

## Flashbulb Memories Are Special After All; in Phenomenology, Not Accuracy

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### SUMMARY

Consistency of flashbulb memories (FBMs) of the 11th September terrorist attacks and of everyday memories (EDMs) of the preceding weekend do not differ, in both cases declining over the following year for a group of Duke University undergraduates. However, ratings of recollection, vividness and other phenomenological properties were consistently higher for FBMs than for EDMs across time. Belief in the accuracy of memory was initially high for both memories, but declined over time only for EDMs. These findings confirm that FBMs are not extraordinarily accurate, but they may systematically differ from EDMs in other meaningful ways. Copyright © 2006 John Wiley & Sons, Ltd.

Flashbulb memories (FBMs) were originally identified as a distinct subset of autobiographical memory because of their extraordinary accuracy and longevity. It has been postulated that a special mechanism is required to account for these properties (Bohannon & Symons, 1992; Brown & Kulik, 1977; Conway et al., 1994; Schmidt & Bohannon, 1988). An accumulation of data refutes the necessity of a uniquely accurate memorial process, instead showing that FBMs often include errors (Curci, 2005; Curci, Luminet, Finkenauer, & Gisle, 2001; Larsen, 1992; McCloskey, Wible, & Cohen, 1988; Neisser, 1982, 1986; Neisser & Harsch, 1992; Schmolck, Buffalo, & Squire, 2000; Weaver, 1993; Weaver & Krug, 2004; Wright, 1993) and are as prone to forgetting as are memories for everyday events (Talarico & Rubin, 2003). However, the concept still resonates. A recent Pew Research Center for the People and the Press, 2002 study (5 September 2002) found that 97% of respondents said they could ‘remember EXACTLY where [they] were or what [they] were doing the MOMENT [they] heard the news about the 11th September terrorist attacks’ (emphasis in original questionnaire). Furthermore, skepticism abounds when reporting flashbulb memory (FBM) research to naïve audiences. Most people believe they are the exception; their memory for the event in question is accurate. It is this paradoxical insistence that proves FBMs *are* special, just not in the way that we have traditionally defined them. It is extraordinary confidence and phenomenology that differentiate FBMs, not extraordinary accuracy.

The definition of FBMs includes two distinct components: event properties and memory properties. Events that lead to FBMs are typically unexpected, emotionally laden and consequential. For methodological sake, we usually examine public events that are

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common across many individuals, but this is not a necessary event characteristic. The terrorist attacks on the United States on 11 September 2001 unquestionably satisfy the event criteria for producing FBMs. Events like 9/11 lead to memories which are long-lasting, extremely vivid (i.e. that have an 'almost perceptual clarity' (Brown & Kulik, 1977, p. 73) and which we *believe* to be extraordinarily accurate. The emphasis on memory accuracy has meant that the consistency of these memory properties and the interactions between event and memory features have been understudied. Some properties, such as vividness, have been included in numerous investigations, yet others, like language and narrative properties, have been virtually ignored. Therefore, a comprehensive examination of FBM characteristics is necessary to determine which of these properties truly differentiate FBMs from everyday memories (EDMs). We examine existing evidence for each of these properties in FBMs, and how they relate to event characteristics, in turn.

### RECOLLECTION

Recollection of the event is a definitive property of autobiographical memory according to Brewer (1986, 1996), Conway (1996) and Rubin (1996), among others, and of episodic memory in general according to Tulving (1972, 2002). Various descriptions of a sense of reliving the past event in the present or of travelling back in time to re-experience the event, recollection differentiates episodic remembering from semantic memory. In laboratory memory tasks, episodic recall is often operationally defined as *remembering* an item rather than just *knowing* that the item occurred. The only investigations of remember/know judgements for FBMs were included in Talarico and Rubin (2003). There, we reported that FBMs were rated more often as 'remembered' and these ratings remained consistently high over time, whereas EDMs were less likely to be rated as 'remembered' over time.

Other measures of recollection are also uncommon in FBM research. It seems that both positive and negative flashbulb events are recollected equally well (Berntsen & Thomsen, 2005), and are recollected more so than are EDMs over time (Talarico & Rubin, 2003). However, recollection and vividness are related (Bluck & Li, 2001); therefore, the more prevalent findings for vividness may hold for recollection as well.

### VIVIDNESS

FBMs are distinguished by their extraordinary vividness (Niedzwienska, 2003a, 2003b; Rubin & Kozin, 1984; Thomsen & Berntsen, 2003), often exhibiting ceiling effects in vividness ratings (Kvavilashvili, Mirani, Schlagman, & Kornbrot, 2003; Talarico & Rubin, 2003; Weaver & Krug, 2004; Yarmey & Bull, 1978), even months after the event (Talarico & Rubin, 2003; Weaver & Krug, 2004). Therefore, we should expect enhanced vividness for FBMs vs. EDMs and that vividness ratings should remain consistent over long delays for FBMs, but decrease for EDMs.

### BELIEF/CONFIDENCE

FBMs are usually recalled with a higher degree of confidence than other memories of equal age (Brown & Kulik, 1977; Paradis, Solomon, Florer, & Thompson, 2004; Talarico & Rubin, 2003; Weaver, 1993), even when individuals are confronted with evidence that

the event in memory could not have occurred as it is remembered (Neisser & Harsch, 1992). Confidence is often at ceiling for FBMs (Christianson & Engelberg, 1999; Neisser et al., 1996; Niedzwienska, 2003a; Weaver & Krug, 2004) and often remains that high for at least months after the event (Christianson & Engelberg, 1999; Niedzwienska, 2003a; Talarico & Rubin; Weaver & Krug; but see Christianson, 1989; Otani et al., 2005). The dissociation of subjective confidence from objective accuracy of hearing about the 11th September terrorist attacks was the primary conclusion of Talarico and Rubin and is why we are trying to redefine FBMs by the former instead of the latter.

## LANGUAGE AND NARRATIVE

The only investigations of narrative coherence or specificity in FBM were included in Talarico and Rubin (2003), where we reported that FBMs were more coherent (and less fragmented) than EDMs, but these ratings decreased over time for both memories. We expect this pattern to continue through the longer delay interval described here.

## EMOTION

Emotion is defined by two distinct components: valence (positive vs. negative) and intensity (high vs. low). Previous work from our lab has shown that intensity is a better predictor of the autobiographical properties described here than is valence (Talarico, LaBar, & Rubin, 2004). Furthermore, the vector model of emotion memory (Bradley, 1994; Bradley, Codispoti, Cuthbert, & Lang, 2001) posits that once a dichotomous choice concerning valence is made, increasing valence is functionally equivalent to increasing intensity. Therefore, if FBMs are rated as more negative and more emotionally intense (as we expect memories for 11th September to be), we should expect enhancement of most phenomenological properties relative to less emotional EDMs.

