this hypothesis, the phenomenological characteristics associated with a recollection, especially the vividness and clarity of sensory details and emotions, were reported as the most frequent basis for confidence judgements. Thus, both phenomenological and supporting evidence apparently influence deliberate memory judgements.

Despite the clarity of the present results, these conclusions are limited by the infrequency of low-confidence memory reports. Thus, there is little basis of comparison to determine whether phenomenological characteristics distinguish memories with different levels of confidence. Reports for the six uncertain events suggest that both phenomenological (e.g. contextual details, clarity) and supporting memory (e.g. social verification) characteristics differ for these memories but the infrequency of such reports prevents clear conclusions. To rectify this limitation, a second study focusing on uncertain memories was conducted.

STUDY 2

Memories retrieved with using the Galton–Crovitz cuing method of Study 1 yielded primarily high confidence memories, so a second study was conducted explicitly asking participants to retrieve childhood memories about which they were not confident. Deliberately retrieving uncertain memories proved to be much more difficult than retrieving confidently held memories, resulting in both a change of procedure and recruitment of fewer participants.

Method

Participants and design

Participants were 10 undergraduate students (6 women) at the University of Regina who were recruited from the Psychology Department Participant Pool and were given bonus

credits in introductory psychology classes. As in Study 1, participants were all young adults (mean age 19.5 years).

Materials and procedure

Pilot testing indicated that participants were largely unable to retrieve memories they were unsure of using the Galton–Crovitz cuing technique. Thus, in recruitment notices, we asked for participants who could recall memories about which they were not entirely sure, and gave an example of such a memory (see Appendix B). During the study, participants were given two examples of uncertain memories and then asked to recall their own memory. Pilot studies with this new procedure indicated that participants were unwilling to discuss reasons for uncertainty until they had discussed the portions of memories about which they were certain (i.e. why they believed that this recollection was an actual memory). Thus, we incorporated this into our procedure, first asking participants whether they were confident of any parts of this memory and the basis of such confidence. A similar question was then asked about the parts of the memory about which they were uncertain. After completing this procedure for the first memory, participants were asked to recall another uncertain memory but only 5 of the 10 participants were able to recall a second such memory.

In all other respects, Study 2 was the same as Study 1: Participants were asked to speak aloud describing their thought processes, and to alert the experimenter when they had a specific memory in mind, to estimate their age in the remembered event⁴ and to indicate whether or not they had discussed the memory with someone else.

Results and discussion

Participants recalled a total of 15 memories. Because participants came to the lab with memories of uncertain events, the think-aloud protocols yielded no information about retrieval strategy. The memories reported in Study 2 tended to be more general and from an earlier age (mean of 4.7 years) than those in Study 1 (mean of 8.9 years). Data were coded in the same manner as Study 1. Intercoder reliability for categorization of the reasons given for confidence, determined prior to discussion of disputed cases, was high (0.91), as was categorization of the reasons given for uncertainty (0.83). All disagreements involved one of the coders including an extra reason, so disagreements were resolved by including all coded reasons in the analyses.

Confidence

Following retrieval, participants were asked to distinguish which aspects of their memories they were certain and uncertain of. These reports were examined separately.⁵

⁴As in Study 1, all participants inferred their age from other information associated with their memory. Estimated ages ranged from 2 to 8 years, with a mean of 4.67 years ($SD = 1.9$).

⁵Participants also completed confidence ratings, as in Study 1. Separate ratings were completed for the parts of the memories of which they were certain and uncertain. As in Study 1, these ratings were consistent with participants' qualitative reports. Confidence ratings were higher for the certain parts (overall mean = 4.45) than the uncertain parts (overall mean = 3.58) of memories, $F(1, 8) = 14.54$, $p = .005$, and the difference was significant for all four questions; $t(9) = 2.212$, $p = .027$ for Remember, $t(9) = 2.343$, $p = .022$ for Accuracy, $t(9) = 1.950$, $p = .042$ for Persuasion and $t(9) = 1.998$, $p = .039$ for Testify. As compared to Study 1 (mean = 5.14), ratings for the certain parts of Study 2 memories were lower (mean = 4.22), $F(1, 20) = 5.47$, $p = .03$. Thus, it appears that when participants retrieve memories with no instructions about confidence, their confidence ratings are higher than when instructed to retrieve memories with uncertain accuracy.

