



ELSEVIER

Contents lists available at ScienceDirect

Consciousness and Cognition

journal homepage: www.elsevier.com/locate/concog

Indirect cueing elicits distinct types of autobiographical event representations [☆]

Alan Scoboria ^{a,*}, Jennifer M. Talarico ^b^a Department of Psychology, University of Windsor, 401 Sunset, Windsor, ON N9B3P4, Canada^b Department of Psychology, Lafayette College, 350 Hamilton Street, Easton, PA 18042, USA

ARTICLE INFO

Article history:

Received 22 March 2013

Available online xxxx

Keywords:

Memory

Event

Autobiographical belief

Cueing

Nonbelieved memory

ABSTRACT

Studies that distinguish among believed memories, believed-not-remembered events (e.g., family stories), and nonbelieved memories (i.e., memories no longer believed to have occurred) typically rely on experimenter provided or overtly elicited events. These methods may mis-estimate the frequency and nature of such events in everyday memory. Three studies examined whether such events would be elicited via indirect cueing. Participants recalled and rated events on autobiographical belief, recollection, and other characteristics associated with remembering. All three event types resulted, but with a low rate of nonbelieved memories. Believed and nonbelieved memories received similar perceptual and re-experiencing ratings, and both exceeded believed-not-remembered events. Lifespan cueing found nonbelieved memories to be most frequent in middle childhood (ages 6–11). Cueing for “events” vs. “memories” revealed that “memory” cues lead to retrieval of a more homogeneous set of events and differences when predicting autobiographical belief and recollection. These studies support the distinction between autobiographical belief and recollection for autobiographical events.

© 2013 The Authors. Published by Elsevier Inc. All rights reserved.

1. Introduction

Discussions of autobiographical memory frequently emphasize the recollective aspects of remembering. For example, autobiographical memory is frequently studied by asking (or cueing) people to provide ‘memories’. Research has identified features of memories that are consistently elicited in response to such queries. Autobiographical events tend to be labeled as memories when event representations are accompanied by vivid mental simulation (perceptual vividness, spatial–temporal details) and a sense of re-experiencing the past (Addis, Pan, Vu, Laiser, & Schacter, 2009). In other terms, recollection is a metacognitive appraisal that is made at the time of remembering (Johnson, Raye, Mitchell, & Ankudowich, 2011; Rubin, 2006). Because researchers typically ask for memories, it is perhaps not surprising that participants tend to report vivid episodic events.

But recollection is not the only metacognitive appraisal present when remembering the past. A variety of other appraisals are also made of autobiographical events. For example: Does the event have particular significance to one’s life story? How recently or how frequently has this event been recalled? How accurate are the various details within the event in representing the prior experience? One central non-recollective judgment that is typically present when vivid autobiographical memories are recalled is the belief that the event genuinely occurred in the past. This is termed *autobiographical belief* (or *belief in*

[☆] This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial-No Derivative Works License, which permits non-commercial use, distribution, and reproduction in any medium, provided the original author and source are credited.

* Corresponding author. Fax: +1 519 973 7021.

E-mail address: scoboria@uwindsor.ca (A. Scoboria).

occurrence), and is defined as the subjective assignment of truth-value to the proposition that the event occurred to the self (Mazzoni, Scoboria, & Harvey, 2010; Scoboria, Mazzoni, Kirsch, & Relyea, 2004).

In the current studies, we examined the methods that are used to elicit autobiographical event representations, and the conclusions that are made about the types of event representations that result. This topic is timely because recent research has shown that recollection and autobiographical belief are substantially independent. In the laboratory, researchers have reliably produced memories for which autobiographical belief exceeds the degree of recollection for the event (i.e., believed-not-remembered events; Hart & Schooler, 2006; Mazzoni, Loftus, Seitz, & Lynn, 1999; Scoboria, Lynn, Hessen, & Fisco, 2007). Such events also occur frequently outside the laboratory. A parent may describe an event for which their child has little recollection, but which he/she comes to believe occurred. Such memories are not infrequent; for example, when rating childhood events, autobiographical belief ratings exceed recollection ratings in nearly half of cases (Scoboria et al., 2004). Confabulatory delusions in some individuals with schizophrenia can also reflect instances where autobiographical belief is high even when recollection is low (Baddeley, Thornton, Chua, & McKenna, 1995). There are also naturally occurring instances in which vivid recollection exists without belief that the event occurred, which are termed “nonbelieved memories” (Mazzoni et al., 2010). In this case the person has a ‘memory’ for the event – participants rate recollective features as being as strong as their past believed memories. At the same time, they report lacking belief that the event represents a true occurrence from their past.

Recent work has drawn on believed-not-remembered events and nonbelieved memories to document a strong and reliable distinction in simple factor structure of the recollection and autobiographical belief constructs, and demonstrated a double dissociation in the predictors of each (Scoboria et al., *in press*). This work shows that characteristics of the memory image (e.g., perceptual features and the sense of re-experiencing) predict recollection but not autobiographical belief, whereas event plausibility strongly predicts autobiographical belief but weakly predicts recollection. This work shows that by focussing on believed memories in autobiographical memory research, we cannot effectively demonstrate the distinction between autobiographical belief and recollection. This is because both are strongly present for such events, leading to an artificial appearance of high correspondence. Furthermore, with this bias toward specific types of autobiographical event representations, the true population and availability of other distinct types of event representations are likely underestimated.

In order to expand upon the range of event representations examined, some studies have queried specific classes of memories or sought to contrast different types of representations. In addition to the word-cue technique, Galton also devised the “breakfast technique” which asked participants to recall the appearance of that morning’s breakfast table, “directing subjects to particular episodes in their lives” (Brewer, 1986, p. 36). In the false memory literature, researchers typically suggest the same false childhood or false laboratory-based events to participants within studies (Hessen-Kayfitz & Scoboria, 2012; Ost, 2013). Other studies have further demonstrated via this approach that nonbelieved memories can be created in the lab (Clark, Nash, Fincham, & Mazzoni, 2012; Otgaar, Scoboria, & Smeets, 2013). Investigators have also drawn participants’ attention to metacognitive judgments about events and/or the phenomenological properties of the memories compared to non-memorial representations. Johnson, Foley, Suengas, and Raye (1988) asked participants to contrast believed autobiographical memories with newly imagined events (see also Arbutnott, Geelen, & Kealy, 2002; Kealy, Kuiper, & Klein, 2006). Crawley and Eacott (2006) asked individuals to retrieve and rate personal memories in contrast to recall of events that occurred to other people. Specific to the distinction between autobiographical belief and recollection, Mazzoni et al. (2010) used an event contrast approach when asking their participants to select and rate age-matched nonbelieved memories, believed memories, and believed-not-remembered events.

There are potential problems associated with directly asking participants to recall events with specific mnemonic characteristics or metacognitive features. Doing so draws attention to properties that may otherwise not be salient to participants when remembering events. The event comparison approach assumes independence of the categories, but awareness of the categories of interest may bias individuals to compare the events when making ratings, whereas ratings may have varied to a different degree if events were elicited in isolation and if participants were not aware of the features in which the researcher is interested. Most troubling, directly querying categories may produce experimental demands to produce particular types of event descriptions, even if representations of the type(s) requested do not occur outside of the laboratory. The false memory approach, and by extension the studies of nonbelieved memories that build upon it, also have the potential limitations that the events used are selected by researchers, are therefore likely less personally significant than genuine events, and the event representations are recently constructed.

What such studies cannot achieve is an understanding of the nature and frequency of nonbelieved memories and believed-not-remembered events as they exist in everyday autobiographical memory. What is needed is a method which encourages the reporting of different types of autobiographical event representations, but without asking for the categories directly (thereby avoiding biases in event selection). Such an approach should sample various types of representations and examine autobiographical events that are personally relevant.

One goal of the current research was to develop methods to indirectly cue events by which greater variability in autobiographical belief and recollection ratings could emerge. Without artificially drawing participants’ attention to these constructs, we hoped to elicit believed memories, believed-not-remembered events, and nonbelieved memories. Furthermore, should such events be elicited, we planned to examine the phenomenology associated with each, the relationship between belief in occurrence and recollection for each, and how cueing techniques influence this relationship. We

anticipated that if belief in occurrence and recollection are distinct components of remembering, then the results derived from indirect cueing should coincide with previous findings.

Across three studies, we cued participants to recall multiple events from their personal past. After this event generation phase, participants rated these events in random order on autobiographical belief, recollection, and related event characteristics. This permitted exploration of the information people use to make autobiographical belief and recollection judgments. In the process, we evaluated the implications of a ‘believed memory bias’ when cueing for “memories.”

The first study cued multiple childhood events and sought to elicit these distinct types of event representations. We defined and contrasted nonbelieved memories, believed memories, and believed-not-remembered events, anticipating that nonbelieved memories and believed memories would show similar perceptual, spatial, re-experiencing ratings, and both would exceed ratings for believed-not-remembered events, consistent with [Mazzoni et al. \(2010\)](#) and [Clark et al. \(2012\)](#). We also anticipated that the nonbelieved memories would be dissimilar to believed memories, such as being more susceptible to persuasion by other people that the event did not occur.