As for the emotion ratings themselves, there are many reports of emotion ratings decreasing over time for FBMs (Christianson & Engelberg, 1999; Lee & Brown, 2003; Pillemer, 1984; Schmidt, 2004). However, an equal number of studies have found no decrease (Christianson, 1989; Neisser & Harsch, 1992; Paradis et al., 2004; Wright, 1993). However, these mixed results may be due to insufficient separation of valence and intensity effects as Talarico and Rubin (2003) reported that intensity ratings decreased over time for both FBMs and EDMs but that valence ratings did not decrease.

Both FBMs and EDMs bring to mind the same emotion at recall as at the time of the event, and both are less similar over time (Talarico & Rubin, 2003). However, FBMs are re-experienced with the same intensity to a much greater degree than EDMs even though both are less effective at recreating the same intensity over time (Talarico & Rubin). Furthermore, valence of the event may differentially effect re-experiencing emotion, with positive events encouraging more similar recall at longer delays than negative events (Berntsen & Thomsen, 2005).

## VISCERAL REACTIONS

Talarico and Rubin (2003) were the first to dissociate cognitive emotional evaluations from visceral reactions and found that FBMs lead to greater visceral reactions than EDMs and

that these ratings decreased over time more so for EDMs than for FBMs. Furthermore, we found that initial visceral reactions were associated with later confidence (but not consistency) and greater PTSD symptoms at a delay.

### FIELD/OBSERVER PERSPECTIVE

All memories are encoded in the same perspective, through one's own eyes (i.e. field perspective). However, at recall, events can be seen from that same perspective or through the eyes of an outside observer (e.g. a bird's eye view or seeing one's self in the memory). Evidence from everyday autobiographical memories has shown that recent memories are more likely to be recalled from a field perspective, but more remote memories are often seen from an observer's perspective (Nigro & Neisser, 1983). Furthermore, emotional memories are more often recalled from a field perspective than are neutral events (D'Argembeau, Comblain, & Van Der Linden, 2003). Consistent with these findings, Talarico and Rubin (2003) reported that EDMs, though initially seen from a field perspective, were more likely to be seen from an observer's perspective at the 42- and 224-day delay intervals, whereas the FBMs was seen from a field perspective initially and at all subsequent delays.

### REHEARSAL

Pennebaker and Harber (1993) describe the initial stage of coping after a stressful event as seeking social support. In most cases, a receptive audience is lacking because others do not know how to or are unwilling to listen and offer such support. This is especially true in cases where the stressful event itself is socially stigmatised (e.g. infidelity of a spouse). However, for flashbulb events, the entire community is equally affected and participates in reciprocal sharing of stories. In such cases, this period of encouraged rehearsal lasts for approximately 2 weeks after which people become reluctant to hear others' stories and therefore, refrain from telling their own.<sup>1</sup> Therefore, we should predict enhanced rehearsal for the FBMs relative to the EDMs, but decreasing rehearsal for each over time.

Therefore, we contacted participants from our original study comparing FBMs for the 11th September attacks and EDMs for events of the preceding weekend for an additional follow-up session approximately 1-year later. The addition of a within-subjects comparison at a lengthier delay interval should allow us to replicate the findings of Talarico and Rubin (2003) as well as extend the description of FBM phenomenology. We predict that FBMs will be differentiated from EDMs for most phenomenological properties, but not for consistency of memory content. It is our hope to redefine the FBM phenomenon as one of phenomenology and not accuracy.

### METHOD

#### Participants

Duke students were contacted and tested on 12 September 2001 for their memory of hearing of the terrorist attacks on the United States the previous morning (initial session). They were then randomly assigned to one of three follow-up sessions scheduled within the

<sup>1</sup>One of the most explicit examples of this reluctance was demonstrated by the appearance of 'Thank you for not sharing your earthquake experience' t-shirts a few weeks after the Loma Prieta earthquake in San Francisco (Neisser et al., 1996; Pennebaker & Harber, 1993).

limits of the academic calendar to produce roughly equal steps on a logarithmic scale (Rubin & Wenzel, 1996). The first group of 18 participants, was tested 1 week (7 days) later, the second group of 18 was tested 6 weeks (42 days) after the initial event and the last group of 18 was tested 32 weeks (224 days) after the event (intervening sessions). The results from these participants were reported in Talarico and Rubin (2003).

Because one important component of the FBM definition is long-term retention, we wanted to assess participants' memory later than 7 months after the terrorist attacks. This additional follow-up session also allowed us to include within-subjects comparisons across time. All initial participants were contacted in August 2002 (to avoid interference from anniversary commemorations) for a final follow-up (1-year session); 27 responded (5 of whom were male,  $M = 18.59$  years).<sup>2</sup> Of those 27, 9 were also in the 1-week delay session, 11 were in the 6-week delay session and 7 were in the 32-week delay session. Participants were compensated with class credit or \$10 for each session.

## Procedures

The experimental sessions each consisted of two short open-ended questionnaires. The first asked specifically about how he or she heard of the terrorist attacks on the United States on Tuesday, 11 September 2001 and the second asked about an everyday event from the participants' lives in the days prior to the attacks. For the 11th September memories we asked: who or what told you of the event; when did you hear the news; what were you doing immediately before you heard; who was with you; where were you and any other distinctive details. For EDMs, we asked: what was the event; when did the event occur; what were you doing; who was there; where were you and any other distinctive details. Three blank lines followed each request. For the everyday event, participants were also asked to provide a brief two- to three-word description which could serve as a cue for that unique event in the future. The types of events listed for the everyday memory (EDM) were typical for the life of an average college student (e.g. parties, sporting events and studying).

Because we wanted to obtain a fair representation of non-flashbulb autobiographical memories from the same time period, we asked participants to identify and report an everyday event from the days preceding the attacks (Saturday, Sunday or Monday) to serve as a control memory. A range of days was necessary to ensure that participants could select a sufficiently memorable event and the maximum difference of 3 days between the everyday event and the flashbulb events was considered inconsequential compared to the length of the retention intervals.

In addition, for each of these events, participants were asked to complete the Autobiographical Memory Questionnaire (AMQ) a rating-scale measure that was designed to assess various properties of autobiographical memory and that has been used effectively to that end in clinical and healthy adult populations (Rubin, Feldman, & Beckham, 2004;

<sup>2</sup>There were 4 significant differences between responders and non-responders out of 67 comparisons (each of the 15 AMQ measures initially and at delay for FBMs and EDMs; initial details recorded, consistent and inconsistent details at delay for both FBMs and EDMs and PCL-S score at delay). Initial ratings of *intensity* for the FBM were higher for nonresponders ( $M = 5.85$ ,  $SEM = 0.17$ ) than for responders ( $M = 4.78$ ,  $SEM = 0.32$ ),  $t(52) = 2.97$ ,  $p < 0.01$ . For EDMs, initial ratings of *in pieces* were higher for nonresponders ( $M = 4.58$ ,  $SEM = 0.26$ ) than for responders ( $M = 3.44$ ,  $SEM = 0.39$ ),  $t(51) = 2.38$ ,  $p = 0.02$ , whereas initial *vividness* ratings were higher for responders ( $M = 4.67$ ,  $SEM = 0.20$ ) than nonresponders ( $M = 5.25$ ,  $SEM = 0.20$ ),  $t(51) = -2.06$ ,  $p < 0.05$ . Lastly, delay scores of *same intensity* for the EDMs were higher for nonresponders ( $M = 2.54$ ,  $SEM = 0.24$ ) than for responders ( $M = 1.70$ ,  $SEM = 0.17$ ),  $t(51) = 2.90$ ,  $p < 0.01$ . Given the number of comparisons made, we concluded that there were no systematic differences between the groups.