Table 4. Frequency of reasons given for confidence in memory recollection (total = 28 certain, 24 uncertain), and the number of participants (*N*) who reported the reason at least once, Study 2

| | Frequency | % | <i>N</i> |
|-----------------------------------|-----------|------|----------|
| Reason for certainty | | | |
| Memory phenomenology | 20 | 71.4 | 10 |
| - Clarity of emotion | 4 | 14 | 4 |
| - Visual detail | 7 | 25 | 6 |
| - Other sensory detail | 4 | 14 | 4 |
| - Clarity of before/after details | 2 | 7 | 1 |
| - Familiar setting | 3 | 11 | 3 |
| Supporting memories | 3 | 10.7 | 3 |
| - Nature of event | 1 | 4 | 1 |
| - External verification | 2 | 7 | 2 |
| Reasoning-based | 5 | 18 | 3 |
| - Metacognitive belief | 5 | 18 | 3 |
| Reason for uncertainty | | | |
| Memory phenomenology | 5 | 20.8 | 3 |
| - Unclear details | 4 | 17 | 3 |
| - Uncertain event order | 1 | 4 | 1 |
| Supporting memories | 11 | 45.8 | 7 |
| - Inconsistent (own recall) | 3 | 13 | 3 |
| - Inconsistent (others' recall) | 8 | 33 | 7 |
| Reasoning | 8 | 33.3 | 5 |
| - Source confusion | 4 | 17 | 3 |
| - Impossible detail | 4 | 17 | 3 |

Certain aspects of memory. In general, participants reported being certain of the sensory and affective details, settings and participants involved in their recalled events. For the elements of memories participants were confident of, fewer reasons for confidence were mentioned than in Study 1 (mean of 1.87 reasons per memory), resulting in a total of 28 reasons. The specific reasons for confidence in these aspects were sorted into the same categories as Study 1, and the frequencies are reported in the top panel of Table 4.

Participants reported memory phenomenology as a basis for confidence more frequently (71.4% of reasons) than other types of information. Participants gave similar reasons as in Study 1, including emotional clarity (*'the emotions I feel when I think of it must have been like the emotions I felt back then when I was living it'*), visual detail (*'I'm looking right out of my eyes, my own eyes and I can see it happening pretty much how it happened'*) and details of other senses (*'I can remember the smell of the boat and the sound'*). There were two novel reports given in Study 2: the familiarity of event settings (*'we went down there a lot'*), and the clarity of events that occurred before and after the target memory (*'I can remember... the whole part after because it was like a big thing because I ended up breaking my arm'*). There were also several reports of deductions based on metacognitive beliefs (*'there's nobody that could have told me'*) as well as two reports of external social verification (*'my mom told me that story'*).

Uncertain aspects of memory. Participants most frequently reported being uncertain of key actions and the locations of recalled events. Unlike the elements they were certain of, sensory details were never mentioned as uncertain elements. Participants reported even

fewer reasons for non-confidence (mean of 1.60 reasons per memory), and these are reported in the lower panel of Table 4.

In contrast to the pattern for confident memories, participants' reasons for doubting their memories relied more on supporting memories and reasoning (79.2% of reasons) than memory phenomenology. In particular, inconsistency with others' recollections ('*people were telling me that it wasn't accurate*') or other memories of their own ('*I'm not sure that was the elevator that was in the school*') led to non-confidence in recalled events. Participants also explicitly reported possible source confusions with dreams ('*it could be just a dream. But then I'm pretty sure I remember it as a memory*') or imagination ('*I think my grandfather's school is very empty and there's why I made the stuff up*') as reasons for uncertainty. In four cases, recalled details in the memories were inconsistent with other autobiographical knowledge ('*it's physically impossible because when I was that young, I couldn't have been in that house*'). Thus, the reasons for doubting memories were quite different than reasons for believing the accuracy of recalled childhood events, consistent with the theory of Conway (Conway, 1997; Conway, Collins, Gathercole, & Anderson, 1996). In these data, confidence in perceived events focused on the target recollection itself, but non-confidence was based more on inferential processes.

