Cue Generation and Memory Construction in Direct and Generative Autobiographical Memory Retrieval

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Abstract

Theories of autobiographical memory emphasise effortful, generative search processes in memory retrieval. However recent research suggests that memories are often retrieved directly, without effortful search. We investigated whether direct and generative retrieval differed in the characteristics of memories recalled, or only in terms of retrieval latency. Participants recalled autobiographical memories in response to cue words. For each memory, they reported whether it was retrieved directly or generatively, rated its visuo-spatial perspective, and judged its accompanying recollective experience. Our results indicated that direct retrieval was commonly reported and was faster than generative retrieval, replicating recent findings. The characteristics of directly retrieved memories differed from generatively retrieved memories: directly retrieved memories had higher field perspective ratings and lower observer perspective ratings. However, retrieval mode did not influence recollective experience. We discuss our findings in terms of cue generation and content construction, and the implication for reconstructive models of autobiographical memory.

Keywords: autobiographical memory; direct retrieval; generative retrieval; visuo-spatial perspective; recollective experience; memory reconstruction

Cue Generation and Memory Construction in Direct and Generative Autobiographical Memory Retrieval

The assertion that autobiographical memory is 'reconstructed' is virtually a truism in cognitive psychology. In a move away from the computer or video tape metaphors which had previously emphasized memory's role in reproducing the past, current theories of autobiographical memory emphasise its malleability, its selectivity, its broader, meaning-making functions, and its openness to social influences (e.g. Anderson, 1997; Bluck & Levine, 1998; Conway, Singer, & Tagini, 2004; Drivdahl & Hyman, 2013; Harris, Berntsen, & Rasmussen, 2014; Hasher & Griffin, 1978; Pasupathi, 2001). These ideas are not new, however, and can be dated back to Bartlett's (1932) observation that "the first notion to get rid of is that memory is primarily or literally reduplicative, or reproductive. In a world of constantly changing environment, literal recall is extraordinarily unimportant…. memory appears to be far more decisively an affair of construction rather than one of mere reproduction" (pp. 204-205). However, the concept of memory reconstruction is used in a variety of contexts and may encompass a variety of different processes in autobiographical memory retrieval (see also Michaelian, 2011)[1]. In the current paper, we investigate the relationship between two processes – cue generation and content construction – and whether there is a distinction between them, by comparing the characteristics of memories retrieved directly and memories retrieved generatively.

Direct and Generative Retrieval Processes

Theories of autobiographical memory suggest that two qualitatively distinct retrieval processes underlie everyday memory: direct retrieval - remembering without an experience of effortful search; and generative retrieval - remembering with an experience of deliberate or effortful search (Addis, Knapp, Roberts, & Schacter, 2012; Conway & Pleydell-Pearce, 2000; Haque & Conway, 2001; Rubin & Berntsen, 2009; Uzer, Lee & Brown, 2012). According to

Conway's Self-Memory System model of autobiographical memory (Conway & Pleydell-Pearce, 2000; Conway, 2005), these two retrieval processes access the same store of 'event-specific' autobiographical knowledge. Direct retrieval is a 'bottom-up' process (Williams, Chan, Crane, Barnhofer, Eade, & Healy, 2006), that occurs when a cue shares enough features with a memory to trigger direct access to the autobiographical knowledge base (Conway, 2005; Conway & Loveday, 2010). Generative retrieval, on the other hand, is a 'top-down' process (Williams et al., 2006), that involves goal-directed, hierarchical searching and spreading activation across the memory network in an attempt to retrieve a memory that meets current goals. In generative retrieval, associative memory networks mean that potential memory cues activate each other, until a cue is activated that successfully accesses the searched-for memory in the autobiographical knowledge base (Conway, 2005, Conway & Loveday, 2010). That is, in generative retrieval, when encountering a memory cue, one has to bring to mind additional, related information and knowledge from one's life before a specific memory is recalled (Uzer et al, 2012).

Some empirical research has supported this distinction between retrieval processes. Direct retrieval is associated with shorter retrieval latencies than generative retrieval (e.g. median response time of 2-4 seconds vs. 10-14 seconds in Uzer et al., 2012, Experiments 1-3; see also Addis et al., 2012). Direct retrieval is more common in response to concrete noun cues, and generative retrieval is more common in response to abstract emotion cues (Uzer et al., 2012). Neuroimaging research has identified strong overlap as well as some interesting differences in brain activity during direct vs. generative retrieval. Specifically, Addis et al. (2012) found that direct retrieval was associated with stronger activation generally across the neural 'autobiographical memory network', and particularly, increased activity in the visuospatial areas. On the other hand, generative retrieval was associated with increased activity in regions involved in executive control, memory search, retrieval of semantic

information, memory elaboration, and post-retrieval monitoring (Addis et al., 2012). Conway and Loveday (2010) described the case of an amnesic patient who was unable to engage in generative retrieval, but whose memory function was intact for direct retrieval when she encountered an appropriate cue.

A related but not identical distinction has been made between voluntary and involuntary remembering (see Berntsen, 2010). Although direct retrieval and involuntary remembering are sometimes conflated in the literature, the defining feature of direct retrieval is its lack of effort, while the defining feature of involuntary retrieval is its lack of intentionality (see also Uzer et al., 2012). While involuntary memories must involve direct and not generative retrieval (since conscious effort to search for a memory must involve the intention to recall), voluntary remembering can involve either direct retrieval or generative retrieval. In fact, the paradigms that have indexed direct and generative retrieval as described above have involved intentional (i.e. voluntary) retrieval, in which participants are given the intention (via task demands) of recalling a memory in response to each cue (Addis et al., 2012; Uzer et al., 2012). Models of autobiographical memory have traditionally emphasized generative retrieval as more common than direct retrieval. For instance, Haque and Conway (2001, p. 532) stated that "More common than direct retrieval is the effortful repeated cycle of access, evaluate, and elaborate as a memory is constructed during the process of generative retrieval. However, new research indicates that direct retrieval occurs as frequently as generative retrieval, even in a laboratory-based intentional autobiographical memory task (Uzer et al., 2012). This finding parallels recent research suggesting that involuntary retrieval is a mundane, everyday experience (Berntsen, 2010).

Cue Generation and Content Construction

Uzer et al. (2012) suggested that the generation involved in generative retrieval is the generation of cues, rather than the generation of memory content per se. That is, generative

retrieval is a backup strategy that is initiated when the presented cue is unsuccessful at directly triggering a memory; in generative retrieval then, people continue to self-generate additional (internal) memory cues until they activate a cue that directly triggers a memory (Uzer et al., 2012). This proposition makes a strong conceptual distinction between cue generation and content construction. An alternative hypothesis – based on Conway's (2005; Conway & Pleydell-Pearce, 2000; Haque & Conway, 2001) hierarchical model of autobiographical memory – is that the generation of memory cues in practice is not separable from the construction of memory content, because the cues in question are linked to the memory in a hierarchy of increasing specificity. As an example, given the cue word 'dog', an individual might first think of their childhood dog, before recalling finding a puppy under the tree on Christmas morning. While moving from the generic cue 'dog' to thinking of one particular dog is certainly cue generation, it is also constructing part of the content that will make up the specific event (see also Addis et al., 2012). A third possibility lies somewhere between these viewpoints: it is possible that cue generation and content construction are distinct processes but that they both operate during retrieval.

These alternative accounts lead to quite different understandings about when the autobiographical memory process is initiated and to quite different understandings about the nature of autobiographical memory retrieval. On one hand, Uzer et al. (2012) argue that generative retrieval only involves generation of cues and not of memory content, and thus that both direct and generative retrieval access "pre-stored event representations". In other words, according to Uzer et al., both processes access event representations that are not the result of reconstruction from fragments of personal knowledge. Uzer et al. (2012) therefore state that they present a fundamental challenge to the prevailing view that the content of autobiographical memories is reconstructed during retrieval (p. 1306), suggesting that there is no evidence for the reconstruction of memory content during retrieval and that existing data

can instead be explained by differences in cue generation that precedes memory retrieval. Alternatively, based on the opposing view presented above (c.f. Conway, 2005) the processes of cue generation and content reconstruction are likely to in fact overlap, because the "cues" that are activated in the hierarchical memory system also contain memory content. While such an argument in not explicit in Conway's (2005) model, it is consistent with his view of the hierarchical nature of memory and the processes of cue generation as occurring via spreading activation within that hierarchy (Haque & Conway, 2001). This latter view is also consistent with Addis et al.'s (2012) findings regarding neural differences in direct vs. generative retrieval, which they argued implied that direct and generative retrieval differ not only in reaction times, but also in the content and characteristics of the resulting memories constructed via these two retrieval processes. In the current paper, we empirically test whether directly and generatively retrieved memories differ in terms of the content of memories generated. Such a finding would be more consistent with the latter view that generative retrieval involves different processes of memory construction (c.f. Conway, 2005), and inconsistent with the former view that generative retrieval involves only the generation of cues entirely distinct from the memory itself (Uzer et al., 2012). On the other hand, if direct and generative retrieval are indistinguishable in terms of the memory content they produce (and only distinct in terms of time or effort involved in retrieval), this would support Uzer et al.'s (2012) account.