To situate the current research for readers who are familiar with other uses of the term ‘belief’ in the autobiographical memory literature, we also note an important distinction between the concept of ‘autobiographical belief’ (studied here) and that of ‘belief in recollection’ (not studied here). Autobiographical belief is the judgment that an event genuinely occurred in the past. An example of an item is, “How likely is it that you personally did in fact experience this event?” ‘Belief in recollection’ is the construct emphasized by [Rubin \(2006\)](#), and is the judgment that what is remembered accurately reflects past occurrence. An example of an item is, “I believe the event really occurred in the way I’m thinking about it and that I have not imagined or fabricated anything that did not occur.” See the discussion below and [Scoboria et al. \(in press\)](#) for more on this issue.

2. Study 1: Cueing multiple childhood events

2.1. Method

In order to maximize our chances of eliciting nonbelieved memories and believed-not-remembered events in addition to believed memories, we asked all participants to recall events from before the age of 6 years old. Naïve beliefs about childhood memory ([Magnussen et al., 2006](#)) as well as empirical data about the shift from known to remembered events ([Bruce, Dolan, & Phillips-Grant, 2000](#)) suggested that believed-not-remembered events might be more prevalent from this age range. Prior work also shows a roughly equal split between believed memories and believed-not-remembered events in this age range ([Scoboria et al., 2004](#)).

2.1.1. Participants

A total of 171 undergraduate students from both Lafayette College and the University of Windsor¹ participated for partial course credit (80.1% female; $M_{\text{age}} = 21.30$, $SD = 4.32$, range 18–47). All procedures for this and all subsequent studies described were reviewed by the Institutional Review Board at Lafayette College and the Research Ethics Board at the University of Windsor.

2.1.2. Procedure

The 30-min study took place in a computer lab with up to 10 individuals per session, using Direct RT v2008 software ([Jarvis, 2008](#)). Participants were cued to recall five events from age 6 or younger; the exact language of the instruction is provided in [Appendix A](#). Participants provided demographic information. They were next asked to recall the first event that came to mind from before age six, and to provide a brief three to four word description of the event. This prompt to recall an event from “before 1st grade (before ~ age 6)” was repeated to cue a total of five events. Participants were then presented with the brief descriptions that they had previously provided in a random order and rated each in turn on belief in occurrence (two items), recollection (three items), plausibility, and 15 memory characteristic items (see [Appendix B](#) for the exact items).

The belief in occurrence and recollection items were taken from [Scoboria et al. \(in press, Study 1\)](#), who reported high scale reliability and evidence of construct validity. The primary belief and recollection items were rated on 1–8 point scales, and the remaining one belief and two recollection items were rated on 1–7 point scales. The memory characteristic items paralleled items used in preceding work on the characteristics associated with autobiographical remembering ([Johnson et al., 1988](#); [Rubin, Schrauf, & Greenberg, 2003](#)). The items were rated on 7-point scales and included: perceptual detail, spatial detail, two re-experiencing items (reliving, mental time travel), specificity, the degree to which one could be persuaded that an event happened differently than recalled, event significance, two rehearsal items (prior talk and prior thought), and three emotion items (current positive emotions, negative emotions, and emotional intensity). Due to the previously established relationship between plausibility and autobiographical belief, general and personal plausibility items were also included ([Scoboria, Mazzoni, Jarry, & Shapero, 2012](#); [Scoboria et al., in press](#)).

¹ The results for all studies were invariant across the institutions.

Following Scoboria et al. (in press), the two belief in occurrence items were averaged ($\alpha = .82$ in the current study), and the three recollection items were averaged ($\alpha = .89$). Reliving and mental time travel were averaged to create an index of re-experiencing ($\alpha = .90$), and talked and thought were averaged to create an index of rehearsal ($\alpha = .81$). Confidence intervals for descriptive statistics were calculated by bootstrapping 1000 samples with replacement. We note that we examined the order with which the events were elicited, and found no notable patterns.

2.2. Study 1 results

First, we operationalized the event representation categories based on autobiographical belief and recollection scores. Based on Scoboria et al. (in press) who reported that recollection exceeded belief by 1.4 scale points on average for self-identified nonbelieved memories, nonbelieved memories here were defined as any event for which the respondent rated the recollection item one or more points higher than the belief item. Believed-not-remembered events were defined as events for which the respondent rated belief one or more points higher than recollection, and believed memories were defined as instances in which the ratings were equal. However, instances in which both ratings were within one point of the upper end of the scales were coded as believed memories, as both phenomena are strong in this case (i.e., if recollection was rated as 8 and belief as 7, or the reverse). Based on this definition, 3.0% ($n = 26$) of events were classified as nonbelieved memories, 58.6% ($n = 501$) as believed memories, and 38.3% ($n = 328$) as believed-not-remembered events. Descriptive statistics for autobiographical belief and recollection by subtype of representation are provided in Table 1.

The next analyses contrasted the remaining memory characteristic items across these three subtypes (Table 2). The comparisons involved one-way ANOVAs followed by pair-wise comparisons with a conservative p -value of .001 to address alpha inflation and non-independence of observations (per the recommendations by Stevens, 2009). We also report 95% confidence intervals of means and Cohen's d values, and base our interpretation in part on overlap of these intervals (see Cummings, 2011). Nonbelieved and believed memories did not differ, and both exceeded believed-not-remembered events for perceptual details and re-experiencing at the time of rating. The spatial, significance, rehearsal, and emotion intensity items were also in the same direction. Nonbelieved memories were rated as less personally plausible, less specific, and more susceptible to persuasion than believed memories. Believed memories significantly differed from believed-not-remembered events for the majority of the remaining items. The types of representation did not differ on current negative emotion, or general plausibility. The pattern of ratings for any of the items did not vary significantly across the order in which the five events were cued.

2.3. Study 1 discussion

The three subtypes of autobiographical event representations were observed using an indirect cueing procedure. The characteristics associated with recollection were consistent with a sub-set of the phenomenological items reported in Mazzoni et al. (2010) and Clark et al. (2012). Nonbelieved memories and believed memories showed similar ratings for perceptual detail and re-experiencing, which exceeded ratings for believed-not-remembered events. The events classified as nonbelieved memories were also associated with features that indicated some doubt as to the occurrence of the event: lower personal plausibility, lower event specificity, and higher ratings of susceptibility to persuasion that the event occurred differently than recalled.

By focusing on early childhood events, we elicited a large number of believed-not-remembered events. Other studies in which participants rated experimenter-provided events on autobiographical belief and recollection have reported that the frequency with which memory ratings exceeded belief ratings ranges from 1.6% to 5.6% (Scoboria et al., 2004, 2007; Sharman & Scoboria, 2009). We found a rate of 3% for nonbelieved memories, a rate similar to those studies but notably lower than the 20% reported by Mazzoni et al. (2010). Unlike Mazzoni et al. (2010), we did not screen for participants with memories of this

Table 1
Average belief and memory ratings by autobiographical representation classification and study.

		<i>n</i>	Belief		Memory		Difference	
			<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Study 1	Nonbelieved memory	26	4.96	1.18	6.38	1.20	-1.42	0.58
	Believed memory	501	7.69	0.71	7.36	0.87	0.32	0.49
	Believed not remembered event	328	7.77	0.61	4.42	1.57	3.36	1.49
Study 2	Nonbelieved memory	21	4.43	1.66	6.38	1.28	-1.95	1.80
	Believed memory	364	7.70	0.70	7.50	0.73	0.20	0.47
	Believed not remembered event	163	7.52	0.89	4.87	1.40	2.64	1.25
Study 3	Nonbelieved memory	42	4.83	1.29	6.43	0.99	-1.60	0.80
	Believed memory	618	7.71	0.86	7.42	0.88	0.29	0.48
	Believed not remembered event	520	7.53	0.83	4.70	1.44	2.83	1.50

Note: Nonbelieved memories were defined as instances in which respondents chose to rate memory one or more points higher than belief, excepting when memory was at the scale ceiling. Believed-not-remembered events were defined as instances in which respondents chose rate belief higher than memory, excepting when belief was at the scale ceiling.

Table 2
Study 1, memory characteristic ratings by autobiographical event representation.