Metacognitive beliefs

Metacognitive beliefs were evident in both reasons given for certainty and uncertainty. As can be seen in Table 5, many of the metacognitive beliefs were similar to those reported in

Table 5. Frequency and examples of metacognitive beliefs about memory veridicality and uncertainty, Study 2 (total = 7)

| Category | Frequency | Example |
|----------------------------|-----------|---|
| Veridicality beliefs | | |
| Phenomenology | | |
| -Sensory clarity | 1 | '...I'm looking right out of my eyes, my own eyes and I can see it happening pretty much how it happened' |
| -Affect clarity | 1 | '...it feels so real because I feel like I live it...the emotions when I feel when I think of it must have been like the emotions I felt back then when I was living it' |
| Other sources disconfirmed | 2 | '...there was nobody there that I know now...so ya, it's my own memory' 'I had never been in a place like that before and I guess I really haven't since then' |
| Self-beliefs | 1 | 'I've always had a real good memory for everything in my life...' |
| Uncertainty beliefs | | |
| Alternative source | 3 | '...the reason I can't be sure now is I've been told since then about the incident' '...I can't remember why I think of those elevators...probably to make my story exciting...there's why I made the stuff up...' |
| Inconsistent knowledge | 1 | 'What I see is a sink that was at my level in the living room—that doesn't make any sense...a sink couldn't be in the middle of the living room...how can a sink be that low for a baby?' |

Study 1. The presence of sensory or affective details in participants' memories was believed to indicate an experienced source of the recalled event. Statements consistent with the idea that veridical memory is the default (Gilbert, 1991) were also reported. Furthermore, knowledge of other potential sources for a recollection was also reported as the basis for non-confidence in a memory (*'I remember the house, but it might be just from a painting I once saw ...'*). Participants appeared to assume that recalled details must reflect actual memory unless they specifically recalled another possible source of the details.

One participant also referred to self-reflective metacognitive beliefs as the source of his confidence. As in Study 1, when the details of a memory were consistent with a self-belief, it was assumed to be veridical, regardless of how unlikely that belief is (*'I have many instances when I remember stuff when I was a baby'*).

The reports of metacognitive beliefs in Study 2 were consistent with those in Study 1, even though some of them were reported as reasons for not being confident in memory accuracy. Thus, it appears that participants use their beliefs consistently, as evidence to both support and doubt the accuracy of their memories.

Discussion of events

Unlike the situation in Study 1, participants reported that they had previously discussed all but two of these memories. This is consistent with previous findings that memories retrieved using the Galton–Crovitz cuing method are less likely to be rehearsed than memories retrieved using other methods (Brewer, 1988a). Another reason for the large number of previously discussed memories in Study 2 is that it is often through reminiscence of a shared event that we discover discrepancies in our memories (Fitzgerald, 1995; Reese & Farrant, 2003), and because we asked for such memories in the recruitment notices, participants who had discovered such discrepant memories were more likely to participate. Of the 13 memories that were previously discussed, participants reported that this had changed the details of their recollections for only three memories. As in Study 1, the changes were generally to improve or exaggerate the story (*'... I kind of added to make it dramatic'*). For an additional two events, participants did not know whether or not discussion had changed their memories. Thus, 8 of 13 memories (61.5%) were reported as unchanged, despite discussion.

Study 2 was conducted to examine judgement processes associated with lower confidence memories to provide a contrast to the reports of confident memories. Although the request to retrieve uncertain memories elicited memories that were unusual in several respects, some aspects of the data indicate that these reports are valid.⁶ For aspects of the memories they were certain of, participants gave reasons very similar to those in Study 1, including reporting of phenomenological characteristics of the memories more frequently than supporting memories. In contrast, however, participants' doubts about the accuracy of memories primarily rested on supporting memories. Uncertainty was most frequently based on conflicts between recalled details and other autobiographical knowledge or the reports of others. This suggests that the informational source of explicit memory judgements may be determined more by a true/false judgement than by heuristic/strategic processes.