Rubin, Schrauf, & Greenberg, 2003, 2004; Sheen, Kemp, & Rubin, 2001; Talarico et al., 2004; Wenzel, Pinna, & Rubin, 2004).

### *Key properties*

Responses to questions about how much 'I feel as though I am reliving' the experience (1—not at all to 7—as clearly as if it were happening now) and 'while remembering the event now, I feel that I travel back to the time it happened' (1—not at all to 7—completely) were collapsed to create a *recollection* measure. Participants also rated whether they 'actually remember it rather than just knowing it happened' (1—not at all to 7—completely) comprising a *remember/know* measure. A composite measure of *belief* was attained by averaging responses to questions of whether they 'believe the event in my memory really occurred in the way I remember it' (1–100% imaginary to 7–100% real) and a reverse scoring of whether he/she could be persuaded that 'your memory of the event was wrong' (1—not at all to 7—completely). Participants rated how much they could 'see it in my mind', 'hear it in my mind' and 'know the setting where it occurred' (1—not at all to 7—as clearly as if it were happening now), which, following the FBM literature (Brown & Kulik, 1977; Rubin & Kozin, 1984), we averaged into one *vividness* measure.

### *Language and narrative*

Individuals were asked if the memory came 'in words or pictures as a coherent *story* or episode and not as an isolated fact, observation or scene,' 'in *pieces* with missing bits', 'in *words*' and was 'based on details *specific* to my life, not on general knowledge that I would expect most people to have' (all rated 1—not at all to 7—completely).

### *Emotion and visceral reactions*

The current *valence* of the memory was assessed by averaging a scale of positive and a reverse-scored scale of negative emotional tone, (both originally scored, 1—not at all to 7—entirely). Participants were also asked to rate the current emotional *intensity* of the memory (1—not at all to 7—extremely). We also asked participants if they felt 'the same particular emotions I felt at the time of the event' (*same emotion*: 1—completely different to 7—identically the same). Similarly, we asked participants if they felt the emotions 'as strongly as I did then' (*same intensity*: 1—not at all to 7—as clearly as if it were happening now). Finally, there were four questions that asked about current visceral responses to the memory: 'I feel my heart pound or race', 'I feel tense all over', 'I feel sweaty or clammy' and 'I feel knots, cramps, or butterflies in my stomach' (all rated 1—not at all to 7—more than for any other memory). These last four questions were averaged to form a global *visceral* response measure.

### *Other features*

Because participants often poorly judge the objective frequency of occurrence of past events in tests like ours (Fiedler & Armbruster, 1994; Parducci, 1968), we had them use relative rating scales to measure rehearsal rates, rather than estimate the number of past rehearsals. Participants rated how often they 'thought about' and 'talked about' the event and how often it came to them 'out of the blue, without my trying to think about it' (1—not at all to 7—more than for any other memory). These were then collapsed into a total *rehearsal* measure. *Field* vs. *observer* modes of remembering were assessed with one question asking if they 'see it out of my own eyes rather than that of an outside observer' (1—not at all to 7—completely).

The intervening and 1-year sessions were identical to the initial session except that the everyday event was cued with the brief description individuals provided at the initial session,

whereas the flashbulb event was cued with the same phrase as at the initial session, 'how you first heard about the news of the attacks on America on Tuesday, 11 September 2001' and all participants were asked to complete the PCL-S, a short survey designed to assess posttraumatic stress disorder (PTSD) symptoms (Weathers, Litz, Huska, & Keane, 1994).

The recall data were scored by two independent raters who counted the number of details. The data presented here were coded by individuals naïve to the experimental hypothesis and unfamiliar with the original paper. A detail was generally any noun, verb phrase or unique modifier. All details recorded at the initial session were considered consistent. Consistency scores were based on coding guidelines developed for the original initial-delay comparisons (Talarico & Rubin, 2003). Coders were instructed to 'be generous' and to mark details as *consistent* if participants used the same or similar words to describe the same real-world entity. For example, saying 'a friend' was with you initially and 'Sue' later would have been marked consistent. Synonyms and repetitions were marked as consistent and were not counted individually. For the 'when' question, anything within one half-hour (in either direction) of a given time was recorded as consistent. For the 'others present' question, each person or group was counted as an individual entity. Any group or number over 10 was counted as one detail (e.g. 'my whole econ class' or 'about 15 people at the bus stop'). Those details that were directly contradictory (the majority of the inconsistent cases) or that could not refer to the same real-world entity were marked as *inconsistent*, for example, saying that 'Mike' was with you initially and 'Sue' later. Saying that 'Mike' was present initially and 'Mike and Sue' were present later would be one consistent and one inconsistent detail. Reliability between the two coders was 0.94 as calculated by Pearson correlation. Disagreements in coding were resolved by discussion.

## RESULTS

Our basic question was that how do FBMs and EDMs differ over time? A repeated measures analysis of variance (ANOVA) analysed the effects of memory type (2: flashbulb vs. everyday), session (3: initial vs. delay vs. 1-year) and group (3: delay of 7 days, 42 days or 220 days). Both memory type and session were within subject factors as each participant provided both a flashbulb and EDM at each of three time points. Group was a between subjects factor as each participant provided only one interim memory report between the 12 September 2001 and August 2002 sessions. The resulting *F* statistics are shown in Table 1. The decision criterion for each comparison within an ANOVA was corrected with a Bonferroni adjustment. Mean and standard error data for details and property data are provided in Table 2 for FBMs and Table 3 for EDMs.

### Consistency

There was a main effect of session for *consistent* details, indicating that recall of FBMs and EDMs is similar, both showing decreased consistency over time (see Figure 1). This finding replicates the major conclusion of Talarico and Rubin (2003) and confirms that FBMs are not extraordinarily accurate.