Item		Non-bel mem n = 21 (a)	Bel mem n = 364 (b)	Bel not rem n = 163 (c)	p < .001	Cohen's d [95% CI]		
						(a) vs. (b)	(b) vs. (c)	(a) vs. (c)
Perceptual detail	M	5.01 [4.28, 5.62]	5.19 [5.06, 5.33]	3.34 [3.19, 3.48]	a, b > c	0.12 [.01, .25]	1.28 [1.18, 1.38]	1.20 [1.05, 1.34]
	SD	1.55	1.49	1.39				
Re-experiencing	M	4.58 [4.03, 5.11]	4.86 [4.72, 5.01]	2.98 [2.82, 3.12]	a, b > c	0.17 [.04, .31]	1.21 [1.10, 1.32]	1.13 [.98, 1.28]
	SD	1.25	1.63	1.43				
Spatial detail	M	5.28 [4.56, 6.00]	6.01 [5.89, 6.12]	4.69 [4.50, 4.87]	b > c	0.56 [.45, .67]	0.89 [.79, .99]	0.34 [.16, .52]
	SD	1.63	1.28	1.74				
Specificity	M	4.92 [4.41, 5.41]	5.78 [5.64, 5.93]	4.92 [4.71, 5.11]	a, c < b	0.55 [.42, .68]	0.51 [.39, .62]	0.00 [−.19, .19]
	SD	1.31	1.58	1.87				
Susceptibility to persuasion	M	4.76 [4.35, 5.18]	3.29 [3.12, 3.45]	4.21 [4.01, 4.39]	a, c > b	0.81 [.66, .97]	0.51 [.39, .64]	0.28 [.07, .48]
	SD	1.09	1.84	1.71				
Significance	M	3.92 [3.29, 4.57]	3.83 [3.65, 4.01]	3.17 [2.98, 3.37]	b > c	0.04 [−.12, .22]	0.35 [.22, .48]	0.44 [.25, .61]
	SD	1.57	2.00	1.75				
Rehearsal	M	3.52 [2.97, 4.14]	3.61 [3.45, 3.75]	3.00 [2.85, 3.16]	b > c	0.06 [−.08, .19]	0.40 [.29, .50]	0.36 [.21, .51]
	SD	1.47	1.60	1.43				
Positive emotion	M	3.48 [2.78, 4.23]	3.63 [3.45, 3.82]	3.42 [3.19, 3.64]		0.07 [−.12, .26]	0.10 [−.05, .24]	0.03 [−.18, .24]
	SD	1.70	2.19	2.07				
Negative emotion	M	2.84 [2.15, 3.68]	2.34 [2.17, 2.51]	2.02 [1.83, 2.23]		0.26 [.10, .43]	0.17 [.05, .30]	0.47 [.29, .65]
	SD	1.95	1.90	1.77				
Emotion intensity	M	3.04 [2.45, 3.62]	2.95 [2.77, 3.12]	2.54 [2.35, 2.73]	b > c	0.05 [−.10, .20]	0.23 [.11, .35]	0.30 [.13, .48]
	SD	1.47	1.83	1.67				
General plausibility	M	5.76 [5.16, 6.43]	5.84 [5.65, 6.03]	6.09 [5.84, 6.32]		0.04 [−.15, .22]	0.11 [−.04, .26]	0.15 [−.08, .38]
	SD	1.54	2.23	2.22				
Personal plausibility	M	5.84 [5.17, 6.50]	7.46 [7.36, 7.54]	7.50 [7.38, 7.61]	a < b, c	1.47 [1.38, 1.57]	0.04 [−.04, .11]	1.50 [1.38, 1.61]
	SD	1.48	1.08	1.08				

Note: Non-bel mem – nonbelieved memory; Bel mem – believed memory; Bel not rem – believed not remembered event. 95% confidence intervals are in brackets.

type and we restricted the age range from which memories could be drawn. Therefore, it may be that although 20% of people have salient nonbelieved memories, their accessibility rate is lower. We wanted to see if we could increase the number of spontaneously-generated nonbelieved memories. Given that [Mazzoni et al. \(2010\)](#) found the greatest number of nonbelieved memories to be reported from middle childhood, we expanded our focus to potentially better sample each subtype of autobiographical episode.

3. Study 2: Events from across the young adult life-span

3.1. Method

3.1.1. Participants

Undergraduate students from Lafayette College and the University of Windsor ($N = 110$, 80.0% female, aged 18+²) participated for partial course credit.

3.1.2. Procedure

The procedure was identical to Study 1, with one exception: rather than cueing early events, participants were cued in a random order to recall one event from five different life periods. The periods were: before age 6, ages 6–11, ages 12–14, ages 15–18, and after age 18. They then rated the events in random order using the same items as in Study 1. Reliability coefficients for belief in occurrence ($\alpha = .76$), recollection ($\alpha = .83$), re-experiencing ($\alpha = .87$), and rehearsal ($\alpha = .84$) were all high.

² Due to a programming error, age was not collected.

3.2. Results

The pattern of episode types across ages differed significantly, $\chi^2(8) = 76.40$, $p < .001$, $\phi_c = .37$ (Fig. 1). Similar to Study 1, nonbelieved memories were a minority (c.f. Table 1). The novel finding in Study 2 was that the proportion of nonbelieved memories was highest in the 6–11 group (6.4%), and lower in the other age groups (3.3%); this difference approached statistical significance, $\chi^2(1) = 3.24$, $p = .072$. As expected from prior work, the proportion of believed-not-remembered events was highest prior to age 6, and decreased across the age ranges. The proportion of believed memories followed the opposite pattern, and was highest in the most recent age range.

The analyses of the memory characteristics and plausibility ratings was conducted in the same manner as in Study 1 (Table 3). Nonbelieved and believed memories did not differ, and both exceeded believed-not-remembered events, for perceptual details and re-experiencing. Spatial detail was also in the same direction. Compared to believed memories, nonbelieved memories were rated significantly lower in personal plausibility and event specificity, and the susceptibility to persuasion item was in the same direction. For the remaining items, believed memories exceeded believed-not-remembered events, while nonbelieved memories did not differ from either, excepting general plausibility which did not differ among episodes.

3.3. Discussion

The rate of nonbelieved memories was highest in the 6–11 range, which is consistent with the age of nonbelieved memories in Mazzoni et al. (2010). However, their rate of 20% continues to stand in contrast with the 6.4% obtained here. Perceptual detail and re-experiencing were once again associated with memories, whether believed or not believed, while personal plausibility and event specificity were associated with lower conviction in nonbelieved memories.

To further explore the implications of the Study 1 findings, we next manipulated the cue instructions. Prior studies have differed in whether participants are asked to recall “events” or “memories.” We questioned whether this matters for the phenomenological and metacognitive characteristics of what is recalled. Cueing “memories” may result in the retrieval of more believed memories with higher recollection ratings, whereas cueing “events” should result in the retrieval of fewer believed memories, lower phenomenal characteristics, and greater variability in ratings. If so, the relationships amongst characteristics should differ in that there should be greater interrelation among items for believed memories (i.e., those generated in response to “memory” cues) than for the other autobiographical episode subtypes (i.e., those generated in response to “event” cues). If these differences are found, it would suggest that cues which emphasize “memory” are biased toward eliciting a homogenous range of autobiographical event representations and are therefore artificially restricting the phenomena in their full complexity.

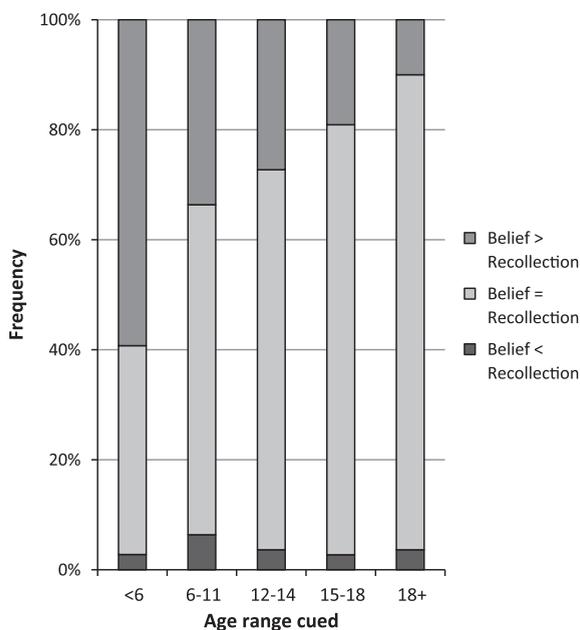


Fig. 1. Study 2, proportion of nonbelieved memories (where recollection ratings exceeded belief ratings), believed memories (where belief and recollection ratings were equal) and believed-not-remembered events (where belief ratings exceeded recollection ratings) generated in response to each age-related cue. See the text for exact method of categorizing autobiographical event representations.

Table 3

Study 2, memory characteristic ratings by autobiographical representation across events.