Thus, in the current study, we tested whether direct and generative retrieval (measured via self-report) differed in terms of the characteristics of the memories recalled, as well as in terms of reaction time. If direct and generative retrieval differ only in terms of cue generation, we should expect reaction time differences but no differences in the characteristics of memories elicited via these two processes. Alternatively, differences in characteristics of directly and generatively retrieved memories would imply that these two retrieval processes

involve differences in the construction of memory content as well as in cue generation. We focused on two particular memory characteristics which have been linked to construction during memory retrieval; we reasoned that differences in these variables might reflect differences in the processes of memory construction. The first characteristic was the perspective or point of view from which the memory was visualised as it was recalled ('visuo-spatial perspective'), and the second characteristic was the phenomenological experience of remembering as the memory was recalled ('recollective experience'). We discuss each of these in turn.

Field vs. Observer Visuospatial Perspective

Following Freud (1899) and Henri and Henri (1896, as cited in Nigro & Neisser, 1983), Nigro and Neisser (1983) distinguished between two perspectives or vantage points from which an experienced past event may be recalled. The first is the first-person perspective, where the memory involves visual imagery from the same vantage point as at encoding; that is, as they recall it the rememberer sees the event as from their own eyes. Nigro and Neisser (1983) called this "field perspective". The alternative is the third-person perspective, where the memory involves visual imagery from a different vantage point than at encoding; that is, as they recall it the rememberer sees the event from some other perspective than that of their own past self, and sees themselves in the memory. Nigro and Neisser (1983) called this "observer" perspective. In studying the characteristics of memories recalled from field vs. observer perspective, Nigro and Neisser (1983) found that field perspective was more common in general, but that observer perspective was more likely for older memories, memories that were less emotionally intense, and memories that were higher in self-consciousness (see also Rice 2010, for a review of the literature on perspective, emotion, and self-consciousness).

Of most interest to the aims of the current paper, visuo-spatial perspective is one

characteristic of memories that has been linked to reconstructive processes during memory retrieval. Nigro and Neisser (1983) asked, based on an earlier argument made by Freud (1899), whether memories recalled from an observer perspective may have been subject to more (or at least different) constructive processes during memory retrieval, since the recollection is less similar to the original image than for memories recalled from a field perspective. They suggested that "some types of reconstruction may leave *tell-tale signs* in phenomenal experience itself" (Nigro & Neisser, 1983, p. 468, our emphasis), and that differences in visual imagery associated with the memory might be one such tell-tale sign of different constructive processes. Other researchers have made similar arguments. For example, Conway (2009) stated that observer perspective may "indicate *more* memory construction" (p. 2306, our emphasis) and, even more strongly, Siedlecki (2014) argued that "generally speaking, all observer memories are essentially false (inaccurate) memories because unless the individual had an out of body experience during the event, only a field perspective memory is possible" (p. 2). On the other hand, some researchers have defended the possibility that remembering from an observer perspective can in principle be just as accurate as from a field perspective (Debus, 2007; Sutton, 2010). While some previous research found that true childhood memories were predominantly remembered from a field perspective and false childhood memories were remembered from an observer perspective (Heaps & Nash, 2001), other researchers have found no difference in perspective of true and false memories (McIsaac & Eich, 2002; Porter, Yuille, & Lehman, 1999; Siedlecki, 2014).

If retrieval mode reflects only cue generation and not the processes by which the memory content was constructed, we might expect no systematic differences in visuo-spatial perspective for directly vs. generatively retrieved memories. However, if retrieval mode reflects both cue generation and memory content construction, we might expect a tendency for directly retrieved memories to involve a field perspective and for generatively retrieved

memories to involve an observer perspective, since generative retrieval might indicate more effortful construction of memory content as well generation of memory cues. Thus, in the current study we compared the visuo-spatial perspective of directly vs. generatively retrieved memories.

Recollective Experience: Remembering vs. Just Knowing

Tulving (1985) introduced the distinction between memory retrieval associated with a feeling of consciously re-experiencing the past, or "autonoetic awareness", and memory retrieval not associated with a feeling of re-experiencing, or "noetic awareness". This distinction in the nature of recollective experience is typically operationalized as an individual's judgement of whether they 'remember' that something happened or simply 'know' that something happened (Tulving, 1993; see also Gardiner, 1988). In autobiographical memory research, participants report both 'remember' and 'know' judgements for their own life events, and 'remember' judgements are associated with higher ratings on a range of other phenomenological characteristics, including vividness, sensory perceptual detail, emotion, and confidence in accuracy (Hyman, Gilstrap, Decker, & Wilkinson, 1998; Rubin, Schrauf, & Greenberg, 2003).

In the recognition memory literature, there is some evidence to suggest that recognition driven by rich recollective experience (i.e. 'remember') is significantly faster than recognition driven by mere familiarity (i.e. 'know'; Dewhurst, Holmes, Brant & Dean, 2006) and is both more accurate and expressed with greater subjective confidence (Yonelinas, 2002), paralleling some of the characteristics associated with direct retrieval (Uzer et al., 2012). However, other work has suggested just the opposite; that a remember judgement is an effortful disambiguation process used when familiarity is not diagnostic. For instance, Mandler (1980) described the experience of sitting next to a man on a crowded bus and having a strong sense that you have seen him before. This instant sense of familiarity is

"knowing", but it is only through an effortful search process that you "remember" the last time you saw him and are able to identify him as your butcher (see also Huppert & Piercy, 1978, Hintzman, 1988). This effortful process mirrors the process of cue generation involved in generative retrieval. However, it is currently unknown whether there is a link between recollective experience and retrieval mode: can both direct and generative retrieval involve both remembering and knowing?

Previous research in autobiographical memory has also linked these two characteristics of retrieved autobiographical memories, connecting recollective experience with visuo-spatial perspective. Crawley and French (2005) asked participants to describe childhood memories that they 'remember', childhood memories that they simply 'know', and childhood memories which they were unsure if they 'remember' or 'know'. They found that field perspective dominated 'remember' events, while observer perspective dominated 'know' events (see also Libby, 2003). Piolino and colleagues (2006) found that older adults (compared to younger adults), showed decreased 'remember' judgements and increased 'know' judgements, as well as parallel decreased field perspective and increased observer perspective. Thus, there is consistent evidence that remember judgements are linked with field perspective and know judgements are linked with observer perspective.

As with visuo-spatial perspective, we used recollective experience to index differences in memory characteristics following different retrieval processes. If retrieval mode reflects only cue generation and not the processes by which the memory content was constructed, we might again expect no differences in recollective experience for directly vs. generatively retrieved memories. However, if retrieval mode reflects both cue generation and memory content construction, we might expect a tendency for directly retrieved memories to be judged 'remembered' and generatively retrieved memories to be judged as 'known' (consistent with the links between recollective experience and visuo-spatial perspective

described above). Thus, in the current study we compared the recollective experience associated with directly vs. generatively retrieved memories.

The Current Study

In the current study, we examined whether directly and generatively retrieved memories differ in their characteristics, particularly in terms of their visuo-spatial perspective and recollective experience. Participants elicited memories in response to cues, and reported their retrieval mode, visuo-spatial perspective, recollective experience, and a range of other phenomenological characteristics. If reported direct vs. generative retrieval only reflects cue generation as suggested by Uzer et al. (2012), then we should see no differences in the characteristics of memories retrieved via these two different retrieval modes. But if generative retrieval reflects different processes of memory content construction from direct retrieval as suggested by Addis et al. (2012) – perhaps more effortful construction of memory content as well as effortful generation of cues – then direct retrieval may be associated with field perspective and with 'remember' judgements, while generative retrieval may be associated with observer perspective and with 'know' judgements.

Method

Participants

Thirty six psychology undergraduates from Macquarie University, Australia (23 females and 13 males, M_{age} = 21.5 years, SD = 7.5, range 18-64 years[2]) participated in this study in return for either course credit or payment of AUD $15. All participants were informed that their responses were anonymous, that they should not report anything that was uncomfortable for them to disclose, and that they were free to withdraw at any point during the procedure. The design was fully within-subjects.

Materials

Participants elicited memories in response to 20 cue words. Ten cues were the

concrete noun cues used by Uzer et al. (2012; bag, ball, book, bread, car, chair, dog, river, pencil, radio) and the other ten cues were the positive and negative emotion word cues used by Uzer et al. (2012; afraid, amused, angry, bored, daring, entertained, frustrated, happy, sad, satisfied).

Procedure

Our procedure was based closely on that developed by Uzer et al (2012). Participants were tested individually. They were seated at desktop computers. The experimenter told them that they would be presented with a series of cue words on the computer, and for each one, they should report the first memory that came into their mind in response to this cue. Participants were encouraged to think of specific events, to sample widely from their life, and to try not to repeat events if possible. The experimenter told participants that they should press the spacebar as soon as they had the event in mind. They would then be prompted to report on its characteristics and describe the event aloud to the experimenter.

The experimenter verbally described to the participant the nature of the three primary distinctions they would be asked to make for each recalled event: direct or generative retrieval, visuo-spatial perspective, and recollective experience. Participants then commenced the experiment, first by reading written instructions regarding the three ratings that closely matched the descriptions given verbally by the experimenter, and then by initiating the presentation of cue words when they were ready.