### Key properties

For both *recollection* and *vividness*, we found main effects of session and memory type. Ratings for both FBMs and EDMs decreased over time, but the FBMs ratings remained

Table 1. ANOVA results

Question	Effect of delay			Effect of flashbulb vs. everyday			
	Session:	Group:	Session × group	Main effect	Interaction		
	1 day/ delay/ year	7-/42-/ 224-day delay			Memory × group	Memory × session	Memory × session × group
Recall							
Details							
Consistent	85.45*	0.66	2.43	1.72	1.46	0.02	0.72
Inconsistent	4.87	1.08	1.48	2.38	1.05	1.59	1.35
Ratings of memories							
Key properties							
Recollection	13.64*	0.59	1.50	22.68*	2.50	3.86	0.52
Belief	2.73	0.06	0.67	7.03	1.20	10.93*	2.75
Remember/know	13.89*	0.08	1.68	16.03*	1.17	6.96*	0.98
Vividness	22.42*	1.89	0.26	11.24*	2.31	5.02	1.30
Language/narrative							
Story	6.56*	0.91	0.29	7.68	0.55	4.18	1.00
In pieces	16.58*	1.67	0.42	7.78	1.25	1.98	0.82
In words	6.52*	1.19	0.69	1.27	0.73	0.51	1.64
Specific	0.03	1.61	0.11	0.99	0.04	1.57	0.85
Emotion							
Valence	1.17	0.98	1.63	74.48*	1.22	0.65	0.78
Same intensity	27.29*	1.29	1.02	38.16*	2.46	2.21	0.22
Intensity	14.06*	0.60	0.74	56.65*	1.71	1.15	0.66
Visceral	15.12*	0.55	0.93	35.80*	1.77	10.82*	0.20
Same emotion	4.78	0.59	0.36	4.40	2.04	1.22	0.43
Other							
Field/observer	9.95*	0.37	1.61	0.79	2.84	9.70*	0.65
Rehearsal	39.80*	3.67	1.32	126.38*	4.57	4.18	0.08

\* $p < 0.007$  (Bonferroni correction).

Note: All ANOVA's involving Session have 48 degrees of freedom in the denominator, all others have 24 degrees of freedom in the denominator (due to missing values, the denominators sometimes fall to 46 and 23, respectively).

higher than the EDMs did at each time point. *Remember/know* ratings also showed main effects of session and memory type as well as a memory type by session interaction. Here, FBMs and EDMs started with high ratings, but the FBMs remained high and consistent whereas the EDMs ratings decreased over time. Lastly, *belief* in the memory's accuracy showed only a memory type by session interaction. Again, the FBMs and EDMs were similar initially, but over time, confidence ratings in the EDMs decreased while they remained high and constant for the FBMs. As shown in Figure 2, participants *believed* that their memories for 11 September were more consistent than their memories for the weekend event (even though this was not so), a belief that may have been supported by similar patterns of judgments of *recollection*, *remember/know* and *vividness*.

### Language and narrative

Only a main effect of session was found for any of these variables. *Story*, *in pieces* and *in words* ratings all decreased over time for FBMs and EDMs similarly. There were no significant effects of memory type or time on whether the memory was *specific* to the

Table 2. Means and standard errors for details and ratings for flashbulb memories

Variable	Group	Initial Session				Delay Session				Year Session	
		Day 1		Day 7		Day 42		Day 224		Day 335	
		<i>M</i>	<i>SEM</i>	<i>M</i>	<i>SEM</i>	<i>M</i>	<i>SEM</i>	<i>M</i>	<i>SEM</i>	<i>M</i>	<i>SEM</i>
<b>Details</b>											
Consistent	1	14.00	(1.15)	7.67	(1.20)					6.11	(0.61)
	2	10.45	(1.38)			6.27	(0.54)			6.36	(0.56)
	3	12.43	(1.11)					5.29	(0.47)	5.43	(0.57)
Inconsistent	1			2.56	(0.96)					5.67	(1.17)
	2					3.09	(0.96)			3.64	(0.99)
	3							3.14	(0.86)	3.57	(1.04)
<b>Key properties</b>											
Recollection	1	4.61	(0.33)	3.94	(0.26)					3.61	(0.43)
	2	4.27	(0.56)			4.00	(0.49)			4.59	(0.43)
	3	4.50	(0.42)					3.93	(0.26)	3.71	(0.36)
Belief	1	5.61	(0.35)	5.22	(0.42)					5.56	(0.21)
	2	5.68	(0.34)			5.91	(0.24)			5.86	(0.27)
	3	5.29	(0.24)					5.86	(0.42)	5.71	(0.24)
Remember/know	1	5.67	(0.41)	5.33	(0.60)					5.22	(0.49)
	2	5.64	(0.56)			5.45	(0.49)			6.36	(0.24)
	3	6.14	(0.34)					5.71	(0.60)	5.86	(0.55)
Vividness	1	5.11	(0.33)	4.63	(0.43)					4.52	(0.30)
	2	5.82	(0.25)			5.55	(0.29)			5.18	(0.26)
	3	5.14	(0.33)					5.00	(0.43)	4.29	(0.42)
<b>Language/narrative</b>											
Story	1	4.56	(0.73)	3.89	(0.65)					4.78	(0.43)
	2	5.00	(0.52)			4.55	(0.49)			4.64	(0.53)
	3	4.71	(0.81)					4.14	(0.65)	4.29	(0.75)
In pieces	1	5.11	(0.65)	4.33	(0.60)					3.33	(0.55)
	2	5.45	(0.55)			5.27	(0.43)			4.36	(0.34)
	3	4.57	(0.72)					3.86	(0.60)	3.14	(0.63)
In words	1	3.89	(0.61)	3.44	(0.41)					2.67	(0.41)
	2	3.27	(0.38)			2.82	(0.48)			3.00	(0.54)
	3	3.43	(0.61)					3.57	(0.41)	2.57	(0.43)
Specific	1	4.22	(0.62)	4.22	(0.43)					4.44	(0.53)
	2	4.55	(0.55)			4.82	(0.54)			5.45	(0.49)
	3	4.71	(0.61)					5.57	(0.43)	5.00	(0.85)
<b>Emotion</b>											
Valence	1	-1.61	(0.42)	-1.44	(0.32)					-1.44	(0.34)
	2	-2.41	(0.11)			-2.23	(0.21)			-1.82	(0.32)
	3	-1.00	(0.36)					-1.57	(0.32)	-1.43	(0.37)
Same intensity	1	4.78	(0.49)	3.56	(0.29)					3.00	(0.24)
	2	4.45	(0.47)			3.73	(0.36)			3.45	(0.45)
	3	3.71	(0.42)					2.71	(0.29)	2.57	(0.30)
Intensity	1	5.11	(0.56)	3.33	(0.37)					3.11	(0.42)
	2	4.91	(0.37)			4.10	(0.43)			4.09	(0.39)
	3	4.14	(0.83)					3.29	(0.37)	3.00	(0.58)
Visceral	1	3.39	(0.47)	1.86	(0.20)					1.81	(0.26)
	2	3.77	(0.61)			2.30	(0.38)			2.61	(0.48)
	3	2.86	(0.42)					1.86	(0.20)	2.25	(0.36)

*(Continues)*

Table 2. (Continued)

Variable	Group	Initial Session				Delay Session				Year Session	
		Day 1		Day 7		Day 42		Day 224		Day 335	
		<i>M</i>	SEM	<i>M</i>	SEM	<i>M</i>	SEM	<i>M</i>	SEM	<i>M</i>	SEM
Same emotion	1	3.67	(0.41)	3.11	(0.26)					3.22	(0.32)
	2	4.36	(0.43)			3.73	(0.41)			4.27	(0.38)
	3	3.43	(0.43)					3.14	(0.26)	3.57	(0.48)
Other											
Field/observer	1	3.89	(0.72)	4.67	(0.53)					3.89	(0.72)
	2	4.36	(0.62)			4.55	(0.55)			4.55	(0.58)
	3	5.57	(0.61)					5.00	(0.53)	4.57	(0.65)
Rehearsal	1	6.00	(0.26)	5.00	(0.24)					3.96	(0.30)
	2	6.09	(0.12)			5.48	(0.20)			4.70	(0.21)
	3	4.95	(0.47)					3.95	(0.24)	3.48	(0.55)

participant's life. Both FBMs and EDMs were rated as specific, personal events and those ratings did not change over time.