⁶For instance, the age estimation strategies are consistent with those reported in the literature (e.g. Barclay & Wellman, 1986; Brewer, 1988b; Thompson et al., 1988).

GENERAL DISCUSSION

These studies were conducted to examine explicit memory judgement processes and the type of information used to support such judgements. Several aspects of these reports support previous findings, increasing our confidence in the validity of the data. Specifically, reported retrieval strategies (Study 1) and age determination strategies (see footnotes 1 and 4) are consistent with previous research on these topics. Furthermore, other aspects of the data are also consistent with existing theories. Participants' default assumptions were consistent with the contentions of Gilbert (1991) and the reports of reasons to doubt memory source were consistent with Conway's model of how false memories are identified (Conway et al., 1996). With respect to our initial question, these data strongly suggest that phenomenological characteristics of memory are central to conscious, strategic judgement. Each of these aspects of the data will be discussed in turn.

Retrieval strategies

Previous evidence indicates that concrete words are more effective at eliciting specific memories than abstract words. Using a cuing method similar to that employed in Study 1, Williams et al. (1999) found that abstract cues were more likely to elicit generic memories, whereas concrete cues reliably evoked specific memories. Similarly, the think-aloud recall strategies reported in Study 1 indicated that recall was more effortful for abstract cues. Moreover, the reports suggest a possible reason for retrieval stopping at generic memories for abstract cues. For concrete cues, although generic memories were often recalled first, a specific memory would usually follow fairly quickly. In contrast, with abstract cues participants often needed to elaborate the cue considerably before a generic memory was retrieved. For example, one of the most frequently reported strategies involved explicit consideration of general situations in which the cue word would apply. In a recall situation with no constraints, the appearance of a personal generic memory after such situational consideration could be taken as achievement of the goal to recall a personal memory. In the current context, although specific memories were sometimes elicited directly from situational consideration, it often required considerably more effort to find a specific memory.

Default assumptions

The analysis of metacognitive beliefs in participants' reports is consistent with the claim that actual experience (or perception) is assumed to be the default source in memory judgement. In other judgement contexts, truth, as opposed to falsehood, appears to be the default judgement (Gilbert, 1991).⁷ With respect to memory, this would mean that memory is presumed to be accurate (or from a perceived source), unless there is specific contrary evidence. There is evidence that acceptance of an idea (or memory, in this case) is an aspect of comprehension, and that rejection (or disavowal of memory veracity) requires additional subsequent processing. In this model, retrieval of an event would necessarily involve the assumption that the event had been experienced.

Gilbert (1991) posits a second, independent, process to determine falsehood. The present data suggest that different information associated with a target memory supports the default and subsequent judgement processes. Information contained within the target

⁷Thanks to an anonymous reviewer for bringing this to our attention.

memory, such as phenomenological characteristics, is used to justify the default assumption, which, in this case, is accurate recall of an experienced event. Conversely, information external to the target memory, such as autobiographical consistency and external verification, supports the judgement of falsehood (or non-memory source). Thus, rather than intra- versus extra-memory information supporting heuristic versus strategic judgement processes, the present results suggest that it is the default versus falsification judgement processes that underlie the division of information sources.

Consistent with Gilbert's model, participants in the present studies reported doubting the source of a memory only if they were aware of alternative sources such as social discussion. In the absence of such recollection, they assumed that their memory was accurate (e.g. *'I know I haven't seen pictures of it, and I know that nobody else knew about it except me and my cousin, so I know that it's not something that somebody told me'*). Reports of low confidence memories also frequently mentioned the absence of social verification and inconsistency with other memories and knowledge.