Item		Non-bel mem n = 21 (a)	Bel mem n = 364 (b)	Bel not rem n = 163 (c)	<i>p</i> < .001	Cohen's <i>d</i> [95% CI]		
						(a) vs. (b)	(b) vs. (c)	(a) vs. (c)
Perceptual detail	<i>M</i>	4.87 [4.20,5.55]	5.37 [5.22,5.53]	3.67 [3.46,3.89]	a, b > c	0.33 [.19,.48]	1.17 [1.04,1.29]	0.83 [.62,1.04]
	<i>SD</i>	1.60	1.48	1.43				
Re-experiencing	<i>M</i>	4.37 [3.71,5.11]	4.87 [4.69,5.06]	3.06 [2.85,3.29]	a, b > c	0.29 [.12,.46]	1.11 [.97,1.25]	0.93 [.73,1.13]
	<i>SD</i>	1.67	1.73	1.38				
Spatial detail	<i>M</i>	5.33 [4.56,6.50]	5.95 [5.81,6.10]	4.56 [4.31,4.80]	b > c	0.46 [.33,.60]	0.98 [.89,1.12]	0.50 [.28,.72]
	<i>SD</i>	1.71	1.32	1.52				
Specificity	<i>M</i>	4.14 [3.30,5.00]	5.35 [5.17,5.54]	4.45 [4.17,4.78]	a, c < b	0.69 [.52,.87]	0.48 [.34,.65]	0.15 [−.14,.44]
	<i>SD</i>	2.01	1.73	2.02				
Susceptibility to persuasion	<i>M</i>	3.67 [2.84,4.42]	2.85 [2.67,3.03]	4.01 [3.76,4.26]	b < c	0.47 [.29,.64]	0.68 [.53,.83]	0.21 [−.02,.44]
	<i>SD</i>	1.83	1.76	1.60				
Significance	<i>M</i>	3.95 [3.09,4.85]	4.63 [4.46,4.82]	3.64 [3.36,3.92]	b > c	0.37 [.20,.56]	0.56 [.40,.71]	0.18 [−.08,.43]
	<i>SD</i>	1.96	1.80	1.75				
Rehearsal	<i>M</i>	3.43 [2.68,4.17]	4.05 [3.87,4.22]	2.81 [2.62,3.03]	b > c	0.36 [.20,.54]	0.78 [.64,.92]	0.45 [.26,.65]
	<i>SD</i>	1.71	1.70	1.33				
Positive emotion	<i>M</i>	2.86 [1.94,3.83]	3.54 [3.31,3.79]	2.82 [2.51,3.13]	b > c	0.30 [.08,.53]	0.33 [.15,.52]	0.02 [−.26,.31]
	<i>SD</i>	2.13	2.24	1.97				
Negative emotion	<i>M</i>	2.29 [1.48,3.15]	2.38 [2.18,2.59]	1.72 [1.50,1.95]	b > c	0.05 [−.15,.24]	0.36 [.21,.52]	0.38 [.17,.60]
	<i>SD</i>	1.98	1.98	1.42				
Emotion intensity	<i>M</i>	2.81 [1.92,3.72]	3.50 [3.30,3.72]	2.55 [2.29,2.81]	b > c	0.34 [.14,.54]	0.49 [.33,.66]	0.15 [−.09,.40]
	<i>SD</i>	2.04	2.04	1.66				
General plausibility	<i>M</i>	5.24 [4.39,6.07]	6.24 [6.05,6.44]	6.12 [5.80,6.44]		0.50 [.30,.70]	0.06 [−.11,.23]	0.44 [.15,.73]
	<i>SD</i>	2.10	1.99	1.99				
Personal plausibility	<i>M</i>	5.57 [4.78,6.38]	7.33 [7.20,7.46]	7.00 [6.72,7.24]	a < b, c	1.35 [1.22,1.48]	0.23 [.12,.36]	0.88 [.64,1.11]
	<i>SD</i>	1.96	1.26	1.59				

Note: Non-bel mem – nonbelieved memory; Bel mem – believed memory; Bel not rem – believed not remembered event. 95% confidence intervals are in brackets.

4. Study 3: Childhood events vs. childhood memories

4.1. Method

4.1.1. Participants

Lafayette College and University of Windsor undergraduate students ($N = 236$) took part for partial course credit (73.3% female, $M_{\text{age}} = 22.03$, $SD = 3.96$, range 18–41).

4.1.2. Procedure

The procedures were identical to Study 1, with the exception that participants were randomized to recall either five “events” ($N = 116$) or five “memories” ($N = 120$). References to “events” in the cueing instructions from Study 1 were replaced with “memory” for approximately half of the participants (c.f., [Appendix A](#)). Reliability coefficients for belief in occurrence ($\alpha = .81$), recollection ($\alpha = .86$), re-experiencing ($\alpha = .87$), and rehearsal ($\alpha = .84$) were all high.

4.2. Study 3 results

4.2.1. Episode types

Using the same criteria to define event subtypes as in Studies 1 and 2, we contrasted rates of nonbelieved memories, believed memories, and believed-not-remembered events between the groups (c.f., [Table 1](#)). As shown in [Fig. 2](#), these distributions were significantly different, $\chi^2(2) = 15.05$, $p = .001$, $\phi_c = .11$. Most relevant, the event cue group produced a significantly greater number of nonbelieved memories (4.4% vs. 2.7%), $\chi^2(1) = 3.92$, $p = .048$. The event cue group also provided more believed-not-remembered events (48.7% vs. 39.3%), and fewer believed memories (46.8% vs. 57.9%).

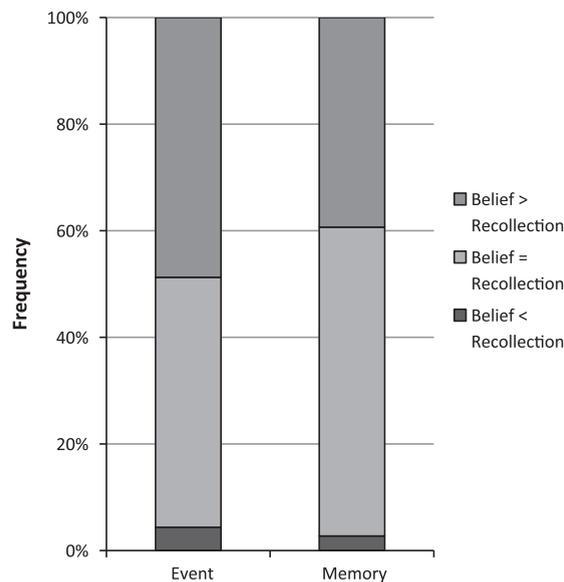


Fig. 2. Study 3, proportion of nonbelieved memories (darkest bars at the bottom), believed memories (lightest bars in the middle) and believed-not-remembered events (bars at the top of each column) generated in response to Event and Memory cues. See the text for exact method of categorizing autobiographical event representations.

Exploration of the metacognitive and phenomenological data indicated that there were no patterns indicative of any cue group by event subtype interactions, thus we collapsed across groups to contrast the subtypes (Table 4) as was done in Studies 1 and 2. We did not use an ANOVA framework in this context, because ANOVA is highly sensitive to large disparities in cell size (Keppel, 1989). Nonbelieved and believed memories did not differ, and exceeded believed-not-remembered events, for perceptual, re-experiencing, negative emotion, and emotion intensity. Nonbelieved memories were rated lower on spatial, specificity, and personal plausibility, and higher on persuasion than believed memories. Believed memories exceeded believed not-remembered events for most items, excepting positive emotion and general plausibility.

4.2.2. Group contrasts

We contrasted average item ratings and standard deviations between the cue groups (Table 5), collapsing across the five events, using independent-samples *t*-tests, and by examining overlap in confidence intervals (Cummings, 2011). The following items had significantly higher mean ratings in the memory-cue group: perceptual detail, re-experiencing, rehearsal, belief in occurrence and recollection. The persuasion item was rated higher in the event-cue than the memory-cue group. The remaining items did not differ by group. The average standard deviation across the belief in occurrence and recollection items was significantly greater for the event-cue group; between subjects $t(234) = 2.51, p = .013, d = 0.30, 95\% \text{ CI } [.11, .54]$ and $t(234) = 2.31, p = .022, d = 0.30, 95\% \text{ CI } [.09, .51]$. The event-cueing procedure resulted in significantly greater variance in belief in occurrence and recollection judgments than did the memory-cueing procedure.

4.2.3. Factor structure and predictors of belief in occurrence and recollection by group

Scoboria et al. (in press) found a stable factor structure for autobiographical belief and recollection across representation types, indicating that the measurement of autobiographical belief and recollection is stable even when the relationships between the constructs differ. They also reported a double dissociation in the predictors of autobiographical belief and recollection (recollection by perceptual, re-experiencing, emotion intensity, significance; autobiographical belief by personal plausibility). The next analyses involved testing whether these patterns depended on the cueing method. We anticipated that the measurement structure would be stable, reflecting reliable measurement of autobiographical belief and recollection across the two groups, but that the predictors would vary with perceptual features more predictive of recollection under the memory cue, and plausibility more predictive of autobiographical belief under the event cue.

We conducted a series of structural equation models using IBM SPSS AMOS 21.0, using the Maximum Likelihood estimation method. In the first model, we tested the invariance of the factors across the event and memory cue groups, using the AMOS 21.0 Multiple Groups procedure. The first model involved loading the items onto their respective factors (two items on the autobiographical belief latent variable, and three items on the recollection latent variable), and the second model added the constraint of equivalence in the loadings across the event and memory cue groups. The unconstrained model was a good fit to the data [CFI = .998; RMSEA = .036(.00 – .08)], and adding the constraint of group equivalence revealed model invariance for loadings of indicators onto latent variables ($\Delta\text{CFI} = -.001$, meeting the criterion recommended by Cheung & Rensvold, 2002). The factor loadings for the items were: Autobiographical Belief: Belief, .72, Belief Strength, .95; Recollection: Memory, .92, Memory Strength, .84, Remember/Know item .71.

Table 4
Study 3, memory characteristic ratings by autobiographical event representation.