### Emotion and visceral reactions

Emotional *intensity* ratings were higher for FBMs than EDMs (as evidenced by a main effect of memory type), but decreased over time at the same rate for each (main effect of session). The same pattern was found for re-experiencing the *same intensity* at recall, higher ratings for FBMs than EDMs and decreasing over time. Along with the main effects of session and memory type, a memory type by session interaction was found for *visceral* reactions. This was primarily driven by a floor effect at all time points for EDMs, but FBMs that were initially rated highly, but decreased over time. Not surprisingly, there was a main effect of memory type on *valence*, with FBMs being rated as significantly more negative than the EDMs. There were no significant effects on re-experiencing the *same emotion* at recall as one felt as the event occurred.

We also examined whether any initial emotional reactions correlated with later PTSD symptoms. While we have no evidence that any of our participants suffered PTSD as a result of the 11th September attacks, some did exhibit symptoms of unwanted re-experiencing the event, increased arousal and/or avoidance of the upsetting event. Only initial visceral reactions predicted PTSD symptoms, and it did so at both the delay session (7, 42 or 224 days later depending on group;  $r(25) = 0.55$ ,  $p = 0.003$ ) and the year session (335 days later;  $r(25) = 0.43$ ,  $p = 0.03$ ).<sup>3</sup>

### Other features

In addition to a main effect of session, there was a memory type by session interaction for *field/observer perspective* (see Figure 3). Both FBMs and EDMs were seen from a field

<sup>3</sup>Correlations between initial visceral reaction and the delay PTSD score were  $r(7) = 0.41$ ,  $r(9) = 0.71$  and  $r(5) = 0.68$  for the 7-, 42- and 224-day delay groups, respectively. Correlations between initial visceral reaction and the year PTSD score were  $r(7) = 0.28$ ,  $r(9) = 0.50$  and  $r(5) = 0.07$  for the 7-, 42- and 224-day delay groups, respectively. Means (standard errors) for PCL-S scores were 33.22 (2.76), 28.73 (2.49) and 22.14 (3.13) for the 7-, 42- and 224-day delay groups, respectively. Grand mean (standard error) for the 335-day group was 24.41 (1.39) and group means were (standard errors) 25.33 (2.48), 25 (2.24) and 22.29 (2.81) for the 7-, 42- and 224-day delay groups, respectively.

Table 3. Means and standard errors for details and ratings for everyday memories

Variable	Group	Initial Session				Delay Session				Year Session	
		Day 1		Day 7		Day 42		Day 224		Day 335	
		M	SEM	M	SEM	M	SEM	M	SEM	M	SEM
<b>Details</b>											
Consistent	1	13.11	(2.07)	7.56	(0.63)					6.00	(0.41)
	2	11.36	(1.11)			7.09	(0.96)			6.09	(0.51)
	3	14.71	(2.30)					7.00	(1.80)	8.57	(2.02)
Inconsistent	1			3.89	(1.07)					4.67	(0.99)
	2					2.27	(0.60)			3.00	(0.73)
	3							2.14	(0.34)	2.14	(0.80)
<b>Key properties</b>											
Recollection	1	4.67	(0.40)	3.50	(0.44)					2.89	(0.48)
	2	3.59	(0.53)			2.45	(0.42)			2.55	(0.35)
	3	3.50	(0.33)					2.21	(0.29)	2.36	(0.34)
Belief	1	5.39	(0.35)	5.50	(0.33)					4.72	(0.46)
	2	5.55	(0.37)			4.50	(0.49)			3.86	(0.50)
	3	5.29	(0.36)					5.00	(0.62)	4.64	(0.59)
Remember/know	1	5.67	(0.37)	4.78	(0.62)					3.89	(0.51)
	2	5.55	(0.49)			4.18	(0.58)			3.91	(0.59)
	3	5.29	(0.52)					3.00	(0.65)	3.86	(0.70)
Vividness	1	5.67	(0.34)	4.44	(0.39)					3.85	(0.31)
	2	5.30	(0.33)			4.12	(0.47)			3.73	(0.44)
	3	4.62	(0.26)					3.14	(0.42)	3.76	(0.38)
<b>Language/narrative</b>											
Story	1	4.67	(0.60)	3.89	(0.68)					2.78	(0.64)
	2	4.00	(0.74)			3.36	(0.72)			2.55	(0.58)
	3	3.43	(0.53)					1.86	(0.26)	2.29	(0.42)
In pieces	1	4.44	(0.75)	3.78	(0.62)					3.56	(0.77)
	2	4.82	(0.66)			2.91	(0.51)			2.55	(0.67)
	3	4.29	(0.68)					1.86	(0.34)	2.43	(0.43)
In words	1	3.78	(0.55)	3.56	(0.58)					3.00	(0.65)
	2	2.91	(0.55)			2.91	(0.51)			2.36	(0.34)
	3	3.43	(0.53)					1.57	(0.20)	2.14	(0.34)
Specific	1	4.78	(0.49)	5.00	(0.55)					4.78	(0.83)
	2	5.64	(0.36)			5.18	(0.38)			4.82	(0.71)
	3	5.86	(0.26)					5.29	(0.61)	5.43	(0.65)
<b>Emotion</b>											
Valence	1	0.39	(0.45)	0.61	(0.46)					0.22	(0.56)
	2	1.18	(0.51)			0.41	(0.38)			0.64	(0.51)
	3	1.21	(0.49)					0.86	(0.61)	1.00	(0.60)
Same intensity	1	3.89	(0.54)	2.11	(0.34)					1.78	(0.28)
	2	2.82	(0.46)			1.36	(0.20)			1.73	(0.27)
	3	3.00	(0.31)					1.71	(0.29)	1.86	(0.34)
Intensity	1	2.67	(0.55)	1.89	(0.31)					2.00	(0.44)
	2	2.18	(0.46)			1.55	(0.25)			1.27	(0.19)
	3	2.43	(0.53)					1.29	(0.29)	1.57	(0.30)
Visceral	1	1.75	(0.40)	1.47	(0.21)					1.28	(0.19)
	2	1.23	(0.14)			1.00	(0.00)			1.11	(0.09)
	3	1.11	(0.11)					1.04	(0.04)	1.07	(0.07)

(Continues)

Table 3. (Continued)

Variable	Group	Initial Session				Delay Session				Year Session	
		Day 1		Day 7		Day 42		Day 224		Day 335	
		M	SEM	M	SEM	M	SEM	M	SEM	M	SEM
Same emotion	1	4.22	(0.60)	2.78	(0.46)					3.22	(0.55)
	2	3.18	(0.57)			2.55	(0.45)			2.91	(0.44)
	3	3.29	(0.57)					2.57	(0.48)	2.43	(0.57)
Other Field/observer	1	5.89	(0.51)	5.22	(0.60)					4.13	(0.67)
	2	5.00	(0.63)			3.18	(0.52)			3.27	(0.56)
	3	6.00	(0.00)					2.86	(0.67)	2.57	(0.65)
Rehearsal	1	3.37	(0.41)	2.37	(0.41)					2.11	(0.32)
	2	2.24	(0.30)			1.60	(0.30)			1.48	(0.20)
	3	2.76	(0.47)					1.76	(0.43)	1.76	(0.28)

perspective (through one's own eyes) initially, but as delay increased, only EDMs followed the typical pattern of a switch to observer perspective. FBMs, in contrast, continued to be recalled from a field perspective even after 1 year. Main effects of session and memory type were seen for *rehearsal* ratings. Basically, FBMs were rehearsed more often than EDMs, although both memories were rehearsed less often over time (see Figure 4).