Both intra-memory and extra-memory information can be used consciously, as is evident in the current studies. However, extra-memory information requires comparison of at least two events, placing greater demands on working memory than intra-memory information. For this reason, the use of extra-memory information in confidence judgement likely requires more conscious awareness and deliberation. Furthermore, because the falsification process is secondary to retrieval (which is associated with the default assumption), more deliberate effort may be necessary to initiate the falsification process at all. Thus, use of the falsification judgement process is likely strategic, whereas the default judgement can occur either strategically or heuristically.

If the falsification process operates, memories may be judged either accurate or uncertain, but if it does not, only judgements of confidence occur. If the consideration of extra- memory information is consistent with the target memory, this would support the conclusion of confidence. Only if the extra-memory information is inconsistent with the target memory would uncertainty result. Thus, confident judgements of memory source and accuracy would be more frequent than uncertain judgements, because both processes can result in confidence, whereas only the secondary process results in non-confidence. This is consistent both with the reports of Study 1 and with the difficulty we encountered eliciting non-confident memories in Study 2.

Memory rejection strategies

These results are also consistent with the autobiographical memory model of Conway (1997; Conway et al., 1996). Conway posits that confirmation of true memories relies on recollective experience, which is reliant on sensory and affective memory details. In a 5-month diary study comparing recognition of experienced (true), and self- or researcher-generated false events, recognition of true events was associated with recollective or 'reliving' experience, including sensory and contextual details (Conway et al., 1996). Recollective experience, Conway et al. argued, evokes a sense of integration between encoding and retrieval experiences, leading to acceptance of a memory as true. In the present studies, participants assumed memory accuracy based on details of the memories themselves, as well as consistency with other autobiographical knowledge.

Conway et al. (1996) further hypothesized that false memories can be rejected on the basis of either inconsistent autobiographical knowledge (empirical rejection) or because no coherent memory can be constructed from a cue (construction failure). In the present

studies, judgements of memory uncertainty apparently arose in one of two manners. The most consistent basis of uncertainty was the presence of conflicting information. The conflict arose from either the participant's own autobiographical knowledge (e.g. *'it's physically impossible because when I was that young, I couldn't have been in that house'*), or from inconsistency with the recollections of others present during the event (e.g. *'saying I remember it and them saying we never lived in a house with such painting'*). The second reported reason for memory uncertainty was the failure to recall details clearly (e.g. *'I can't remember anything that was said, can't remember who the boy was, what he looked like, anything like that—if he was bigger than me, smaller than me, I don't remember any of those details at all'*). Thus, if reports of absent or unclear details are considered examples of construction failure, both types of memory rejection (lack of confidence) posited by Conway et al. (1996) were observed in these studies. These reports thus provide empirical verification of Conway et al.'s theory of memory judgement.

Memory judgement

The results for memory judgement indicate that, for high-confidence memories, phenomenological characteristics are reported more often than supporting memories. The latter are also reported, but at a much lower rate than factors such as clarity of sensory details and affect. The analyses of metacognitive beliefs also support this conclusion: Participants considered the presence of clear and detailed sensory characteristics and affect as evidence of memory veracity. In contrast, the lack of supporting evidence or inconsistency with other autobiographical memories were more commonly evoked as reasons to doubt memory source or accuracy. This pattern of results suggests that the informational assumptions of the source-monitoring framework for strategic judgement may need to be revised. The information underlying heuristic judgement cannot be addressed with this data, but it appears that phenomenological characteristics underlie explicit (strategic) memory judgement to a considerable degree.

There are two possible interpretations of this pattern of results. First, this could indicate that information sources both internal and external to specific event memories are used in strategic memory judgements. This would contrast with the assertions of the source-monitoring framework that information internal to a memory (e.g. phenomenological characteristics) is involved primarily in heuristic judgement, whereas information external to the memory itself (e.g. autobiographical consistency, external verification) primarily underlies strategic judgement.