Each of the cue words was presented in a random order in the centre of the computer screen. When the cue appeared, at the bottom of the screen an instruction reminded participants to “Press the spacebar as soon as you have a memory in mind”. If/when participants pressed the spacebar, they were prompted to make three initial, immediate reports about their memory retrieval.

First, participants reported the retrieval mode. Previously, the verbal and written

instructions had described the direct vs. generative retrieval distinction to participants as follows, based on Uzer et al.'s (2013) Experiment 3, which avoids defining direct and generative retrieval in terms of effort or time:

> "There are two ways that people can retrieve memories in response to cues: the first is when the cue directly triggers a memory and no additional information needs to be thought about; the second is when the cue does not directly trigger a memory so additional information from one's life is thought about in order to arrive at a specific memory."

For each retrieved memory, participants rated retrieval mode. To avoid biasing responses in either direction, we used two versions of the question regarding retrieval mode when participants made their ratings, and we counterbalanced which version participants saw. Half the participants saw the statement "This memory was directly triggered by the cue word so I did not have to use information about my life to help me recall this memory", and the response instruction "If the statement above is true for how you retrieved this memory, please press 'Y'. If you thought about other information and considered its content before a memory could be brought to mind, please press 'N'." The other half of the participants saw the statement "This memory was not directly triggered by the cue word so I had to use information about my life to help me recall this memory" and the response instruction "If the statement above is true for how you retrieved this memory, please press 'Y'. If you didn't think about other information, and the cue word directly triggered the memory, please press 'N'." In both counterbalancing conditions, responses were coded such that 1 = direct and 0 = generative retrieval.

Second, participants reported the perspective with which they retrieved their memory. Previously, the written/verbal instructions had described this to participants as follows, based on Rice and Rubin (2009)'s recommendation that field and observer perspective be rated

independently:

> "When people remember an event from their lives, there are generally two ways they can visualize the scene: first person, from their own eyes, or third person, where one can oneself in the scene. These options are not mutually exclusive, and both may be more or less present for any particular memory retrieval."

For each retrieved memory, participants rated field and observer perspective on two separate 7-point scales (i.e. "How did you see this event as it came to mind? I saw this event from my own eyes, first person" and "How did you see this event as it came to mind? I saw this event as an outside observer, like watching a movie of myself, third person"; 1 = not at all and 7 = very much). We counterbalanced the order in which participants made these ratings, such that half the participants rated field perspective first and half rated observer perspective first.

Third, participants reported recollective experience. Previously, the verbal and written instructions had described the remember/know distinction to participants as follows, based on Gardiner and Java (1990):

> "Memories can be experienced differently as they come to mind: sometimes, we consciously experience aspects of the event like visual images or emotions, and other times, we simply know something happened without being consciously aware of particular aspects."

For each retrieved memory, participants rated their recollective experience. Again, to avoid biasing responses in either direction, we used two versions of this question and counterbalanced which version participants saw. Half the participants saw the statement "Do you consciously remember this event, or do you simply know that it happened?" and the response instruction "If you can consciously recollect specific aspects of this event (like how things looked, how you felt), please press 'Y'. If you just know that it happened but are not aware of any particular aspect of the experience, please press 'N'." The other half of the

participants saw the statement “Do you simply know that this event happened, or do you consciously remember it?” and the response instruction “If you just know that it happened but are not aware of any particular aspect of the experience, please press ‘Y’. If you can consciously recollect specific aspects of this event (like how things looked, how you felt), please press ‘N’.” In both counterbalancing conditions, responses were coded such that 1 = remember judgment and 0 = know judgment.

After answering these initial three questions, participants then turned to the experimenter and described the memory to him in a few sentences. The experimenter audio recorded their response using a digital voice recorder. Finally, on the computer participants reported how old they were in years at the time of the event, and rated on 7-point Likert scales their confidence in the memory's accuracy (1 = happened not at all as remembered, 7 = happened exactly as remembered), the clarity of the memory (1 = not at all clear, 4 = somewhat clear, 7 = extremely clear), personal importance of the event (1 = not at all important, 4 = somewhat important, 7 = extremely important), how often they had recalled the event previously (1 = not rehearsed at all, 4 = somewhat rehearsed, 7 = rehearsed a great deal), positive emotionality (1 = not at all positive, 7 = highly positive), and negative emotionality (1 = not at all negative, 7 = highly negative).

If participants did not press the spacebar in response to an item, that item timed out after 90 seconds, and the computer automatically proceeded to the next item. The procedure was repeated until participants had completed all 20 items. This procedure took approximately 1 hour, although exact durations varied between participants.

Results

Manipulation Checks

Initial tests indicated that we could collapse across counterbalancing conditions. We conducted separate analyses of the effects of: (1) retrieval response counterbalancing (direct

retrieval emphasised vs. generative retrieval emphasised) on direct vs. generative retrieval ratings; (2) order of rating perspective (field first vs. observer first) on field and observer perspective ratings; and (3) recollective experience response counterbalancing (remember judgements emphasized vs. know judgements emphasized) on remember/know ratings. For retrieval ratings, a chi-square test indicated a non-significant tendency for participants to report more direct retrieval when the question wording emphasised it, $X^2(1, n = 706) = 3.20$, $p = .083$. For recollective experience, a chi-square test also indicated no differences across counterbalancing conditions, $X^2(1, n = 706) = 1.78$, $p = .196$. For field and observer perspective ratings, separate t-tests confirmed no effect of counterbalancing condition on ratings, all ts < 0.65, all ps > .52. Overall, the way we asked participants to report the retrieval mode, perspective, and recollective experience for each memory did not significantly bias their responses in either direction. Thus, we collapsed across counterbalancing conditions in all subsequent analyses. We also examined the relationship between participants' field and observer perspective ratings. The correlation was strongly and significantly negative, $r(704) = -.78$, $p < .001$, indicating that ratings were strongly inversely related to each other, similar to the findings of Rice and Rubin (2009).

Prevalence of Direct and Generative Retrieval

Participants elicited 706 of 720 (98.1%) requested memories. The type of cue (concrete noun vs. emotion word) did not influence response rates: 353 out of 360 (98.1%) memories were elicited for both cue types. Across all cues, direct retrieval was reported for 335 (47.5%) of elicited memories (and generative retrieval was reported for the remaining 52.5% of memories). Contrary to the findings of Uzer et al. (2012), we found no difference in the prevalence of direct retrieval in response to concrete vs. emotion cues: participants reported direct retrieval for 166 of the 353 (47.0%) memories elicited to concrete nouns and for 179 of the 353 memories elicited to emotion words (47.9%), $X^2(1, n = 706) = 0.51$, p

= .880. Overall, direct retrieval was common: just under half the memories were reported by participants to have been the result of direct retrieval.

However there were marked individual differences in the rates of direct and generative retrieval evident when using participants rather than elicited memories as the unit of analysis. On average, participants reported 9.31 directly retrieved memories (*SD* = 3.59; or 47.67% of elicited memories), consistent with the analyses above indicating approximately 50% of memories were directly retrieved. However, rates of direct retrieval ranged from one participant who reported only 1 out of 20 (5%) memories as directly retrieved, and one participant who reported 16 out of 20 (80%) memories as directly retrieved (see Figure 1). The distributions show that some individuals were more likely to recall memories directly and others were more likely to recall generatively.

The retrieval latencies were consistent with participants' self-reports of retrieval mode. On average, memories that were rated as "directly retrieved" were elicited in 8.85 seconds (*SD* = 9.91), while memories that were rated as "generatively retrieved" were elicited in 16.92 seconds (*SD* = 16.13). However, inspection of the distribution of means and the very high standard deviations shows that these means were influenced by outliers (see Figure 2), and hence we examined medians (consistent with Uzer et al., 2012). The median elicitation latency for memories rated as directly retrieved was 5.22 seconds, and the median elicitation latency for memories rated as generatively retrieved was 11.40 seconds, relatively consistent with response times reported for direct and generative retrieval in previous research (Addis et al., 2012; Uzer et al., 2012). An independent-samples Mann-Whitney U test confirmed that these distributions were significantly different from each other ($U = 37{,}290.00$, $p < .001$). Thus, reported direct retrieval was associated with faster recall.

Retrieval Mode, Visuo-spatial Perspective, and Recollective Experience

Our hypotheses concerned the differences in the content of directly and generatively

retrieved memories in terms of visuo-spatial perspective and recollective experience. For each variable, we conducted analyses using elicited memories as the unit of analysis (n = 706), and we used multi-level modelling where possible to take into account that each participant contributed multiple memories.

Visuo-spatial Perspective. Participants rated field and observer perspective on two separate 7 point scales. Comparing across retrieval mode, a 2 (retrieval mode: direct vs. generative) × 2 (perspective rating: field vs. observer) between-memories ANOVA on ratings of perspective yielded a significant main effect of perspective, $F(1,704) = 110.93$, $p < .001$. Overall, field perspective ratings ($M = 4.69$, $SD = 2.19$) were higher than observer perspective ratings ($M = 3.17$, $SD = 2.21$), consistent with previous research (Nigro & Neisser, 1983). However, this main effect was moderated by a significant interaction between retrieval mode and perspective, $F(1,704) = 17.81$, $p < .001$. The main effect of retrieval mode was not significant, $F(1,704) = 0.45$, $p = .503$.