Item		Non-bel mem n = 42 (a)	Bel mem n = 618 (b)	Bel not rem n = 520 (c)	p < .001	Cohen's d [95% CI]		
						(a) vs. (b)	(b) vs. (c)	(a) vs. (c)
Perceptual detail	M	4.89 [4.44, 5.33]	5.24 [5.12, 5.36]	3.61 [3.49, 3.73]	a, b > c	0.24 [.12, .35]	1.12 [1.03, 1.21]	0.91 [.79, 1.02]
	SD	1.46	1.49	1.41				
Re-experiencing	M	4.40 [3.95, 4.86]	4.84 [4.72, 4.96]	3.18 [3.06, 3.30]	a, b > c	0.29 [.17, .40]	1.12 [1.03, 1.20]	0.86 [.74, .98]
	SD	1.45	1.54	1.42				
Spatial detail	M	5.24 [4.83, 5.65]	6.02 [5.92, 6.12]	4.93 [4.79, 5.07]	b > a, c	0.60 [.51, .71]	0.75 [.67, .84]	0.19 [.06, .33]
	SD	1.32	1.28	1.63				
Specificity	M	4.69 [4.22, 5.16]	5.41 [5.27, 5.55]	4.61 [4.44, 4.78]	b > a, c	0.41 [.28, .54]	0.42 [.32, .54]	0.04 [−.12, .20]
	SD	1.52	1.77	1.98				
Susceptibility to persuasion	M	4.17 [3.78, 4.56]	3.06 [2.91, 3.20]	4.08 [3.93, 4.22]	b < a, c	0.72 [.50, .77]	0.59 [.48, .69]	0.05 [−.08, .19]
	SD	1.25	1.78	1.70				
Significance	M	3.74 [3.22, 4.26]	3.88 [3.73, 4.03]	3.18 [3.02, 3.34]	b > c	0.07 [−.07, .22]	0.37 [.26, .48]	0.31 [.16, .46]
	SD	1.67	1.91	1.84				
Rehearsal	M	3.67 [3.13, 4.21]	3.84 [3.71, 3.98]	3.09 [2.96, 3.22]	b > c	0.10 [−.03, .23]	0.47 [.38, .56]	0.38 [.25, .51]
	SD	1.73	1.67	1.51				
Positive emotion	M	3.45 [2.78, 4.12]	3.64 [3.46, 3.82]	3.42 [3.23, 3.60]		0.09 [−.08, .25]	0.10 [−.03, .23]	0.02 [−.16, .19]
	SD	2.15	2.23	2.13				
Negative emotion	M	2.62 [2.01, 3.23]	1.99 [1.85, 2.14]	1.66 [1.53, 1.78]	a, b > c	0.34 [.20, .48]	0.21 [.10, .30]	0.65 [.53, .77]
	SD	1.95	1.84	1.43				
Emotion intensity	M	3.24 [2.67, 3.80]	2.75 [2.61, 2.89]	2.19 [2.06, 2.32]	a, b > c	0.27 [.14, .41]	0.34 [.24, .43]	0.68 [.56, .81]
	SD	1.82	1.78	1.51				
General plausibility	M	5.26 [4.69, 5.83]	6.11 [5.95, 6.27]	6.25 [6.09, 6.42]	a < c	0.44 [.27, .58]	0.07 [−.04, .18]	0.53 [.37, .68]
	SD	1.82	2.01	1.90				
Personal plausibility	M	5.76 [5.34, 6.19]	7.36 [7.26, 7.46]	7.21 [7.10, 7.32]	a < b, c	1.21 [1.15, 1.35]	0.11 [.04, .19]	1.10 [1.02, 1.24]
	SD	1.36	1.27	1.28				

Note: Non-bel mem – nonbelieved memory; Bel mem – believed memory; Bel not rem – believed not remembered event. 95% confidence intervals are in brackets.

Table 5
Study 3, memory characteristic ratings by group.

	Event cue		Memory cue		p Value (df = 234)	Cohen's d [95% CI]
	M [95% CI]	SD	M [95% CI]	SD		
Perceptual detail	4.34 [4.17, 4.50]	0.94	4.65 [4.46, 4.83]	1.02	.013	0.32 [.19, .44]
Re-experiencing	3.88 [3.70, 4.06]	1.10	4.31 [4.12, 4.48]	1.15	.003	0.38 [.24, .53]
Spatial detail	5.45 [5.28, 5.16]	0.95	5.58 [5.41, 5.72]	0.85	.261	0.15 [−.03, .26]
Specificity	4.94 [4.73, 5.14]	1.12	5.12 [4.88, 5.34]	1.23	.240	0.15 [−.01, .30]
Susceptibility to persuasion	3.73 [3.53, 3.94]	1.09	3.36 [3.14, 3.58]	1.31	.017	0.31 [.15, .46]
Significance	3.48 [3.28, 3.68]	1.14	3.65 [3.42, 3.86]	1.29	.429	0.14 [−.02, .30]
Rehearsal	3.34 [3.16, 3.52]	0.96	3.66 [3.44, 3.88]	1.20	.028	0.29 [.16, .44]
Positive emotion	4.02 [3.78, 4.25]	1.29	4.03 [3.78, 4.27]	1.32	.934	0.01 [−.17, .16]
Negative emotion	2.54 [2.33, 2.75]	1.12	2.62 [2.41, 2.83]	1.20	.682	0.05 [−.08, .22]
Emotional intensity	3.49 [3.26, 3.72]	1.30	3.47 [3.24, 3.69]	1.28	.799	0.02 [−.14, .18]
General plausibility	6.13 [5.89, 6.36]	1.22	6.17 [5.93, 6.40]	1.26	.863	0.03 [−.13, .19]
Personal plausibility	7.19 [7.02, 7.34]	0.91	7.30 [7.16, 7.45]	0.89	.392	0.12 [.01, .24]
Belief in occurrence	6.92 [6.79, 7.04]	0.68	7.15 [7.07, 7.23]	0.44	.002	0.40 [.33, .48]
Recollection	5.20 [5.05, 5.36]	0.88	5.59 [5.41, 5.72]	0.87	.001	0.44 [.34, .56]

Table 6

Study 3, item loadings for structural equation models predicting the autobiographical belief and recollection factors separately for the memory and event cue groups.

Factor	Predictor	Model 2a event cue			Model 2b memory cue		
		Estimate	95% CI	<i>p</i>	Estimate	95% CI	<i>p</i>
Autobiographical belief	Personal plausibility	0.66	[0.57, 0.73]	.002	0.46	[0.34, 0.59]	.002
	Perceptual	−0.01	[−0.11, 0.10]	.940	−0.07	[−0.24, 0.11]	.514
	Reexperiencing	0.06	[−0.04, 0.16]	.280	0.08	[−0.11, 0.24]	.474
	Spatial	0.18	[0.07, 0.28]	.002	0.17	[0.02, 0.30]	.029
	Specificity	0.10	[0.01, 0.18]	.023	0.13	[0.04, 0.22]	.010
	Persuasion	−0.08	[−0.17, −.01]	.066	−0.06	[−0.18, 0.04]	.214
Recollection	Personal plausibility	0.12	[0.06, 0.18]	.002	0.03	[−0.03, 0.09]	.252
	Perceptual	0.28	[0.18, 0.38]	.002	0.27	[0.18, 0.38]	.002
	Reexperiencing	0.40	[0.30, 0.51]	.002	0.58	[0.48, 0.66]	.002
	Spatial	0.19	[0.12, 0.26]	.002	0.10	[0.02, 0.17]	.015
	Specificity	0.09	[0.02, 0.16]	.012	0.10	[0.04, 0.16]	.003
	Persuasion	−0.14	[−0.21, −0.08]	.002	−0.09	[−0.14, −0.03]	.002

Note: These standardized path coefficients resulted when predicting the two latent factors (autobiographical belief, recollection) simultaneously within the same model. Separate models were conducted for each group (memory cue, event cue) because the initial model indicated that while the factor loadings were invariant, the pathways for the predictors were not.

In the next model we added the predictors (i.e., perceptual, spatial, re-experiencing, specificity, personal plausibility, and susceptibility to persuasion³); all predictors were allowed to correlate. As expected, a test of the unconstrained model against a model in which the path coefficients were constrained to be equal across groups failed to show model invariance ($\Delta\text{CFI} = .017$). This indicates that the relationships between the predictors and the factors varied by group. We ran separate SEM models for each group; the standardized path coefficients are provided in Table 6. The key differences between groups were: (1) while plausibility was strongly associated with autobiographical belief in both models, the relationship was stronger in the ‘event’ group; (2) re-experiencing predicted recollection to a greater extent in the ‘memory’ group; and (3) plausibility predicted recollection only in the ‘event’ group. Consistent across the groups were that perceptual details, re-experiencing, specificity and susceptibility to persuasion (negatively) predicted recollection, whereas personal plausibility and spatial detail predicted autobiographical belief.