The second possibility is that participants' reports represent 'output' phenomena—after-the-fact justification of heuristic decisions. This is the suggestion of Johnson (2006), who proposed that confidence judgement is a different process than source judgement, with the output of heuristic processes entering into confidence judgement in the same manner as supporting memories. This explanation is more consistent with the claims of the source-monitoring framework, but posits an additional process to account for explicit judgements such as confidence.

It is also possible that these strategic judgements were not influenced by both types of evidence, despite participants' reports. For instance, there is considerable evidence that individuals make political and moral judgements on the basis of emotions rather than evidence, and then marshal information to support their position (e.g. Haidt, 2001). This process could also operate in confidence judgements, with participants noticing the phenomenological details of a memory after they have judged it as accurate. However,

participants' metacognitive belief reports indicated that explicit reasoning was influenced by phenomenological characteristics, indicating that confidence was influenced by phenomenological memory characteristics. Thus, at the least, participants were aware of both types of evidence as candidates to support their intuitive judgements.

There is also evidence that all source memory may require attentional control, at least relative to item memory. For example, Troyer, Winocur, Craik, and Moscovitch (1999) observed that source memory was impaired by divided attention to a greater degree than item memory. Furthermore, studies of patient and developmental populations indicate that source memory performance is related to frontal lobe health (Glisky, Polster, & Routhieaux, 1995; Janowsky, Shimamura, & Squire, 1989; Spencer & Raz, 1995). This suggests that source monitoring always involves strategic processing, at least to some degree. If this is the case, then heuristic source monitoring may not operate entirely automatically, even when attention is not explicitly drawn to memory characteristics.

Regardless of the theoretical explanation, these results indicate awareness of and reliance on phenomenological characteristics in memory judgement. Moreover, strategic reasoning processes, whether direct or after-the-fact justification of such judgements, use both phenomenological characteristics and external sources of information in a very similar manner. Of course, the two types of information are supported by different metacognitive beliefs about their relationship to memory accuracy, but participants in these studies seemed equally sanguine using both types of information to support their confidence.

The observation that phenomenological characteristics of memory are used in strategic source judgement is, perhaps, not surprising if memory representations consist primarily of perceptual traces. Paivio (2007), for instance, claims that memories are essentially sensory and affective, derived from perceptual, behavioural and affective experiences. If this is the case, then judgements of memory, whether heuristic or strategic, would necessarily involve consideration of such perceptual traces, in addition to associated extra-memory information.

The primary difference in reports in the present studies appeared to be related to the presence of conflicting details in a recollection, rather than the type of information. Conflicting details were more frequently related to supporting memories (*'trying to put some pieces that weren't together and they didn't really fit'*) and social verification (*'my mom told a different version of the story'; 'people were telling me that it wasn't accurate'*), but were, on occasion, also related to sensory characteristics (*'I remember the house, but it might be just from a painting I once saw . . .'; 'I know that happened, but I don't think it looks anything like I'm seeing'*). Thus, assuming that heuristic and strategic judgement are different processes, based on phenomenological characteristics and supporting memories, respectively, may be incorrect. Both types of information appear to be used in awareness, and to be involved in deliberate reasoning in this and perhaps in most source judgement contexts (Glisky et al., 1995; Troyer et al., 1999). Perhaps what is assumed to be heuristic source judgement is instead reasoning based on the default assumption that memories are accurate (and from a perceptual source). Rather than source judgements occurring without awareness, such judgements are made consciously, but the default assumption is supported unless there is a specific reason to doubt it.

Metacognitive beliefs and knowledge

These data suggest that participants were aware of factors that influence memory strength and accuracy, such as age, discussion of remembered events, event distinctiveness and

emotional intensity. However, their discussion of reasons for confidence in their memory indicates that such awareness is likely underutilized in memory judgements. Furthermore, although participants' metacognitive beliefs indicated awareness of many of the factors that influence memory, such awareness was apparently not tempered by exceptions such as vivid phenomenology associated with imagined or discussed events.