To interpret the interaction we conducted follow up tests to compare direct and generatively retrieved memories on each perspective rating separately. We conducted these follow up tests using multi-level modelling. This multi-level modelling takes into account that each participant contributed multiple memories and thus these memories are not independent data points (such multi-level modelling was not possible in the previous, omnibus ANOVA due to the within-subjects factor). Table 1 provides the data for the model, and Figure 3 presents the relevant means. These follow up tests ($\alpha = .05/2$ with a Bonferroni correction for multiple comparisons) indicated that directly retrieved memories received significantly higher field ratings than generatively retrieved memories, $t(703.17) = 2.89$, $p = .004$ (see Table 1 and Figure 3. Unsurprisingly, given the strong inverse relationship between field and observer perspective ratings, the opposite pattern was present for ratings of observer perspective: directly retrieved memories received significantly lower observer

perspective ratings than generatively retrieved memories, $t(702.94) = 3.22$, $p = .001$ (see Table 1 and Figure 3. Thus, our results suggested that there were differences in memory content depending on retrieval mode: field perspective was more dominant for directly retrieved memories and observer perspective was more dominant for generatively retrieved memories.

Recollective Experience. Of the 706 elicited memories, 481 (68.13%) were rated as "remembered" and the remaining 225 were rated as "known". Across participants 13.36 ($SD = 3.31$) memories (out of a possible 20) were judged as remembered, and this ranged between 8 and 20 memories across participants. However, we found no difference in the prevalence of direct retrieval in response to memories judged as remembered vs. known: participants reported direct retrieval for 229 of the 481 (47.6%) memories judged as remembered and for 106 of the 225 (47.1%) of the memories judged as known, $X^2(1, n = 706) = 0.02$, $p = .936$. To investigate whether perspective ratings differed depending on recollective experience, and whether this interacted with retrieval mode, we conducted a 2 (retrieval mode: direct vs. generative) × 2 (recollective experience: remembered vs. known) × (2) (perspective rating: field vs. observer) mixed models ANOVA on ratings of perspective. This analysis yielded effects of retrieval mode on perspective, as described in the earlier analysis. This ANOVA also yielded a significant interaction between recollective experience and perspective rating, $F(1,702) = 18.98$, $p < .001$, but there was no significant interaction between recollective experience and retrieval mode, all Fs < 2.48 all ps > .116.

Follow up tests – again using multilevel modelling to take into account that each participant contributed multiple memories – indicated a very similar pattern to that found for retrieval mode (see Figure 4): memories judged as remembered received significantly higher ($M = 5.01$, $SD = 2.10$) field perspective ratings than memories judged as known ($M = 4.29$, $SD = 2.06$), $t(698.34) = 4.47$, $p < .001$. The pattern was opposite for ratings of observer

perspective: memories judged as remembered received significantly lower (M = 3.02, SD = 2.18) observer perspective ratings than memories judged as known (M = 3.68, SD = 2.12), t(698.08) = 3.81, p < .001. However, this relationship did not depend on retrieval mode. Thus, across scoring and analysis methods, our results suggest that while there were links between retrieval mode and visuo-spatial perspective and links between visuo-spatial perspective and recollective experience, there was no direct relationship between retrieval mode and recollective experience. We return to this point in the Discussion.

Other Qualities and Phenomenological Characteristics

To further explore possible differences in the content of memories retrieved via direct vs. generative retrieval, we examined the effects of retrieval mode on a range of characteristics. We compared memories in terms of: (1) memory length, obtained by transcribing the audio-recorded memories and calculating a word count; (2) age of the event in years; (3) subjective accuracy, rated on a Likert scale of 1-7; (4) subjective clarity, rated on a Likert scale of 1-7; (5) personal importance and significance, rated on a Likert scale of 1-7; (6) frequency of previous rehearsal, rated on a Likert scale of 1-7; (7) positive emotionality, rated on a Likert scale of 1-7; and (8) negative emotionality, rated on a Likert scale of 1-7. Across these variables, we conducted one-way ANOVAs for retrieval mode on the 706 elicited memories, using multilevel modelling to account for each participant having contributed multiple memories. Means are presented in Table 2. There were no differences in the length of memories described to the experimenter, how long ago the event had occurred, its subjective accuracy, or its associated positive and negative emotion, all ts < 0.99, all ps > .326. However, directly retrieved memories were rated as significantly more clear, t(703.99) = 3.32, p = .001, significantly more frequently rehearsed, t(505.35) = 7.48, p = .006, and marginally more personally important than generatively retrieved memories, t(699.27) = 1.75, p = .081.

Discussion

We replicated recent findings concerning the prevalence of direct retrieval, even in intentional, laboratory-based memory cuing tasks. Our rate of direct retrieval – at about 50% - was similar to that identified by Uzer et al. (2012), and retrieval latencies associated with direct and generative retrieval were also similar, with directly retrieved memories recalled faster on average than generatively retrieved memories. It is interesting to note the distributions in retrieval latencies for direct and generative retrieval however (in Figure 2), with instances of direct retrieval reported at 60 seconds, and instances of generative retrieval reported within 2 seconds. Thus while retrieval time does vary systematically between retrieval modes, it is not the defining feature. We did not replicate Uzer et al.'s (2012) findings regarding differences between concrete and emotional cues, but the magnitude of these differences was relatively small in their studies. Overall, our findings add weight to the claim that direct retrieval is common and underestimated in autobiographical memory research, going against the view that generative retrieval is most common and direct retrieval relatively rare (Haque & Conway, 2001). Even non-personal, generic word stimuli trigger high rates of direct retrieval, and the rates are likely even higher when encountering personally-relevant cues in day-to-day life (see Berntsen, 2010).

Our findings also suggested the possibility of stable individual differences in the extent to which people engage in direct vs. generative retrieval. Rates of direct retrieval across participants ranged from 5% to 80%. This may simply reflect the arbitrary nature of the experimenter-provided cues, which may have happened to be more personally-relevant and meaningful to some participants than others. Alternatively, this may reflect underlying individual differences. We examined whether participant age might account for some of these differences, although most of our participants fell within a very narrow young adult age range[2]. There was no correlation between age and rate of direct retrieval, and our one "older"

participant (aged 64 years) had 40% direct retrieval, similar to the mean of the other participants. Thus, there is no suggestion in our data that age might account for these individual differences. Further research, utilising different kinds of cues and testing additional participant characteristics is required to understand this further.

Our main aim was to test whether direct and generative retrieval differed in the characteristics of the recalled memories, or whether they only differed in terms of retrieval time and not memory content. We found that directly and generatively retrieved memories did differ in terms of memory characteristics: specifically, directly retrieved memories had stronger field perspective and generatively retrieved memories had stronger observer perspective. Directly retrieved memories were also rated as clearer, more rehearsed, and more personally significant than generatively retrieved memories, suggesting that those memories which could be directly recalled were more accessible. However, there were no differences in recollective experience associated with directly and generatively retrieved memories. Overall, our results are inconsistent with the view that direct and generative retrieval differ only in terms of cue generation or retrieval effort; instead, there appear to be differences in the characteristics of memories retrieved via these two retrieval modes.

Direct vs. Generative Retrieval and Memory Content

Directly retrieved memories had stronger ratings of field perspective and weaker ratings of observer perspective than generatively retrieved memories. This is consistent with the view that recalling generatively involves different processes of construction of the memory content, since differences in visuo-spatial perspective in particular have been suggested to be a consequence of different processes of memory construction (see Nigro & Neisser, 1983; Conway, 2009). If directly and generatively retrieved memories differed only in terms of cue generation, we should not expect these differences in memory characteristics. Thus, our results suggest that cue generation and memory content construction – while

conceptually distinguishable – may in practice overlap, and that direct and generative retrieval may involve different processes of memory reconstruction.

However, these results were complicated by the finding that directly retrieved memories were equally likely to be judged as remembered and known; that is, retrieval mode was not associated with recollective experience. In terms of generation of cues, construction of content, and recollective experience, we had two possible hypotheses. First, consistent with research suggesting 'remember' judgements accompany faster recall (Dewhurst et al., 1996), we could expect that 'remember' judgements might be linked with rapid, effortless direct retrieval. Conversely, consistent with a view that 'remember' judgements are the result of effortful retrieval processes (while 'know' judgements reflect effortless familiarity; Mandler, 1980), we could expect that 'remember' judgements could be linked with effortful generative retrieval. Our results indeed supported the view that remember judgements accompany faster recall (consistent with Dewhurst et al., 1996), since elicitation latency was lower for memories judged as remembered. But in contrast with our expectations and with both the possible relationships outlined above, we found no relationship between retrieval mode and recollective experience (although there was an independent relationship between retrieval mode and visuo-spatial perspective). Moreover, the characteristics of directly vs. generatively retrieved memories and 'remember' vs. 'know' memories were not parallel. While both direct retrieval and remember judgments were associated with faster recall, and with clearer and more personally significant events, remember judgements were also associated with a range of other phenomenological characteristics while direct retrieval was not. Thus our results suggest that the memory characteristics associated with direct and generative retrieval are not the same characteristics as participants use to make 'remember' vs. 'know' judgements.