## DISCUSSION

FBMs were differentiated from EDMs by exhibiting enhanced recollection, exaggerated confidence in the memory's accuracy, prolonged recall from a field perspective, as well as greater emotional involvement and increased rehearsal. However, FBMs were not different from EDMs in consistency. This supports our assertion that it is phenomenological property by which we should define FBMs, not extraordinarily accurate recall of the reception context of surprising, consequential and emotional news. The only set of properties not to follow this pattern were the language and narrative variables, for which the main effect of memory type failed to reach the adjusted criterion for significance. However, is it vividness and confidence which have been consistently identified with FBMs, not coherence, language or specificity, so this failure to discriminate between FBMs and EDMs does not threaten the main conclusion. In fact, the lack of any memory type effects in this area help to refute arguments that our findings are mere statistical artifacts. Furthermore, other studies have found little, if any effect of stress (Rubin, Feldman, & Beckham, 2004) or time (Rubin, Boals, & Klein, in preparation) on narrative and linguistic properties.

Those who maintain that FBMs are qualitatively different from other memories may point to our low sample size to contest our null results for consistent and inconsistent details. This criticism is valid and should encourage others to replicate this work in larger samples (preferably samples that are more representative of the general population than our undergraduate sample is) for other flashbulb events. However, we have not argued that FBMs are required to display perfect consistency in order to validate the concept for memory content, only that they must display more consistency than would be expected for

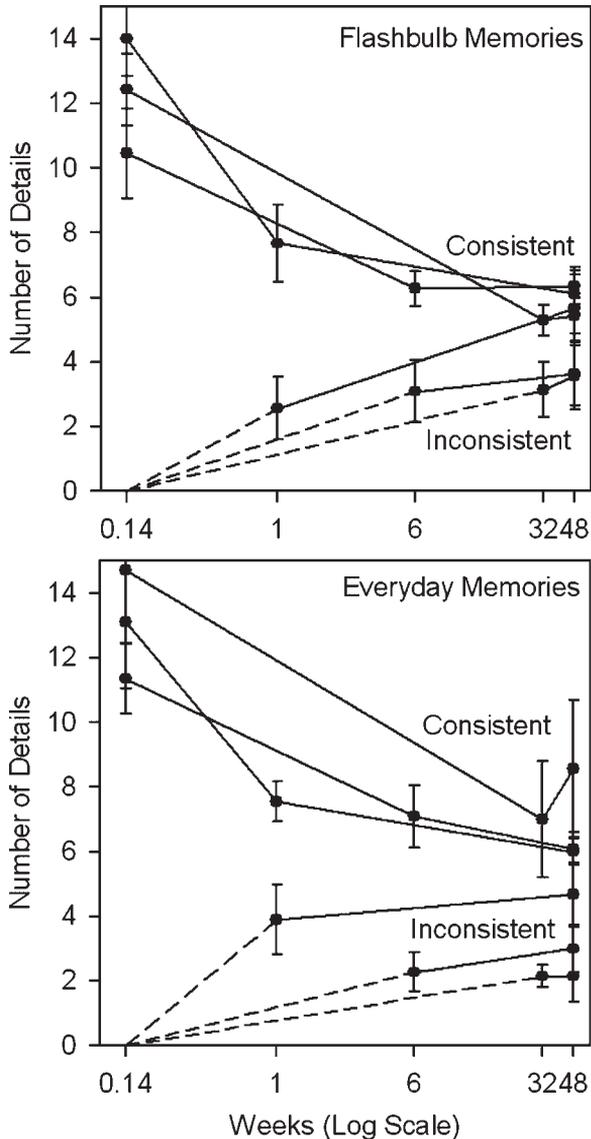


Figure 1. Consistency of memories. The top panel shows the mean number of consistent and inconsistent details for the flashbulb memories from each of the three groups. The bottom panel shows the mean number of consistent and inconsistent details for the everyday memories from each of the three groups. All groups participated in the initial session (1 day after the terrorist attacks), each group participated in one of the three follow-up sessions (7, 42 or 224 days later), and all groups participated in the 1-year follow-up session (335 days)

any other, everyday autobiographical event. It is the addition of this empirical control condition that enables us to contradict the special mechanism hypothesis, not simply the evidence of a forgetting curve within FBMs. Furthermore, it is precisely this logic that leads us to conclude that FBM is a viable concept for autobiographical memory phenomenology. We are unconcerned whether FBMs exhibit objective ceiling effects for a property like recollection, and in fact, they do not. Instead, we are impressed by the fact that

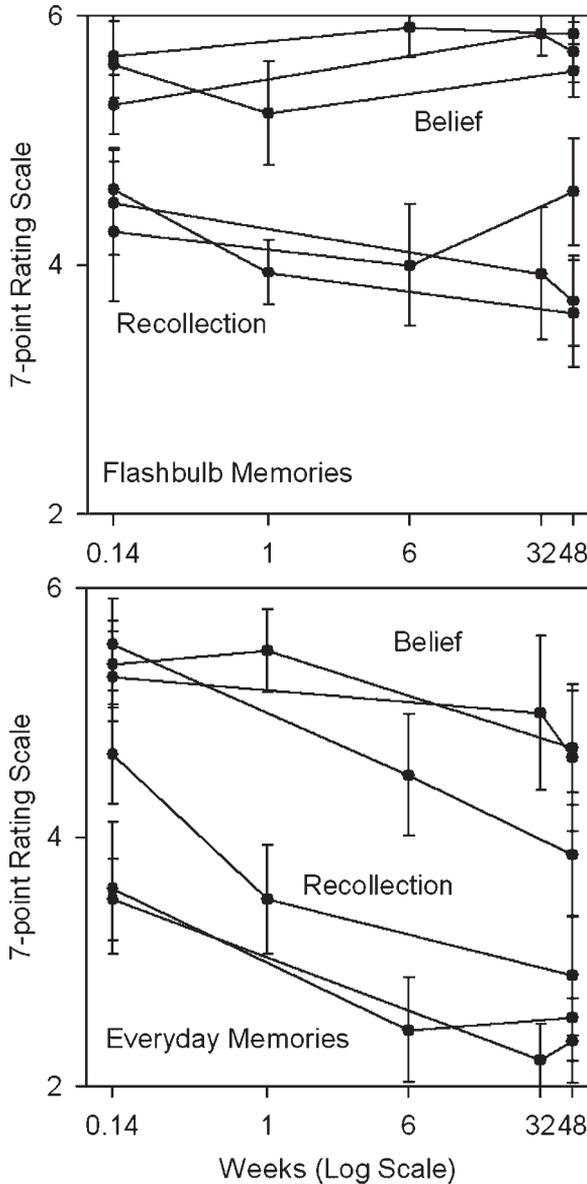


Figure 2. Key properties of memories. The top panel shows the mean ratings of belief in the accuracy of the memory and recollection for flashbulb memories for each of the three groups. The bottom panel shows the same data for everyday memories. All groups participated in the initial session (1 day after the terrorist attacks), each group participated in one of the three follow-up sessions (7, 42 or 224 days later), and all groups participated in the 1-year follow-up session (335 days)

FBMs are recollected to a greater degree than are EDMs and that this effect persists across time.