Responses to the query about the influence of subsequent discussion on recollection were particularly revealing. There is considerable evidence that social interactions about specific events influence memory reports quite strongly, especially for peripheral details (e.g. Hyman & Pentland, 1996; Hollin & Clifford, 1983; Loftus & Palmer, 1974; Niedzwienska, 2003). Information from others influences both memory content (e.g. Meade & Roediger, 2002) and confidence in recollections (Hoffman et al., 2001). In Study 1, participants most often claimed that no subsequent discussion had occurred, consistent with the assertion of Rabbitt and Winthorpe (1988) that memories retrieved via Galton–Crovitz cuing are less frequently rehearsed than uncued memories. But even when participants recalled conversation about an event, more than half the time they did not think the conversation had influenced their recollection. This suggests that, although participants were aware that discussion can alter memories, they were not fully aware of the pervasive social influence on memory.

Limitations and advantages of method

The think-aloud and introspective methods used in these studies have both advantages and limitations. The primary disadvantages are those associated with introspection, namely that participants are unaware of many relevant processes and can thus not report them. A considerable number of cognitive processes and influences are known to be unconscious, so introspective reports of thinking are clearly incomplete.

Similarly, the results of these studies were restricted to the information used in conscious confidence judgements, and thus cannot speak to the use of information in automatic or heuristic judgement processes. Most significantly, these results cannot speak to the judgement processes themselves because participants' responses involved content (e.g. memory characteristics, supporting evidence, metacognitive beliefs) rather than processes themselves. Thus, participants were aware of and reported the informational sources of their output, rather than their judgement processes.

It is also possible that participants' reports were influenced by our questions, even though the questions did not draw attention to specific memory characteristics. When querying memory confidence, we explicitly mentioned events that were imagined or relayed by another person as contrasts to actual experience (see Appendix A, question 2) and it is possible that these specific contrasts drew attention to characteristics that were presumed by participants to discriminate between memories for actual versus imagined or vicarious narrative experiences (i.e. the match-to-average heuristic). Comparison between these particular memory sources could focus attention on the vividness of phenomenological characteristics, which are presumed to differ in match-to-average expectations. However, determining whether a memory results from an imagined event would likely also evoke consideration of evidence such as consistency with autobiographical knowledge and external verification, so the present results seem to argue against this interpretation.

The selection bias inherent in our recruitment and memory elicitation procedures for Study 2 is another limitation of the present results. Only participants who were aware of having low-confidence memories volunteered for the study, and specific memories were

likely retrieved prior to participation in the study. Thus, it is possible that the collection of memories reported in Study 2 were not comparable to other types of low-confidence memories. The finding that memories in Study 2 were from significantly earlier ages than those in Study 1 suggests a possible means to overcome the difficulty of eliciting low-confidence memories in future studies: Using Galton–Crovitz cuing, participants could be asked to retrieve memories of events experienced before the age of 6, potentially eliciting less confident memories than those from later childhood.

These limitations are balanced, however, by advantages. Open-ended questioning is more similar to real-world recollection situations, resulting in greater ecological validity. The decisions reported here are different from source-monitoring decisions typically studied in the laboratory, in which participants choose a recollection source (e.g. memory or imagery), and then either rate or indicate the basis of their selection. In the present studies, participants recollected a memory and then indicated their confidence that their recollection was accurate, similar to the situation facing most forensic investigators. Witnesses offer recollections, and then give reasons why their memories should be believed. These findings are thus more directly generalizable to applied situations in which memory is probed using open-ended questions.

The second advantage of the present method is that participants were free to report whatever they were aware of, opening the possibility of identifying factors that have been overlooked or underestimated. This appears to have been the case for strategic consideration of phenomenological characteristics of memory. Phenomenological characteristics appeared to be the most influential information in judging memories participants were confident of. In contrast, supporting memories were most influential in identifying inconsistencies. As the present results illustrate, strategic judgement can result in both positive (memory confidence) and negative (memory uncertainty) decisions, so it is important not to assume that strategic processes are defined only by negative decisions.

CONCLUSION AND APPLICATIONS

Memory judgements appear to be based on both knowledge (autobiographical and social) and perception (phenomenological characteristics), much like other types of reasoning. Both types of information support explicit reasoning processes, and both are vulnerable to errors. However, it is likely that reasoning based on both perceptual and factual memories leads to functional decisions in many cases, which is why both are so evident in human thinking.