Despite conceptual links between retrieval mode and recollective experience –

particularly in notions of the speed and effort involved in retrieval and the generation of cues and memory content (e.g. Dewhurst et al., 1996; Mandler, 1980) – we found no evidence that these two distinctions mapped onto each other. One alternative possibility is that our measure of recollective experience was simply not sensitive enough to capture differences between memories. The majority of memories (approximately two thirds) were rated as remembered, although ratings were note at ceiling. Perhaps use of a scale rather than a forced choice, or even the use of a "guess" or "don't know" option might allow for relationships to emerge (e.g. see Gardiner, Java, & Richardson-Klavehn, 1996). Research on perspective has supported the use of separate scales for field and observer ratings (Rice & Rubin, 2009), but whether similar separate ratings of recollective experience might be valuable remains unknown.

Distinction Between Cue Generation and Content Construction

The notion that all autobiographical memories are inherently reconstructed is well accepted in cognitive psychology (see Bluck & Levine, 1998; Hyman, 1999; Hyman & Loftus, 1998; Ross, 1989). However, this notion lacks conceptual clarity (see also Alba & Hasher, 1983; Michaelian, 2011, for a taxonomy of types of memory reconstruction). For instance, memory can be reconstructive because: memory accessibility is selective and subject to self-serving biases (Conway & Pleydell-Pearce, 2000); because aspects of recall can be false (and there are a whole spectrum of different kinds of memory errors; Hyman, 1999); and because in neural terms, memories are stored in a distributed fashion and reconstructed into a single whole by the hippocampus during retrieval (Shastri, 2002). Some stronger conceptual distinctions regarding specific terms and processes may be fruitful. However, our data do not support a strong distinction between cue generation and the content of memory. While this distinction can be made conceptually (e.g. Uzer et al., 2012), our evidence suggest that differences in cue generation prior to memory retrieval result in differences in the construction of the memory content itself, particularly in terms of visuo-

spatial perspective as well as in other characteristics of the content.

Our finding that cue generation and construction of memory content may in practice be related to each other is consistent with previous work by Conway (2005; Conway & Pleydell-Pearce, 2000) and by Addis et al. (2012). In Conway and Pleydell-Pearce's (2000) self-memory-system model of autobiographical memory, the cues that are generated in generative retrieval are part of the hierarchy of autobiographical memory. In Addis et al.'s study of direct and generative retrieval, they used general cues like "leg" to elicit generative retrieval and specific cues like "the time I broke my leg" to elicit direct retrieval. They presumed that these two cues access different levels of the hierarchy of autobiographical knowledge, but both cues and particularly the latter, specific cues also contain memory content. Addis et al.'s (2012) neural evidence supported the view that direct and generative retrieval may differ in terms of reconstructive processes and in terms of the characteristics of memories recalled, since generative retrieval involved more hippocampal activation (suggesting differences in reconstruction during retrieval) and direct retrieval involved stronger activation of the sensory-perceptual areas (suggesting more sensory-perceptual content, and consistent with higher vividness ratings).

More speculatively, we might conceptualise direct retrieval and generative retrieval as two different routes through the autobiographical memory system, the former bottom up and the latter top-down. This raises the idea that there are different kinds of constructive processes in which memories can be reconstructed from different kinds of information, and that these different reconstructive processes result in different visual perspectives (as well as differences in other memory characteristics). For instance, in bottom-up direct retrieval, memory content may tend to be reconstructed from more concrete information, linking it with the concrete, field perspective (c.f. Libby, Shaeffer, & Eibach, 2009), and consistent with neural evidence that it involves more sensory-perceptual activation (Addis et al., 2012). In

contrast, top-down, generative retrieval, memory content may tend to be reconstructed from more abstract information, linking it with the abstract observer perspective (c.f. Libby et al, 2009), and consistent with neural evidence that it involves more frontal and hippocampal activation (Addis et al., 2012). Although we didn't find differences in retrieval mode depending on concrete noun vs. abstract emotion cues, Uzer et al. (2012) found higher rates of direct retrieval with concrete cues and lower rates with abstract, emotional cues, which is consistent with the idea that direct and generative retrieval might reflect reconstruction of memories from different kinds of information. However this speculation – of different kinds of reconstruction – requires further research.

Important conceptual distinctions between different processes operating prior to and during memory retrieval – generation and construction; distortion and construction; selection and construction, as well as different kinds of memory reconstruction – require careful disentangling both theoretically and empirically in order to refine our notions of what a constructive view of autobiographical memory entails, and to understand the multiple processes that may fall under broad notions of 'reconstruction'.

Retrieval Effort and Retrieval Intentionality

As noted in the Introduction, although the literatures suggest that there are similarities between direct retrieval and involuntary retrieval, these concepts can be distinguished by their defining characteristic: a lack of retrieval effort in the case of direct retrieval vs. a lack of retrieval intention in the case of involuntary retrieval. Our methodology focused only on voluntarily/intentionally retrieved memories, since participants were given the task of recalling episodes in response to cue words, and yet we found high rates of direct retrieval similar to Uzer et al. (2012). This finding highlights the differences between direct and involuntary retrieval. Moreover, our findings of the relationship between direct retrieval and visuo-spatial perspective are inconsistent with previous research suggesting no relationship

between involuntary memory and visuo-spatial perspective (Mace, Atkinson, Moeckel & Torres, 2011). Future research should focus on more clearly distinguishing between these two aspects of retrieval: effort and intentionality, and in understanding how direct retrieval and involuntary remembering are related to each other.

Final Conclusion

We investigated whether there were differences in the content of memories that were directly vs. generatively retrieved, or whether these memories differ only in the amount of cue generation required to recall them. We found differences between memories consistent with differences in the processes of constructing the memory content; specifically, directly retrieved memories had stronger field perspective and generatively retrieved memories had stronger observer perspective. Although directly retrieved memories also differed from generatively retrieved memories on a number of other characteristics, there was no association between retrieval mode and recollective experience. These findings are not consistent with the view that direct and generative retrieval differ only in terms of cue generation, and that both access the same store of autobiographical knowledge in the same way. Rather, they suggest that cue generation and memory construction – while conceptually distinct – may in practice overlap. Because content differences were found in terms of visuo-spatial perspective – a characteristic of memories argued to be linked to reconstructive processes – our findings are also not consistent with the view that both direct and generative retrieval access "pre-stored event representations" (Uzer et al., 2012). Rather, our findings suggest that direct and generative retrieval involve different kinds of memory reconstruction. More generally, we suggest ongoing conceptual and empirical work to unpack and refine notions of memory construction, and to explore its component processes.

References

Addis, D. R., Knapp, K., Roberts, R. P., & Schacter, D. L. (2012). Routes to the past: Neural substrates of direct and generative autobiographical memory retrieval. *Neuroimage, 59*, 2908-2922.

Alba, J. W., & Hasher, L. (1983). Is memory schematic? *Psychological Bulletin*, *93*, 203.

Anderson, N. H. (1997). Functional memory versus reproductive memory. *Behavioral and Brain Sciences, 20*, 19-20.

Bartlett, F. C. (1932). Remembering: An experimental and social study. *Cambridge: Cambridge University*.

Berntsen, D. (2010). The unbidden past: Involuntary autobiographical memories as a basic mode of remembering. *Current Directions in Psychological Science, 19*, 138-142.

Bluck, S. & Levine, L. J. (1998). Reminiscence as autobiographical memory: A catalyst for reminiscence theory development. *Ageing and Society, 18,* 185-208.

Conway, M. A. (2005). Memory and the self. *Journal of Memory and Language, 53*, 594-628.

Conway, M. A. (2009). Episodic memories. *Neuropsychologia*, *47*, 2305-2313.

Conway, M. A., & Loveday, C. (2010). Accessing autobiographical memories. In J. H. Mace (Ed.), *The Act of Remembering*, Wiley-Blackwell: Oxford, UK, pp. 56-70.

Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review*,*107*, 261.

Conway, M. A., Singer, J. A., & Tagini, A. (2004). The self and autobiographical memory: Correspondence and coherence. *Social Cognition, 22,* 491-529.

Crawley, S., & French, C. (2005). Field and observer viewpoint in remember-know memories of personal childhood events. *Memory, 13*, 673-681.

Debus, D. (2007). Perspectives on the past: A study of the spatial perspectival characteristics of recollective memories. *Mind and Language*, *22*, 173-206.

Dewhurst, S. A., Holmes, S. J., Brandt, K. R., & Dean, G. M. (2006). Measuring the speed of the conscious components of recognition memory: Remembering is faster than knowing. *Consciousness and Cognition, 15*, 147-162.

Drivdahl, S. B., & Hyman Jr, I. E. (2013). Fluidity in autobiographical memories: Relationship memories sampled on two occasions. *Memory*, (ahead-of-print), 1-12.

Eade, J., Healy, H., Williams, J. M. G., Chan, S., Crane, C., & Barnhofer, T. (2006). Retrieval of autobiographical memories: The mechanisms and consequences of truncated search. *Cognition and Emotion, 20*, 351-382.