Others may criticise our ‘everyday’ event as being more flashbulb-like because of its association to the emotional events of 11th September by virtue of the study or by the

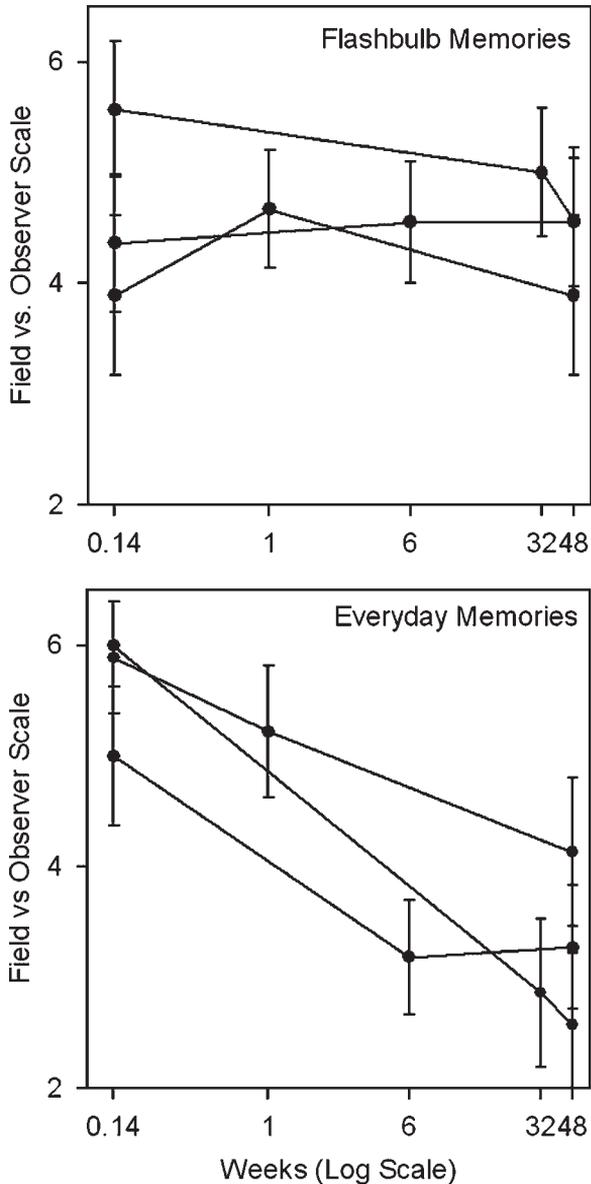


Figure 3. Field vs. observer perspective. The top panel shows the mean ratings for whether participants for each of the three groups saw the flashbulb memory through their own eyes (rating of 7) or through the eyes of an outside observer (rating of 1). The bottom panel shows the same data for the everyday memories. All groups participated in the initial session (1 day after the terrorist attacks), each group participated in one of the three follow-up sessions (7, 42 or 224 days later), and all groups participated in the 1-year follow-up session (335 days)

simple fact of being identified, described, rated and later cued in the context of this study. Perhaps we have unfairly inflated the consistency of the EDM to flashbulb-like proportions, thereby showing that normative events can attain flashbulb status not that FBMs display a normative recall pattern.

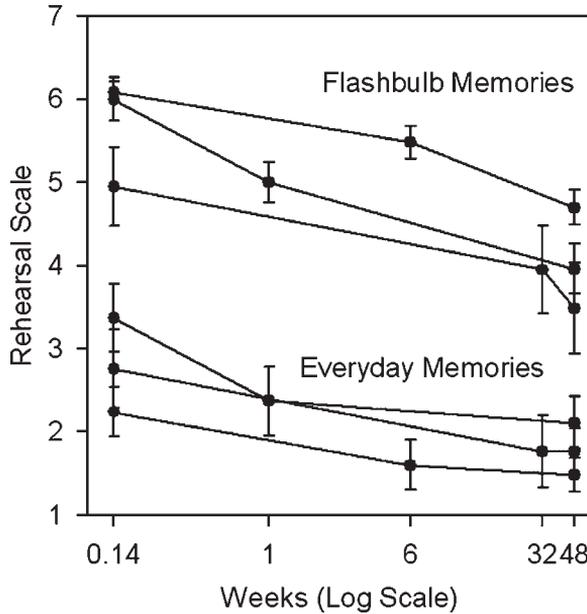


Figure 4. Rehearsal. Mean ratings for how often participants rehearsed the flashbulb and everyday memories for each of the three groups. All groups participated in the initial session (1 day after the terrorist attacks), each group participated in one of the three follow-up sessions (7, 42 or 224 days later), and all groups participated in the 1-year follow-up session (335 days)

In fact, we admit that paucity of the original memory was a concern and why we instructed participants to choose the most memorable event from a range of 3 preceding days. Christianson (1989) reported that only 22% of respondents could recall the previously identified EDM from previous 1-year. We thought his weak cue ('the event you described from the last Saturday before we called you the first time', as compared to 'how you heard the news about Olof Palme's death') unnecessarily penalised the everyday event. We were especially concerned because Christianson also reported that at the delay, all individuals recalled their participation in the first interview. Therefore, for one weakly cued everyday event, only 22% of individuals had a vivid, accurate memory, but for another unique, well-defined event, 100% of individuals remembered. In asking for memorable events from the preceding weekend and cueing each with a specific prompt, we tried to collect distinctive, but not unique, events from our participants' lives with which to compare the event of first learning about the September 11th attacks.

Before our participants were provided with their own self-generated cue at either of their follow-up sessions, we first asked them to recall 'the most distinctive life event from the days preceding the attack' that had been provided 'during a previous experimental session'. Three participants failed to recall the event in response to this cue at both the delay session (one at 42 days and two at 224 days) and the year session. Additional four participants were able to recall the event at the delay session (two at 7 days, one at 42 days and one at 224 days), but failed to recall it at the year session. However, five participants who had failed to recall the event at the delay (one at 7 days, two at 42 days and two at 224 days) subsequently recalled it at the year session, indicating that subsequent exposure to the event

and forced rehearsal may serve to make the event more memorable (though not enough to completely prevent forgetting). Therefore, we do not believe that mere association with their 11th September memory or with participation in a psychology study is sufficient to make these events more distinctive and therefore, not comparable to other everyday events.