We calculated the variance explained in each of the factors by these predictors for each group. In the memory cue group, 69% (90% CI [.60, .79]) of the variance in recollection and 44% (90% CI [.32, .59]) of the variance in autobiographical belief was predicted. In the event cue group, 65% (90% CI [.57, .74]) of the variance in recollection and 68% (90% CI [.58, .79]) of the variance in belief was predicted. Autobiographical belief was not as well predicted in the ‘memory’ group. The greater prediction of autobiographical belief in the ‘event’ group was due to stronger influence of personal plausibility. When recollection was strong, plausibility showed a weaker influence on autobiographical belief. Finally, when the cue emphasized ‘events’ features associated with autobiographical belief showed a weak but significant relationship with recollection.

4.3. Discussion

Study 3 provides evidence for a recollection bias with “memory” cues. We found greater overlap amongst features associated with recollection in events generated in response to “memory” cues. Seemingly small changes in language resulted in differences in the frequency of event representations that resulted. This is consistent with long-standing arguments about the effects of the retrieval environment on memory output (Tulving & Thomson, 1973). ‘Event’ cues produced more nonbelieved memories and believed-not-remembered events compared to ‘memory’ cues, and influenced greater variability in autobiographical belief and recollection ratings. Perceptual detail and re-experiencing uniquely predicted recollection across both groups, and perceptual detail explained more variance in recollection in the ‘memory’ group. Plausibility predicted belief in occurrence in both groups, and was weakly associated with recollection only in the ‘event’ group. Quite simply, one finds different autobiographical experiences depending on how one asks.

5. General discussion

We raised a number of questions in the introduction that the current series of studies have addressed. We found that nonbelieved memories and believed-not-remembered events can be elicited in the absence of deliberate cueing. However, the number of nonbelieved memories produced was not large. This strikes us as not particularly surprising, as believed autobiographical representations form a preponderance of self-relevant event representations. The 20% nonbelieved memory rate reported by Mazzoni et al. (2010) is notably higher than the 3%–6.4% rates observed here. This difference in accessibility may be due to a bias toward reporting believed events under typical testing conditions. Participants may assume that

³ Preliminary analyses revealed that the remaining items (emotion items, rehearsal items, and the significance item) did not predict either factor, and these were excluded from the final models.

researchers are interested in events that are believed to have occurred when participating in a memory study. It is also possible that once the truth status for a believed memory is reduced, that the event becomes less accessible, all other event characteristics being equal. One test would be to cue individuals who are known to have nonbelieved memories, and see if such events emerge when indirectly assessed.

While memory representations are frequently updated (reconstructed) due to the acquisition of new information, salient nonbelieved memories occur when new information is sufficiently discrepant with a memory to produce cognitive dissonance, and additional processing is required to make a decision about the belief status of the memory (Scoboria et al., *in press*). The nonbelieved memories studied to date are those for which the challenging of the memory representation is remembered along with the prior memory representation. Presumably many reattributions of memories as non-memories are less important and occur heuristically, without awareness that the status of the event has changed (see, Johnson, Hashtroudi, & Lindsay, 1993, for a discussion of heuristic vs. systematic processing). Hence, it is not surprising that nonbelieved memories do not manifest readily when cued, and new experimental procedures will be needed to access such processes indirectly. We look forward to work that identifies what we assume to be a distinct type of nonbelieved memories, those which are forgotten relatively soon after autobiographical belief is withdrawn.

Nonbelieved memories were defined in this study as any instance in which respondents chose to rate recollection higher than belief by one point or more, provided that both ratings were also not highly rated on each scale. For the majority of nonbelieved memories, the difference was near one point on the scale. These studies show that a one point difference does matter – when people choose to rate recollection higher than autobiographical belief, they are doing so based on distinct phenomenology. This observation is supported by data from Scoboria et al. (*in press*, Study 2) who directly asked for salient nonbelieved memories and found that recollection exceeded belief by 1.4 points on average. Perhaps it is the decision to rate recollection higher than belief at all that matters. Future research might develop indirect cueing methods which can oversample instances in which belief is rated lower than recollection and for which recollection ratings more substantially exceed autobiographical belief ratings, in order to address such questions. Furthermore, we draw attention to the fact that autobiographical belief for the nonbelieved memories is moderate, particularly when contrasted to the believed-not-remembered category. This finding is consistent with Scoboria et al. (*in press*), and suggests that nonbelieved memories are characterized by autobiographical belief that is substantially attenuated, but not completely undermined.

These studies indicate that the distribution of the types of representation varies depending on the age of the event and on how events are cued. More believed-not-remembered events are generated when cues are directed at younger ages. This is consistent with prior evidence from the developmental psychology literature on infantile amnesia which shows a transition from “knowing” that events occurred to “remembering” events at around 4½ years of age (Bruce et al., 2000). This may reflect the emergence of recollective autobiographical event representations. Prior to this age, knowledge about autobiographical events is due to presumed reliance on secondary sources for autobiographical event knowledge (e.g., family stories, photographs and videos, etc.). Nonbelieved memories were more likely to occur when cueing in age ranges between 6 and 11 years old. Mazzoni et al. (2010) reported that their participants' nonbelieved memories were, on average, from middle childhood, and the average age when that belief was challenged and withdrawn was early adolescence. Based on this finding, future studies should explicitly cue this age range. Future work that examines the dating of nonbelieved memories by individuals of varying age would be useful for confirming whether nonbelieved memories are reliably associated with middle childhood to early adolescence or if the relationship between belief and recollection (and predictors of each) are the same during these developmental time points as during adulthood.

Key aspects of the phenomenological and metacognitive ratings associated with the nonbelieved memories matched those reported by Mazzoni et al. (2010). Perceptual detail and re-experiencing were consistently associated with events theoretically high in recollective quality (believed and nonbelieved memories). Convergent findings have been reported in studies of experimentally created nonbelieved memories (Clark et al., 2012; Otgaar et al., 2013). This is in alignment with the body of work that has associated perceptual imagery and re-experiencing with autobiographical remembering (Brewer, 1996; Johnson et al., 1993; Rubin et al., 2003; Tulving, 1983). This and other work on nonbelieved memories shows that this association holds even in the absence of autobiographical belief. Other items (spatial/contextual detail and emotional intensity) associated with both believed and nonbelieved memories in Mazzoni et al. (2010) were not reliably associated with the nonbelieved memories elicited in these studies. This suggests that the approach used to elicit events matters for some features associated with remembering but not for others.

Other variables differentiated believed from nonbelieved memories. Nonbelieved memories were consistently rated as less personally plausible and more susceptible to persuasion. Personal plausibility is a rating that an event *could* have occurred, and reflects the assessment of the ontological status of the event (“could this event have existed in my past?”). Hence the current nonbelieved memories reflect cases in which recollection is strong but the reality status of the event is undermined. It is not clear in this work if the association of nonbelieved memories with persuasion is due to innate characteristics of the mental representation, or if these events have been subject to challenge via social feedback. Social feedback is the most frequently reported reason for relinquishing belief in one's memory (Mazzoni et al., 2010), and more generally, people frequently report seeking input from others when verifying events (Wade & Garry, 2005).

Belief in the occurrence of autobiographical events is a default state with regard to one's own memories (Conway, 1997; Gilbert, 1991) and is often based on the coherence of the overall memory and the amount of perceptual detail (Ross, Buehler, & Karr, 1998). Individuals who report reduced confidence in the accuracy of memory for events cite (in order of frequency) lack of social verification, lack of visual detail, and implausibility as reasons why they experienced uncertainty (Arbuthnott,

Kealy, & Ylioja, 2008). Plausibility appears to be increasingly related to autobiographical belief as the strength of recollective qualities decreases (see Scoboria et al., 2012, for more on plausibility). One explanation for this is that autobiographical belief is likely inferred when recollection is strong (Scoboria et al., 2004).

The third study demonstrated that cueing for “events” leads to different conclusions about autobiographical belief and recollection compared to cueing for “memories”. Cueing for memories resulted in ratings that approached the scale ceiling and which showed less variability perhaps due to ceiling effects. Cueing for ‘memories’ therefore makes observing the distinction between these constructs more difficult. This leads to the conclusion that cueing for memories results in a narrower, more homogenous set of representations, while cueing for events obtains a broader, more heterogeneous sample of autobiographical representations. Which approach is used should depend on the research questions. If focusing on distinguishing between autobiographical belief and recollection, the ‘event’ cue is more appropriate as it facilitates greater variability in ratings. These findings are consistent with the more general argument that how one asks for events, and who does the asking, informs the reports received (Hyman, 1994). The method used to elicit events has implications for the conclusions that one makes about the nature and components of remembering. It is also unclear how these characteristics may differ among specific event memories (e.g., attending Sally’s 21st birthday party), general memories that merge many instances of the same nature (e.g., going to parades), and memories of extended periods (e.g., spending a semester abroad). Our instructions emphasized the recall of specific events. The paucity of information provided by participants in response to each prompt in the current design (i.e., 3–4 word descriptions) prevents a detailed analysis of how well participants followed that instruction. Future research is needed to examine more precisely the role of autobiographical belief and recollection among these types of autobiographical representations.