Freud, S. (1899). Screen memories. Reprinted in *Collected Papers of Sigmund Freud, Vol. V.*, London: Hogart Press, 1956.

Gardiner, J. M. (1988). Functional aspects of recollective experience. *Memory and Cognition*, *16*, 309-313.

Gardiner, J. M., & Java, R. I. (1990). Recollective experience in word and nonword recognition. *Memory and Cognition, 18*, 23-30.

Gardiner, J. M.; Java, R. I.; Richardson-Klavehn, A. (1996). How level of processing really influences awareness in recognition memory. *Canadian Journal of Experimental Psychology, 50,* 114-122.

Harris, C. B., Rasmussen, A. S., & Berntsen, D. (2014). The functions of autobiographical memory: An integrative approach. *Memory*, *22*, 559-581.

Haque, S., & Conway, M. A. (2001). Sampling the process of autobiographical memory construction. *European Journal of Cognitive Psychology, 13*, 529-547.

Hasher, L., & Griffin, M. (1978). Reconstructive and reproductive processes in memory. *Journal of Experimental Psychology: Human Learning and Memory*,*4*, 318.

Heaps, C. M., & Nash, M. (2001). Comparing recollective experience in true and false autobiographical memories. *Journal of Experimental Psychology: Learning, Memory,*

and Cognition, 27, 920.

Hintzman, D. L. (1988). Judgements of frequency and recognition memory in a multiple-trace memory model. *Psychological Review, 95*, 528.

Huppert, F. A., & Piercy, M. (1978). The role of trace strength in recency and frequency judgements by amnesic and control subjects. *The Quarterly Journal of Experimental Psychology, 30*, 347-354.

Hyman Jr, I. E. (1999). Creating false autobiographical memories: Why people believe their memory errors. *Ecological approaches to cognition: Essays in honor of Ulric Neisser*, 229-252.

Hyman Jr, I. E., Gilstrap, L. L., Decker, K., & Wilkinson, C. (1998). Manipulating remember and know judgements of autobiographical memories: An investigation of false memory creation. *Applied Cognitive Psychology, 12*, 371-386.

Hyman Jr, I. E., & Loftus, E. F. (1998). Errors in autobiographical memory. *Clinical Psychology Review*, *18*, 933-947.

Libby, L. K. (2003). Imagery perspective and source monitoring in imagination inflation. *Memory and Cognition, 31*, 1072-1081.

Libby, L. K., Shaeffer, E. M., & Eibach, R. P. (2009). Seeing meaning in action: a bidirectional link between visual perspective and action identification level. *Journal of Experimental Psychology: General, 138*, 503.

Mace, J. H., Atkinson, E., Moeckel, C. H., & Torres, V. (2011). Accuracy and perspective in involuntary autobiographical memory. *Applied Cognitive Psychology, 25*, 20-28.

Mandler, G. (1980). Recognizing: The judgement of previous occurrence. *Psychological Review, 87*, 252.

McIsaac, H. K., & Eich, E. (2002). Vantage point in episodic memory. *Psychonomic Bulletin and Review, 9*, 146-150.

Michaelian, K. (2011). Generative memory. *Philosophical Psychology*, *24*, 323-342.

Nigro, G., & Neisser, U. (1983). Point of view in personal memories. *Cognitive Psychology, 15*, 467-482.

Pasupathi, M. (2001). The social construction of the personal past and its implications for adult development. *Psychological Bulletin*, *127*, 651.

Piolino, P., Desgranges, B., Clarys, D., Guillery-Girard, B., Taconnat, L., Isingrini, M., & Eustache, F. (2006). Autobiographical memory, autonoetic consciousness, and self-perspective in aging. *Psychology and Aging, 21*, 510.

Porter, S., Yuille, J. C., & Lehman, D. R. (1999). The nature of real, implanted, and fabricated memories for emotional childhood events: implications for the recovered memory debate. *Law and Human Behavior*, *23*, 517.

Rice, H. J. (2010). Seeing where we're at. In J. H. Mace (Ed.), *The Act of Remembering*, Wiley-Blackwell: Oxford, UK, pp. 228-258.

Rice, H. J., & Rubin, D. C. (2009). I can see it both ways: First-and third-person visual perspectives at retrieval. *Consciousness and Cognition, 18*, 877-890.

Rice, H. J., & Rubin, D. C. (2011). Remembering from any angle: the flexibility of visual perspective during retrieval. *Consciousness and Cognition, 20*, 568-577.

Ross, M. (1989). Relation of implicit theories to the construction of personal histories. *Psychological Review*, *96*, 341.

Rubin, D. C., & Berntsen, D. (2009). The frequency of voluntary and involuntary autobiographical memories across the life span. *Memory and Cognition, 37*, 679-688.

Rubin, D. C., Schrauf, R. W., & Greenberg, D. L. (2003). Belief and recollection of autobiographical memories. *Memory and Cognition, 31*, 887-901.

Shastri, L. (2002). Episodic memory and cortico–hippocampal interactions. *Trends in Cognitive Sciences*, *6*, 162-168.

Siedlecki, K. L. (2014). Visual perspective in autobiographical memories: Reliability, consistency, and relationship to objective memory performance. *Memory, (ahead-of-print)*, 1-11.

Sutton, J. (2010). Observer perspective and acentred memory: some puzzles about point of view in personal memory. *Philosophical Studies*, *148*, 27-37.

Tulving, E. (1985). Memory and consciousness. *Canadian Psychology, 26*, 1-12.

Tulving, E. (1993). What is episodic memory? *Current Perspectives in Psychological Science, 2*, 67-70.

Uzer, T., Lee, P. J., & Brown, N. R. (2012). On the prevalence of directly retrieved autobiographical memories. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 38*, 1296-1308.

Williams, J. M. G., Chan, S., Crane, C., Barnhofer, T., Eade, J., & Healy, H. (2006). Retrieval of autobiographical memories: The mechanisms and consequences of truncated search. *Cognition and Emotion*, *20*, 351-382.

Yonelinas, A. P. (2002). The nature of recollection and familiarity: A review of 30 years of research. *Journal of Memory and Language, 46*, 441-517.

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Footnotes

1. There is some inconsistency in the use of related terms *reconstructive* and *constructive*, and it is not entirely clear whether these terms refer to different kinds of processes or imply different conclusions about the nature of autobiographical memory. One solution, suggested by Michaelian (2011), is to use ‘constructive’ for processes acting at encoding, and ‘reconstructive’ for processes acting at retrieval. ‘Reconstructive’ is generally the most commonly used term in the literature, and we retain it here while noting that ‘constructive’ may be more appropriate, and that more conceptual and empirical work is required to precisely define and differentiate these terms..
2. Aside from one 64-year old participant, all others were aged less than 30 years, and 31 out of 36 participants were in the age range of 19-21 years.