Participants' reported reasons for confidence in their memories highlighted their beliefs about how memories differ from internally generated (e.g. imagined) or passively perceived (e.g. stories told by others) events. Many participants reported metacognitive beliefs that strong sensory or emotional details associated with a memory virtually guarantee its veridicality (see also Johnson, Raye, Foley, & Foley, 1981). Such certainty about the source of strongly experienced recollections may be a functional adaptation because situations that most benefit from prior learning, such as occasions of danger or great benefit, would likely be associated with strong emotions and sensory experiences. However, such beliefs are also potentially risky for source attribution, because manipulations such as conversational encoding (Kealy & Arbuthnott, 2003) or repeatedly imagining the same scene (Arbuthnott, 2005; Lampinen et al., 2005) can increase the sensory and emotional phenomenology of imagined events. Furthermore, emotional and

sensory stimulation is the explicit goal of many media events, so it is likely that memory of such media-induced experiences would also be associated with vivid phenomenology. In these cases, if an individual does not explicitly recall the source of such experiences, the risk of memory misattribution based on sensory and affective strength would be high, given the evidence of beliefs about the source of vivid phenomenology revealed in these studies.

Guidelines for professionals who must interpret memory attributions (e.g. Brown, Schefflin, & Hammond, 1998; Lindsay & Read, 1994; Shobe & Schooler, 2001) emphasize the use of external verification as the gold standard for assessing memory accuracy. Participants who had such evidence did report considerable confidence in their memories, and the absence of social verification was often named as a reason for lack of confidence. However, external verification evidence was mentioned much less frequently than emotional or sensory vividness as a basis for confidence in both studies. It may be that, under natural circumstances, external verification is neither sought nor noticed when vivid sensory and affective phenomenology is associated with a recollection, unless there are reasons to search for evidence of memory falsehood (Conway, 1997; Gilbert, 1991). When there is a reason to doubt memory veracity, however, the presence of external verification is influential. This evidence supports the importance given to external verification in forensic settings, as drawing individuals' attention to supporting memories can likely increase accuracy and confidence calibration whether or not external evidence exists.

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APPENDIX A: INSTRUCTIONS AND QUESTIONS, STUDY 1

1. Think aloud as you try to recall a specific memory from before age 12. Tell me everything that goes through your mind, no matter how irrelevant it seems.
2. How confident are you that you actually experienced this event, as opposed to it being something you imagined (that you imagined before and are now recalling this imagining), or something that somebody told you?
3. How did you decide this? What parts of the memory do you think are important in making you confident that you experienced this?
4. Have you ever discussed this incident with someone else? If so, do you think you have changed or added details based on their version that you had not initially recalled?
5. How old were you? How did you decide your age?

APPENDIX B: INSTRUCTIONS FOR STUDY 2

Description of research on recruitment poster: We are interested in specific childhood memories that people are not entirely sure of. For example, Katherine has a clear visual memory of the 2nd birthday party of her second son in the back yard of their house in Saskatoon. However, this memory cannot be correct, because they did not move into that house until that son was 4. Participants will be asked to recall two childhood memories they are not entirely sure about and to report on the thought processes that occur as they recall the memories.

Experimental instructions: We are interested in specific childhood memories that people are not entirely sure of. For example, Katherine has a clear visual memory of the 2nd birthday party of her second son in the back yard of their house in Saskatoon. However, this memory cannot be correct, because they did not move into that house until that son was 4. Similarly, Kinda has a memory of riding in the back of a car entertaining her brother by telling him about a series of dreams she had that featured the brother dressed as Spiderman. She is not sure which parts of the memory actually happened—did she actually have such recurring dreams, or was she elaborating on a single dream to tell her brother a better story?

Please think aloud as you try to recall whether you have any such memories (preferably from before age 12). Tell me everything that goes through your mind, no matter how irrelevant it seems.