Some researchers may wonder how the autobiographical recollection/autobiographical belief distinction might relate to the so-called remember/know distinction. While the ideas of ‘recollection’ and ‘remember’ are substantially similar, ‘autobiographical belief’ and ‘know’ are not the same. The remember/know distinction was proposed by Tulving (1983) to reflect that some memory reports are based in episodic awareness whereas other reports are not. There is considerable debate as to the nature of the distinction, a review of which is beyond the scope of this paper. The debate has spanned issues as to whether the remember and know states are distinct or overlapping (Gardiner, 2001), and whether the processes involved in basic memory studies with word lists are the same as those that are involved in the evaluation of autobiographical memories (Fitzgerald & Broadbridge, 2012; Wilkinson & Hyman, 1998).

Our position is that most conceptualizations of ‘remember’ and ‘know’ describe processes that could each contribute to autobiographical belief judgments as defined here. Autobiographical belief is the judgment that an event truly occurred. It is an overarching, summative appraisal that is based on all information available at the time the judgment is made. Autobiographical belief is not the absence of recollection; autobiographical belief judgments are made in the presence of strong, moderate, weak, or no recollection. While recollection is a powerful influence when present, autobiographical belief may be based partly or wholly on other sources of information and processes. Examples of other influences include, but are not limited to, social influence (e.g., pressure to remember or to forget); the plausibility of events (e.g., available evidence to support/refute the possibility of occurrence); and cognitive experience while ‘remembering’ (e.g., attribution of processing fluency as indicating memory).

The remember/know (R/K) task frequently used in studies of memory should also not be confused with the measurement of autobiographical belief or recollection. In studies that use the R/K procedure, when individuals indicate that an item was presented before, they are asked to judge whether they remember the item, or know that it was presented without remembering. Translating this to the current work, the autobiographical belief rating is the initial decision that the item was presented (see Scoboria et al., *in press*, for further discussion), and not some subsequent judgment made to report the origin(s) of the judgment. This research and Scoboria et al. (*in press*) indicate that in the context of recalling autobiographical events, self-report items that query remembering vs. knowing are excellent indicators of recollection.

Our point in discussing remember/know in this paper is to emphasize that our approach is substantially distinct. Some readers might assume that the distinction between autobiographical belief and recollection parallels the R/K distinction, which is not the case. We take no position here on the relevance of remember/know judgments as implemented in single item (e.g., word list) studies within the domain of autobiographical memory. We refer the reader to McCabe, Geraci, Bowman, Sensenig, and Rhodes (2011) and Fitzgerald and Broadbridge (2012) for further discussion of the use of R/K judgments in autobiographical memory.

Finally, we observe that the current work is consistent with Brewer’s (1996) definition of autobiographical remembering as comprised of multiple metamemorial components. Of specific interest, he mentions: (1) a memory image (recollection); (2) belief that the event occurred in the past (autobiographical belief); and (3) confidence that the details recalled accurately represent what occurred (termed ‘belief in recollection’ in Scoboria et al., *in press*). The current studies emphasize the first and second components, and do not at all address the third. The Basic Systems Model (Rubin, 2006) emphasizes the first and third components, and several studies point to the potential validity of that distinction (Fitzgerald & Broadbridge, 2012; Rubin et al., 2003). Future research is needed that simultaneously examines the relatedness of all three components.

In summary, these studies show a more complete picture of autobiographical remembering than is typically examined. Just as the study of autobiographical memory has enriched our understanding of basic memory, so too does the careful examination of how memories are brought to mind and what the component processes are when recalling the past. We cannot afford to take one exemplar of memory and mistake it for all memories. We look forward to future research in which further study of less typically studied autobiographical event representations leads to novel understanding of the components and functions of remembering personally-experienced past events.

Acknowledgment

This work was supported by a Natural Science and Engineering Research Council of Canada Discovery Grant to the first author.

Appendix A

Event cue instructions (All studies)

Next you will be asked to think of a number of EVENTS from your childhood, from before the age of 6. By “Event” we mean any story or scene that occurred at a particular time and in a specific place. Events usually last for minutes or hours and no more than a single day.

A box will appear where you must type a 2–3 word description of this event, which need be intelligible only to you, that is specific enough to remind you of that unique event at a later time. All of the events should be different. Please do not record any proper names (for people or places) or other information that would let us know who you are – use an initial if necessary.

We would like you to record the first event that comes to mind for each prompt. The event may or may not have been significant to you.

You also may or may not have thought much about the event since it happened, it does not matter. You may or may not have discussed the event with other people. For example, an event might be a family story that involves you.

We are interested in any and all personally-experienced events.

Please select a different event for each prompt.

Memory cue instructions (Study 3)

Next you will be asked to think of a number of MEMORIES from before the age of 6. By “memory” we mean any story or scene you remember from your personal past that occurred at a particular time and in a specific place.

A box will appear where you must type a 2–3 word description of this memory, which need be intelligible only to you, that is specific enough to remind you of that unique memory at a later time. All of the memories should be different. Please do not record any proper names (for people or places) or other information that would let us know who you are – use an initial if necessary.

We would like you to record the first memory that comes to mind for each prompt. The memory may or may not have been significant to you.

You also may or may not have thought much about the memory since it happened, it does not matter. You may or may not have discussed the memory with other people. For example, a memory might be of a one-time-only event you haven't remembered since it happened.

We are interested in any and all personally-experienced memories.

Please select a different event for each prompt.

Appendix B

Belief in Occurrence items

1. How likely is it that you personally did in fact experience this event?
1 Definitely did not happen; 8 Definitely happened
2. How strong is your belief that this event actually occurred (whether or not you remember the event)?
1 No belief, 3 Weak belief, 5 Moderate belief, 7 Strong belief

Recollection items

3. Do you actually remember experiencing this event?
1 No memory of event at all, 8 Clear and complete memory of event
4. How strong is your memory for this event (whether or not you believe the event occurred)?
1 No memory, 3 Weak memory, 5 Moderate memory, 7 Strong memory
5. Sometimes people know something happened to them without being able to actually remember it. As I think about the event, I can actually remember it rather than just knowing that it happened.
1 Not at all, 3 Vaguely, 5 Distinctly, 7 As much as any memory

Predictors

Perceptual detail

6. As I think about the event, I can see, hear, or otherwise perceive in my mind what happened.
1 Not at all, 3 Vaguely, 5 Distinctly, 7 As clearly as if it were happening now

Re-experiencing

7. While thinking about this event, I feel as though I am reliving it.

(continued on next page)

- 1 Not at all, 3 Vaguely, 5 Distinctly, 7 As clearly as if it were happening now
8. While thinking about this event, I feel that I travel back to the time when it happened.
1 Not at all, 3 Vaguely, 5 Distinctly, 7 Completely
- Spatial detail*
9. While thinking about this event, I know the setting where it occurred
1 Not at all, 3 Vaguely, 5 Distinctly, 7 As clearly as if it were happening now
- Specificity*
10. This event is based on details specific to my life, not on general knowledge that I would expect most people to have
1 Not at all, 3 In some details, 5 In some main points, 7 Completely
- Susceptibility to persuasion*
11. If another witness to the event, who you generally trusted, existed and told you a very different account of the event, to what extent could you be persuaded that your version of the event was wrong?
1 Not at all, 3 In some details, 5 In some main points, 7 Completely
- Significance*
12. This event is significant to my life because it imparts an important message for me or represents an anchor, critical juncture, or turning point.
1 Not at all, 3 Vaguely, 5 Distinctly, 7 More than any other event
- Rehearsal items*
13. Since it happened, I have thought about this event.
1 Not at all, 3 Vaguely, 5 Distinctly, 7 More than any other event
14. Since it happened, I have talked about this event.
1 Not at all, 3 Vaguely, 5 Distinctly, 7 More than any other event
- Emotion items*
15. While thinking about this event, the emotions that I feel are
1 Neutral, 3 Somewhat pleasant, 5 Pleasant, 7 Extremely pleasant
16. While thinking about this event, the emotions that I feel are
1 Neutral, 3 Somewhat unpleasant, 5 Unpleasant, 7 Extremely unpleasant
17. While thinking about this event, the emotions that I feel are intense.
1 Not at all, 3 Hardly, 5 Somewhat, 7 Extremely intense
- General plausibility*
18. How plausible is it that at least some people could have experienced this event?
1 Not at all plausible; 8 Extremely plausible
- Personal plausibility*
19. How plausible is it that you personally could have experienced this event?
1 Not at all plausible; 8 Extremely plausible