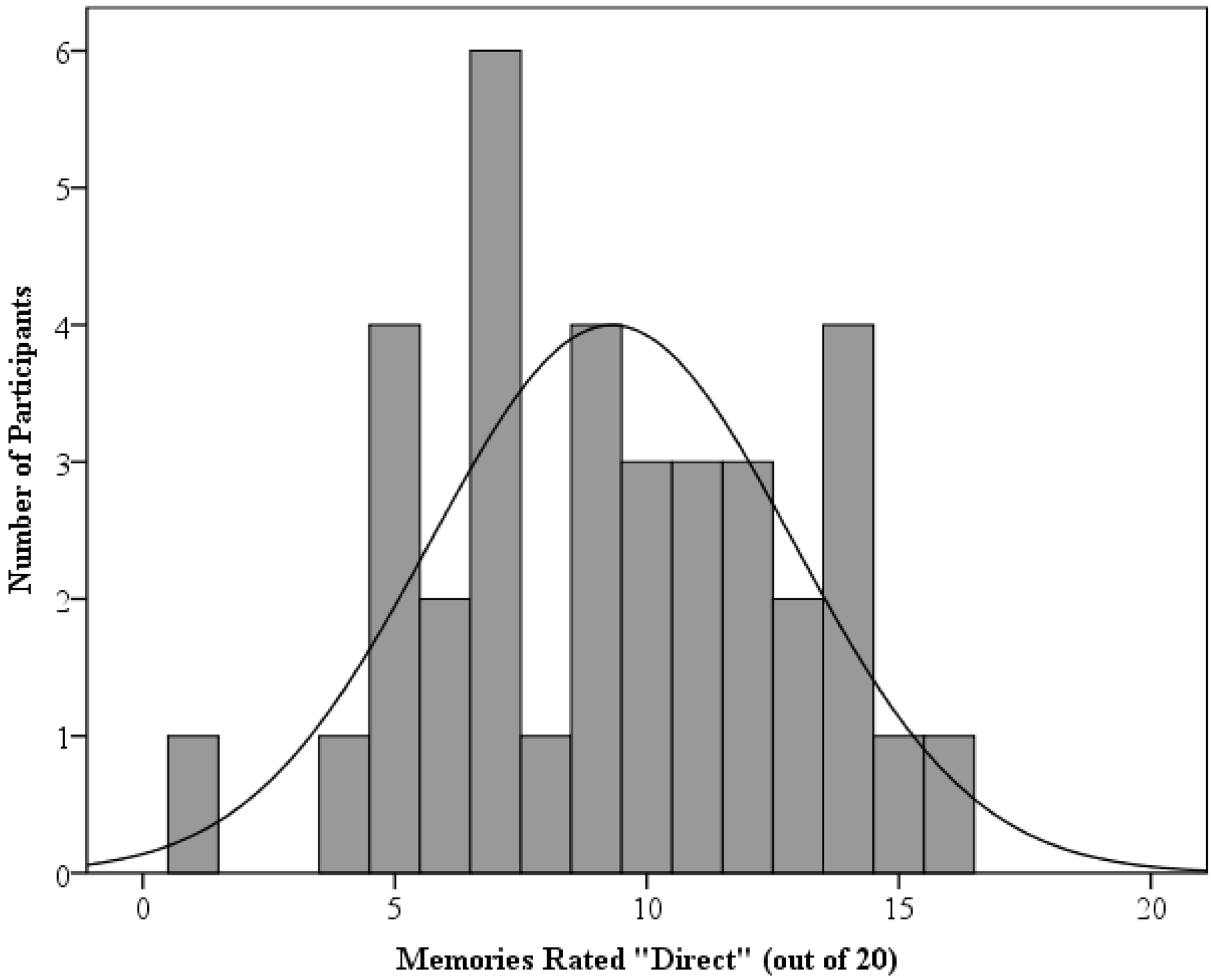
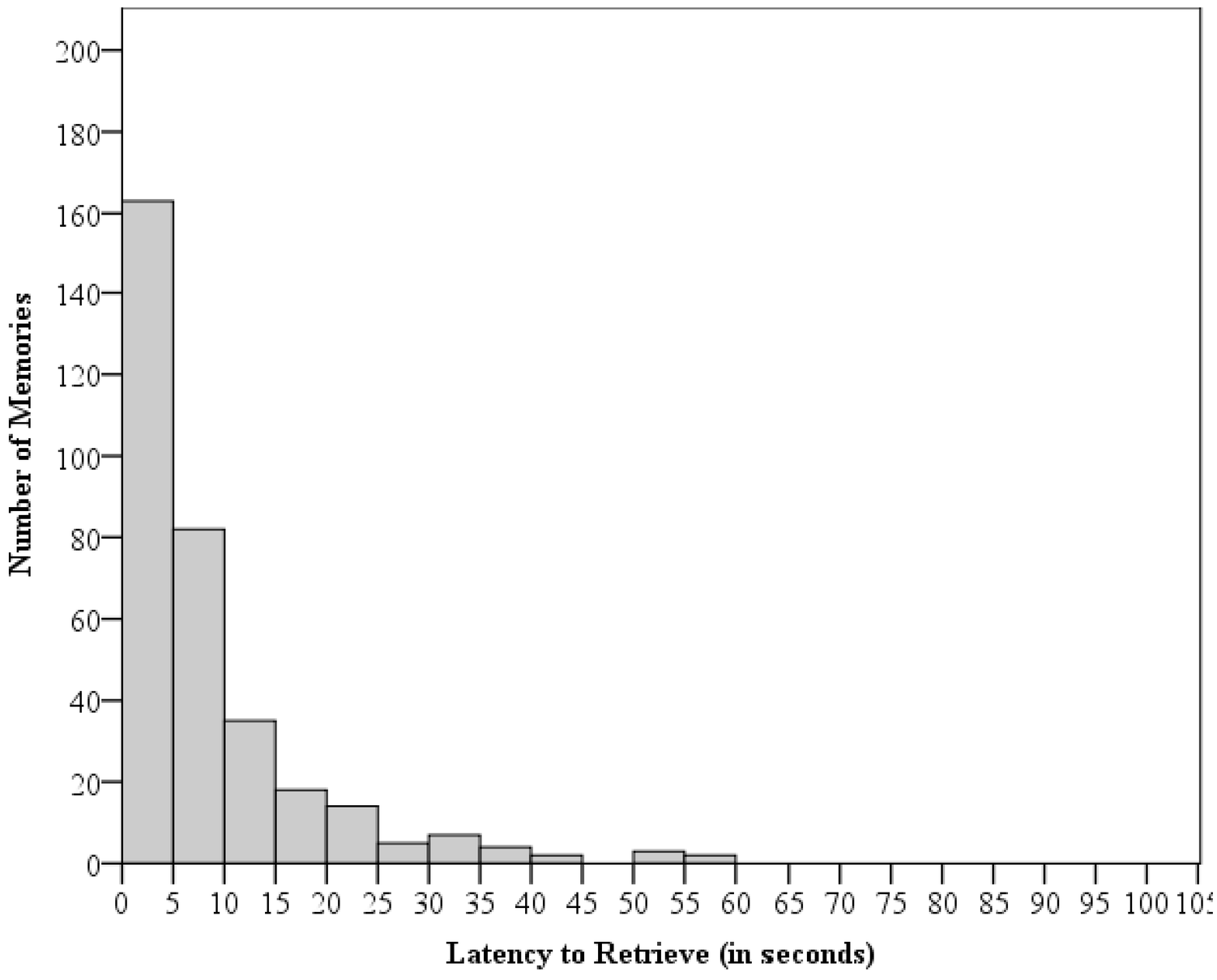


Figure 1. Frequency distribution (with normal curve) showing individual differences in number of directly retrieved memories.

Direct Retrieval



Generative Retrieval

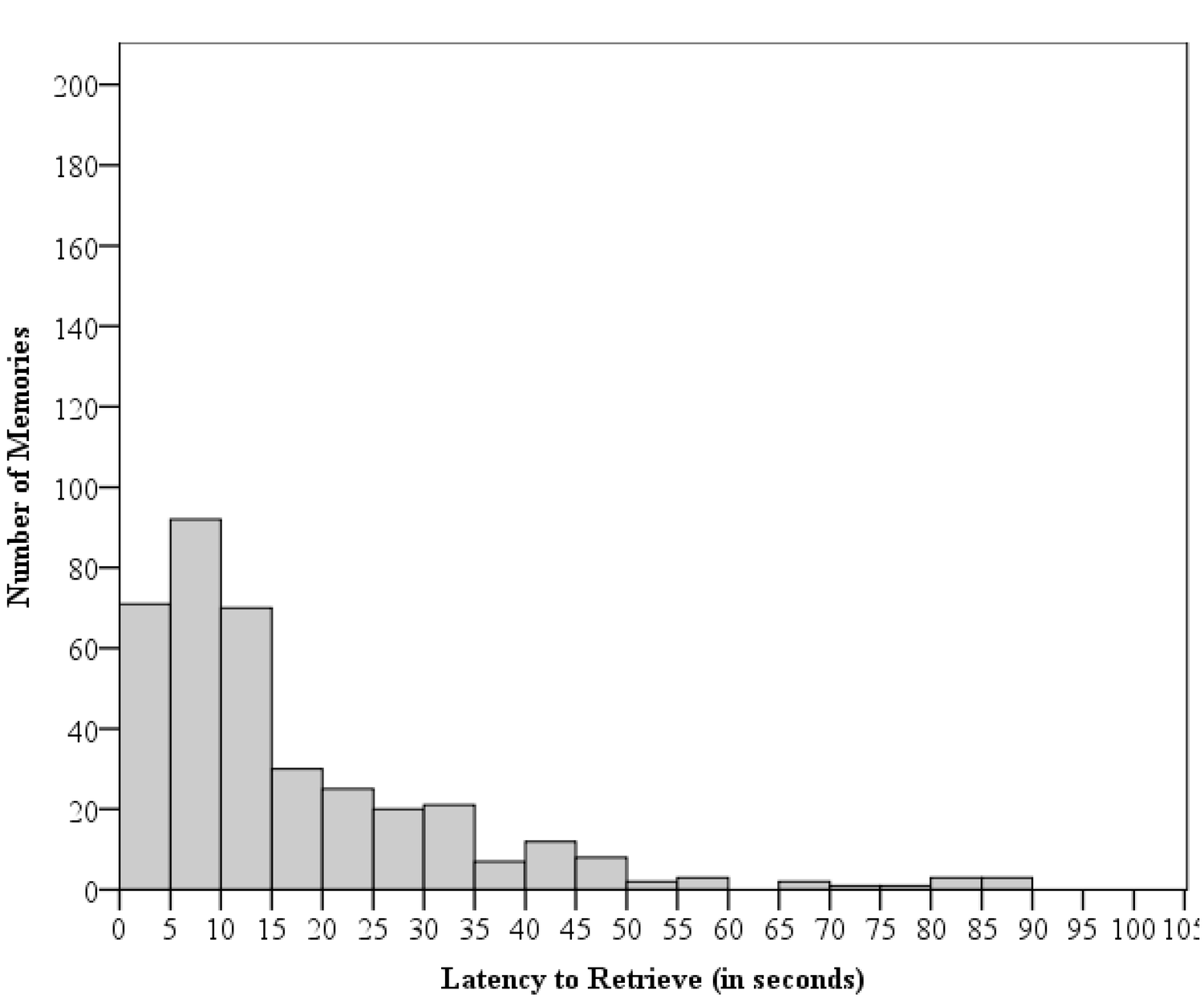


Figure 2. Distribution of retrieval latencies for direct vs. generative retrieval, across elicited memories.