However, other comparison events are possible and may address this issue more directly. For example, in an undergraduate sample, one could specify the last class prior to the event as the autobiographical memory to be recorded. Therefore, this cue and the flashbulb-specific cue could be used for all subjects at all intervals, eliminating the need for our personalised cue-generation task. However, these events would differ from the FBMs by being highly scripted and repetitive as well as along the theoretically more relevant dimensions of novelty, surprise, consequentiality and emotionality. Alternately, someone close to the participant could nominate a unique event from the participant's life for comparison (e.g. Thompson, 1982). Then, being asked to describe that event at delay would be the participant's first exposure to the event within the experimental context. Therefore, the EDM will not have received any benefit from previous identification or association with the flashbulb event (Pillemer, personal communication, 26 July 2005).

The nature of the comparison event will necessarily depend on the most important feature(s) of the flashbulb event for which one wants to control. Our purpose was to find a specific, non-repeated, personally experienced event from the same time that included similar event features of people involved, an ongoing activity, a time, date and location. We also wanted participants to be able to rate memory for that event on the same phenomenological scales as for the FBM. Some have compared FBMs to event memory (Bohannon, 1988; Bohannon & Symons, 1992; Nachson & Zelig, 2003; Pezdek, 2003; Smith, Bibi, & Sheard, 2003; Tekcan, Ece, Gulgoz, & Er, 2003) to control for time and emotional import of the content information, while others have used ordinary news events as a comparison (Larsen, 1992) to control for the arbitrary and repeated nature of reception context. Each of these comparisons has strengths and weaknesses; the important point is to include a control event that is suited to task of describing some aspect of how FBMs are special.

Existing theories of FBM, though originally formulated to explain enhanced consistency, can be adapted to explain the phenomenological effects. The emotional-integrative model (Finkenauer et al., 1998) describes the four primary determinants of FBM: novelty (distinctiveness/surprise), consequentiality (personal importance/significance), emotional intensity (as a property of the individual, not of the memory) and rehearsal. Specifically, they postulate that a novel event leads to surprise and evaluations of consequentiality. These, then, enhance the individual's emotional reaction which encourages post-event elaboration and rehearsal. Nothing about this process is unique to FBM content. Post-event elaboration and social rehearsal can equally serve to enhance recollection, vividness and confidence in the memory's accuracy just as the acts of sharing one's narrative confirms the consequentiality and novelty of the event and eases emotional reactions.

Across two studies examining the function of recalled autobiographical memories, the majority were conversational retellings of an individual's personal experience with the topic at hand (Hyman & Faries, 1992). This would be exaggerated when the topic was not only of immediate significance to the conversational participants, but also of historical significance. In a sociological study of generation effects, Schuman and Scott (1989) describe spontaneous FBM reports in response to questions about the most important events in the last 50 years. Furthermore, there was a general trend to identify as important events that occurred in one's youth and early adulthood to justify such choices with personal experience narratives. This parallels Rubin, Rahhal, and Poon's (1998) finding of

a 'bump' in autobiographical memories for early adulthood. Other evidence suggests that 17–25 years is a critical age for the formation of a political identity (Mannheim, 1928 as cited by Schuman & Rieger, 1992, p. 324) which may explain anecdotal references to 11th September as this generation's Pearl Harbor and underscores the issue of generational and national connectedness. Similar examples can be seen when a political assassination attempt triggers John F. Kennedy assassination memories for Americans (Pillemer, 1984), when Hillsborough football stadium disasters cue other football disaster memories (Wright, 1993), or even when the Clarence Thomas hearings cue memories of personal sexual harassment experiences (Morse, Woodward, & Zweigenhaft, 1993).

Furthermore, rehearsal can account for the dissociation between confidence and accuracy as retellings do not differentiate between accurate and inaccurate details (Loftus & Kaufman, 1992; Skowronski & Walker, 2004). Errors that are rehearsed can become part of the memory (McDermott, 1996). In fact, subsequent reports are more similar to one another than to the original even with repeated exposure to the original and therefore, opportunity for revision (Howe, 1970; Kay, 1955). For FBMs, there is no veridical record so there are no opportunities for repeated exposure or opportunities for correction. Therefore, the errors that are introduced early are even more likely to persist. Subsequent events (especially those that underscore the personal importance of the primary event) may act as a 'repeat exposure' introducing more errors into the memory (what Brewer, 1988 called 'wrong time slice' errors). Furthermore, the goal of a rehearsal can influence what is recalled, omitted or exaggerated (Dudukovic, Marsh, & Tversky, 2004; Hyman, 1994; Marsh & Tversky, 2004). In each case, the objective consistency of the narrative would not necessarily be enhanced, but the recollective quality and vividness would be.

Wright and Gaskell (1992) applied Abelson's (1986) five attributes of belief to the attributes of a FBM report: sharedness with others (we all have a story to tell about this event), uniqueness from others (how I heard is different from how you heard), defensibility (my story is consistent over time), extremity (my story is interesting and informative) and centrality to one's identity (my experience of this event defines me as a person). Pillemer focuses on how the properties of the report subserve functions to the individual recalling the memory: to evoke emotionality, intimacy and immediacy (Pillemer, 1992, p. 245), to facilitate catharsis (p. 248) and to describe the directive effects of the event on one's life (p. 252–253). Similarly, Skowronski and Walker (2004) describe the need to be informative, understandable, relevant, honest and brief when sharing autobiographical memories with others. There is social reinforcement (to a point, see footnote number 1) for sharing one's story and a near involuntary need to disclose (Pillemer, 1992, p. 248). Rubin (1992, p. 269) commented that the hallmarks of a 'good' FBM are good narrative form, new and interesting information, including concrete, imageable details and emotional reactions. The intrusions of more dramatic events into the primary FBM narrative are primary examples of this. Neisser et al. (1996) describe the frequent intrusions of the Bay Bridge collapse in memories of the Loma Prieta earthquake. Mistakenly believing that one saw video of the first airplane hitting the World Trade Center is described by others (Greenberg, 2004; Pezdek, 2003). Paradis et al. (2004) argued that their Manhattan sample displayed enhanced memory for 12 September 2001 (in addition to 11th September) because of the pervasive effects that the terrorist acts had on their daily lives (e.g. disrupted work schedules, the sight of smoke, the military presence, etc.) for weeks after the event (p. 309). Again, these social factors all interact to enhance the phenomenological experience of remembering an event like the 11th September attacks.

The desire to 'never forget' results in overconfidence in the accuracy of our memory for hearing the news because the alternative is to admit being a callous observer and, in the case of the 11th September attacks, a poor patriot. Instead, we maintain vivid recollections and retell our stories in order to achieve social goals, not memorial ones. Therefore, our FBMs are differentiated by their phenomenological properties, not by enhanced accuracy.

### ACKNOWLEDGEMENTS

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