References

- Addis, D. R., Pan, L., Vu, M. A., Laiser, N., & Schacter, D. L. (2009). Constructive episodic simulation of the future and the past: Distinct subsystems of a core brain network mediate imagining and remembering. *Neuropsychologia*, 47, 2222–2238. <http://dx.doi.org/10.1016/j.neuropsychologia.2008.10.026>.
- Arbuthnott, K. D., Geelen, C. B., & Kealy, K. L. K. (2002). Phenomenal characteristics of guided imagery, natural imagery, and autobiographical memories. *Memory & Cognition*, 30, 519–528. <http://dx.doi.org/10.3758/BF03194953>.
- Arbuthnott, K. D., Kealy, K. L. K., & Ylloja, S. (2008). Judgement of confidence in childhood memories. *Applied Cognitive Psychology*, 22, 953–978. <http://dx.doi.org/10.1002/acp.1404>.
- Baddeley, A., Thornton, A., Chua, S. E., & McKenna, P. (1995). Schizophrenic delusions and the construction of autobiographical memory. In D. C. Rubin (Ed.), *Remembering our past: Studies in autobiographical memory* (pp. 384–428). New York: Cambridge University Press.
- Brewer, W. F. (1986). What is autobiographical memory? In D. C. Rubin (Ed.), *Autobiographical memory* (pp. 25–49). New York: Cambridge University Press.
- Brewer, W. F. (1996). What is recollective memory? In D. C. Rubin (Ed.), *Remembering our past: Studies in autobiographical memory* (pp. 19–66). New York: Cambridge University Press.
- Bruce, D., Dolan, A., & Phillips-Grant, K. (2000). On the transition from childhood amnesia to the recall of personal memories. *Psychological Science*, 11, 360–364. <http://dx.doi.org/10.1111/1467-9280.00271>.
- Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, 9, 233–255. http://dx.doi.org/10.1207/S15328007SEM0902_5.
- Clark, A., Nash, R. A., Fincham, G., & Mazzoni, G. (2012). Creating non-believed memories for recent autobiographical events. *PLoS ONE*, 7, e32998. <http://dx.doi.org/10.1371/journal.pone.0032998>.
- Conway, M. (1997). Past and present: Recovered memories and false memories. In M. Conway (Ed.), *Recovered memories and false memories* (pp. 150–191). New York: Oxford University Press.
- Crawley, R. A., & Eacott, M. J. (2006). Memories of early childhood: Qualities of the experience of recollection. *Memory & Cognition*, 34, 287–294. <http://dx.doi.org/10.3758/BF03193407>.
- Cummings, G. (2011). *Understanding the new statistics*. New York: Routledge.
- Fitzgerald, J. M., & Broadbridge, C. L. (2012). Latent constructs of the Autobiographical Memory Questionnaire: A recollection-belief model of autobiographical experience. *Memory*, 21, 230–248. <http://dx.doi.org/10.1080/09658211.2012.725736>.
- Gardiner, J. M. (2001). Episodic memory and autoeitic consciousness: A first-person approach. *Philosophical Transactions of the Royal Society B*, 356, 1351–1361.
- Gilbert, D. T. (1991). How mental systems believe. *American Psychologist*, 46, 107–119. <http://dx.doi.org/10.1037/0003-066X.46.2.107>.

- Hart, R. E., & Schooler, J. W. (2006). Increasing belief in the experience of an invasive procedure that never happened: The role of plausibility and schematicity. *Applied Cognitive Psychology*, 20, 661–669. <http://dx.doi.org/10.1002/acp.1218>.
- Hessen-Kayfitz, J., & Scoboria, A. (2012). False memory is in the details: Photographic details differentially predict memory formation. *Applied Cognitive Psychology*, 26, 333–341. <http://dx.doi.org/10.1002/acp.1839>.
- Hyman, I. E. (1994). Conversational remembering: Story recall with a peer versus for an experimenter. *Applied Cognitive Psychology*, 8, 49–66. <http://dx.doi.org/10.1002/acp.2350080106>.
- Jarvis, B. G. (2008). *DirectRT (Version 2008) (Computer Software)*. New York, NY: Empirisoft Corporation.
- Johnson, M. K., Foley, M. A., Suengas, A. G., & Raye, C. L. (1988). Phenomenal characteristics of memories for perceived and imagined autobiographical events. *Journal of Experimental Psychology: General*, 117, 371–376. <http://dx.doi.org/10.1037/0096-3445.117.4.371>.
- Johnson, M. K., Hashtroudi, S., & Lindsay, D. S. (1993). Source monitoring. *Psychological Bulletin*, 114, 3–28. <http://dx.doi.org/10.1037/0033-2909.114.1.3>.
- Johnson, M. K., Raye, C. L., Mitchell, K. J., & Ankdowich, E. (2011). The cognitive neuroscience of true and false memories. In R. F. Belli (Ed.), *True and false recovered memories: Toward a reconciliation of the debate. Nebraska symposium on motivation* (Vol. 58, pp. 15–52). New York: Springer. http://dx.doi.org/10.1007/978-1-4614-1195-6_2.
- Kealy, K. L. K., Kuiper, N. A., & Klein, D. N. (2006). Characteristics associated with real and made-up events: The effects of event valence, event elaboration, and individual differences. *Canadian Journal of Behavioural Science*, 38, 158–175. <http://dx.doi.org/10.1037/cjbs2006005>.
- Keppel, G. (1989). *Data analysis for research designs*. New York: Worth.
- Magnussen, S., Andersson, J., Cornoldi, C., De Beni, R., Endestad, T., Goodman, G. S., et al (2006). What people believe about memory. *Memory*, 14, 595–613. <http://dx.doi.org/10.1080/09658210600646716>.
- Mazzoni, G. A. L., Loftus, E. F., Seitz, A., & Lynn, S. J. (1999). Changing beliefs and memories through dream interpretation. *Applied Cognitive Psychology*, 13, 125–144. [http://dx.doi.org/10.1002/\(SICI\)1099-0720\(199904\)13:2<125::AID-ACP560>3.0.CO;2-5](http://dx.doi.org/10.1002/(SICI)1099-0720(199904)13:2<125::AID-ACP560>3.0.CO;2-5).
- Mazzoni, G., Scoboria, A., & Harvey, L. (2010). Nonbelieved memories. *Psychological Science*, 21, 1334–1340. <http://dx.doi.org/10.1177/0956797610379865>.
- McCabe, D. P., Geraci, L., Bowman, J. K., Sensenig, A. E., & Rhodes, M. G. (2011). On the validity of remember-know judgments: Evidence from think aloud protocols. *Consciousness and Cognition*, 20, 1625–1633.
- Ost, J. (2013). Recovered memories and suggestibility for entire events. In A. Ridley, F. Gabbert, & D. La Roy (Eds.), *Suggestibility in legal contexts: Psychological research and forensic implications* (pp. 107–127). New York: Wiley.
- Otgaar, H., Scoboria, A., & Smeets, T. (2013). Experimentally evoking nonbelieved memories for childhood events. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 39, 717–730. <http://dx.doi.org/10.1037/a0029668>.
- Ross, M., Buehler, R., & Karr, J. W. (1998). Assessing the accuracy of conflicting autobiographical memories. *Memory & Cognition*, 26, 1233–1244. <http://dx.doi.org/10.3758/BF03201197>.
- Rubin, D. C. (2006). The Basic-Systems Model of episodic memory. *Perspectives on Psychological Science*, 1, 277–311. <http://dx.doi.org/10.1111/j.1745-6916.2006.00017.x>.
- Rubin, D. C., Schrauf, R. W., & Greenberg, D. L. (2003). Belief and recollection of autobiographical memories. *Memory & Cognition*, 31, 887–901. <http://dx.doi.org/10.3758/BF03196443>.
- Scoboria, A., Jackson, D. L., Talarico, J. M., Hanczakowski, M., Wysman, L., & Mazzoni, G. (in press). *Journal of Experimental Psychology: General*. <http://dx.doi.org/10.1037/a0034110>.
- Scoboria, A., Lynn, S. J., Hessen, J., & Fisco, S. (2007). So that is why I don't remember: Normalizing forgetting of childhood events influences false autobiographical beliefs but not memories. *Memory*, 15, 801–813. <http://dx.doi.org/10.1080/09658210701685266>.
- Scoboria, A., Mazzoni, G., Jarry, J., & Shapero, D. (2012). Implausibility inhibits but does not eliminate false autobiographical beliefs. *Canadian Journal of Experimental Psychology*, 66, 259–267. <http://dx.doi.org/10.1037/a0030017>.
- Scoboria, A., Mazzoni, G., Kirsch, I., & Relyea, M. (2004). Plausibility and belief in autobiographical memory. *Applied Cognitive Psychology*, 18, 791–807. <http://dx.doi.org/10.1002/acp.1062>.
- Sharman, S. J., & Scoboria, A. (2009). Imagination affects perceived plausibility, but plausibility does not affect imagination inflation. *Applied Cognitive Psychology*, 23, 813–827. <http://dx.doi.org/10.1002/acp.1515>.
- Stevens, J. P. (2009). *Applied multivariate statistics for the social sciences* (5th ed.). New York: Routledge.
- Tulving, E. (1983). *Elements of episodic memory*. Oxford: Clarendon Press.
- Tulving, E., & Thomson, D. (1973). Encoding specificity and retrieval processes in episodic memory. *Psychological Review*, 80, 352–373. <http://dx.doi.org/10.1037/h0020071>.
- Wade, K., & Garry, M. (2005). Strategies for verifying false autobiographical memories. *The American Journal of Psychology*, 118, 587–602.
- Wilkinson, C., & Hyman, I. E. (1998). Individual differences related to two types of memory errors: Word lists may not generalize to autobiographical memory. *Applied Cognitive Psychology*, 12, 29–46.