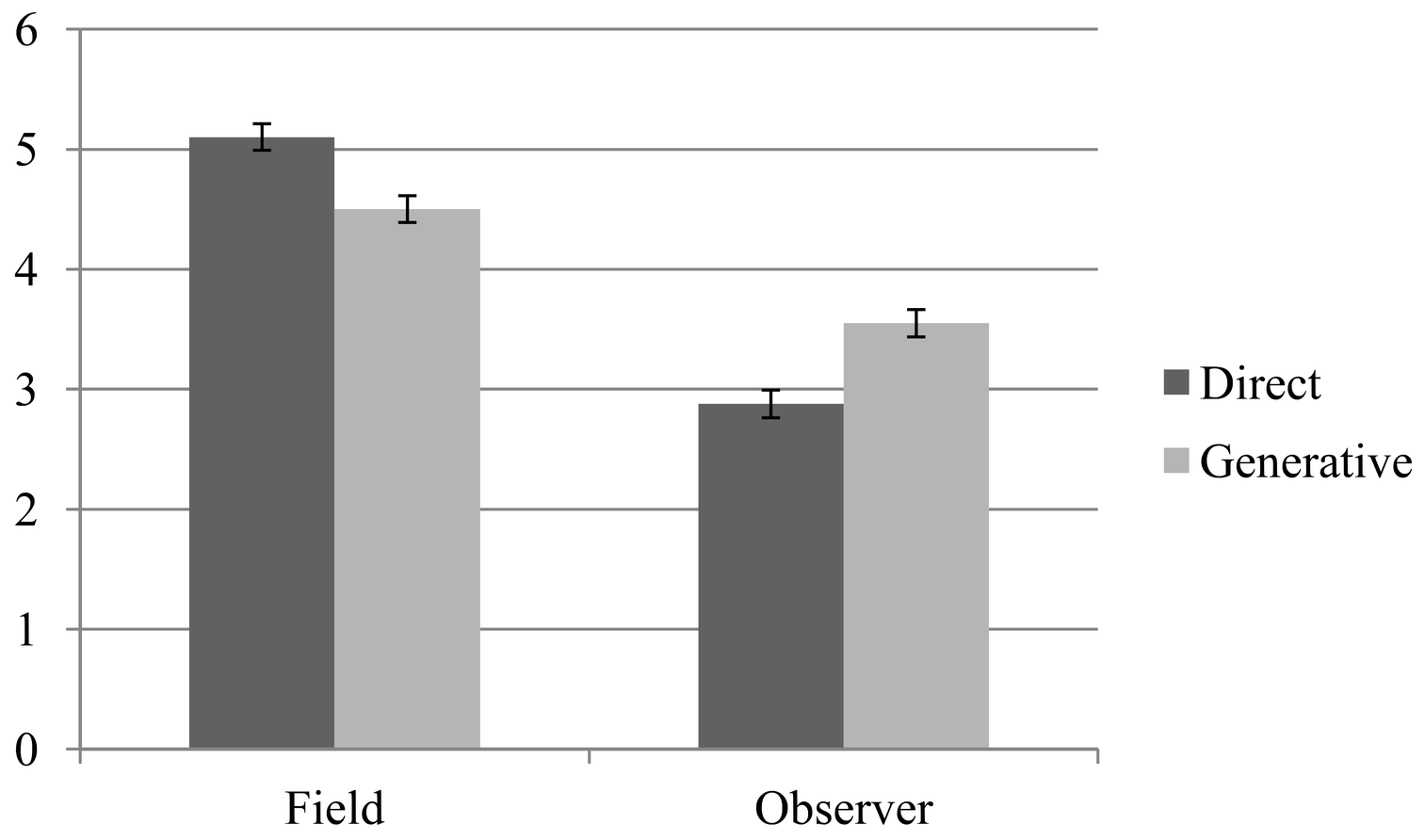


Figure 3. Field and observer perspective ratings across retrieval mode. Values are means, across 706 elicited memories. Error bars are standard error of the mean.

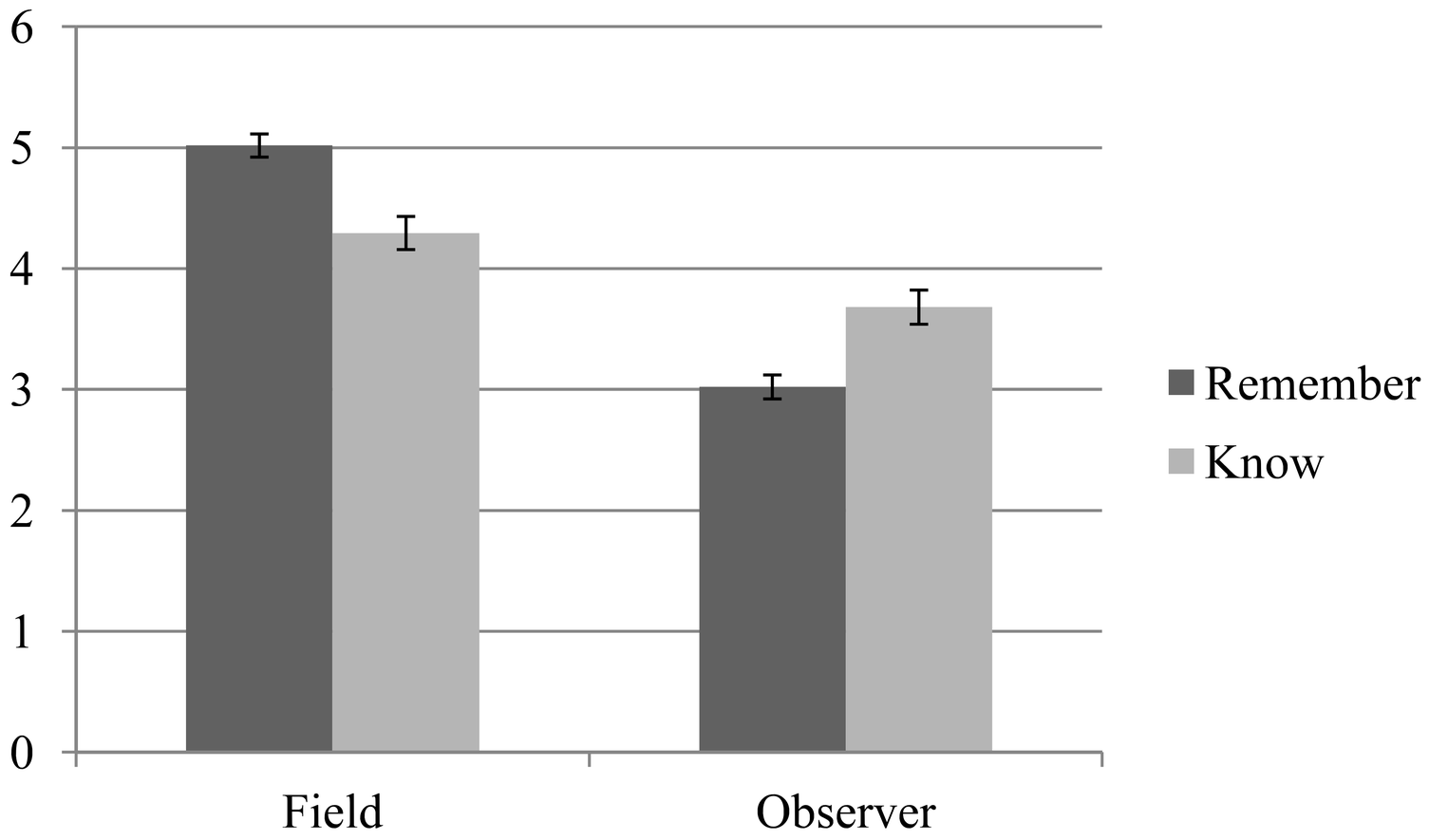


Figure 4. Field and observer perspective ratings across recollective experience. Values are means, across 706 elicited memories. Error bars are standard error of the mean.

Table 1

Statistics for the Multilevel Model Testing the Difference Between Direct and Generatively Retrieved Memories for Field and Observer Perspective Ratings

	Field Perspective	Observer Perspective
Model Estimate	0.44	0.51
Standard Error	0.15	0.16
Model *df*	703.17	702.94
Model *t*	2.88	3.22
Model *p*	.004	.001
95% Confidence Interval of the Difference	0.14-0.75	0.20-0.82

Table 2

Characteristics of Directly vs. Generatively Retrieved Memories

	Direct (n = 335 memories)	Generative (n = 371 memories)
Word Count	40.09 (25.79)	40.55 (27.35)
Age of Event (years)	4.32 (10.24)	5.13 (10.12)
Accuracy (1-7)	5.31 (1.23)	5.11 (1.47)
Clarity (1-7)	5.37 (1.45)	4.96 (1.59)
Rehearsal (1-7)	3.29 (1.68)	2.91 (1.65)
Importance (1-7)	3.72 (1.82)	3.34 (1.79)
Positive Emotion (1-7)	4.12 (2.13)	3.94 (2.11)
Negative Emotion (1-7)	3.04 (2.03)	3.14 (2.03)

Values are means across elicited memories, with standard deviations in parentheses.