

*Analyzing Flashbulb Memories In Relation to the
Infantile Amnesia Barrier: A Study of 9/11*

Briarcliff High School

Gabby Blauner

Abstract

Flashbulb memories refer to the vivid recollection of certain emotionally poignant experiences, often constituting a feeling of “reliving” (Brown and Kulik, 1977).

Other psychological phenomena exist in relation to recollection, more specifically the infantile amnesia barrier. This “barrier” refers to the hindered recollection prior to the age of four (Bernsten, 2006). Prior research has analyzed these two psychological occurrences in isolation, however there has been a failure to emphasize these two events in conjunction with one another. The recall of a population of high school students was analyzed, as they were of a vulnerable age of three to six years old at the time of 9/11. This study investigated the level of memory impairment, as a consequence of their age at the time of the incident. Analysis of individual 9/11 memories from various age groups showed a novel finding that flashbulb memory formation was possible prior to the age of four, but not obligatory. The intensity of this recollection increased as a factor of age. Although age operates as a key factor in memory recall, it does not entirely ruin the possible formation of a memory, as it does the degree of that recollection.

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Review of Literature

Everyone of a certain generation has a memory of the Kennedy assassination, the Challenger disaster, the fall of the Berlin Wall, or 9/11. Characterized through their rich detail and specificity, these memories have often been described as “snapshots” in time (Brown & Kulik, 1977). More specifically, these vivid memories have come to be known as a phenomenon by the name of Flashbulb memories. As proposed by Roger Brown, PhD, and James Kulik, flashbulb memories develop as a photograph; characterized by their vividness, as well as their brevity(1977). Such memories are not only identified by the extensive detailing associated with it, but also the emotional aspect. The formation of this type of memory generally follows a traumatic or emotionally poignant experience. Recollection of these memories can often constitute the feeling of “reliving” the experience (Neisser & Harsch, 1992).

A flashbulb memory is comprised of several crucial assets. Where one was when the event occurred, who they were with, how they first heard the news; this is all readily available information, consistent with the formation of a flashbulb memory (Brown & Kulik, 1977). Even more so, simultaneous, yet trifling details, often craft a flashbulb memory as well. What one was wearing or how they couldn't find the remote to turn on the news. Random and trivial specifics are often highlighted as well, due to their idiosyncratic nature.

Flashbulb memories can occur on a personal scale as well. The global impact of an event is common, but not crucial to the formation. Two approaches can be taken to analyze the nature and occurrences of these memories: group differences or personal event differences. Group differences pertain to how different groups of

people recall the same type of memory. Meanwhile, personal event differences observe how one individual recalls an array of memories (Davidson, Cook, & Rapcsak, 2005). By focusing on a representative population and one global event, scientists have been more successful in studying group differences. Contrary to the study of group differences, scientists have successfully studied personal differences with a relatively small population, but a large number of events (Wright, 1995).

This debate of memory persists, as to whether or not a flashbulb memory should be analyzed as an individual faculty, or a social faculty. Brown and Kulik's study combined both these views (1977). A questionnaire was presented which inquired about a series of news events in addition to personal memories. The assortment of events was targeted to evoke significance with certain participants and not others, asking subjects to rank the importance of each memory, despite their personal of universal nature. As high rankings for a particular memory presented a direct correlation with "flashbulb characteristics", low rankings from other participants afforded much more ambiguous recollection for the same event. This allowed for the analysis of both group differences and personal differences.

Certain flashbulb memories, often those analyzed by group differences, serve as generational or social markers. (Law, 2011) However, some individuals are too young to remember these pivotal events. This occurrence is known as infantile amnesia (Howe, 2008). This condition refers to the lack of recall for children below an age of four. This lack of able recall results from continuous generation of brain cells in the hippocampus, even throughout adulthood. This process, known as neurogenesis, directly impacts the potential recollection of events, since the

hippocampus is the structure responsible for autobiographical memory formation (Insel, 2013). An insufficient amount of properly developed hippocampal cells limits the functioning and thus creates hindered recollection. The underdeveloped prefrontal cortex is yet another possible source of this hampered recall. However, as the prefrontal cortex is not as heavily responsible for event memories, this “barrier” exists at about 3.5 years. Context rich memories however, or episodic memories, have typically been limited to above the age of four (Drummey & Newcombe, 2002) Other explanations exist as well. One commonly accepted theory indicates that information that is stored early in life remains intact in storage. Consequently, infantile amnesia is the result of fluctuations in the retrievability of that information (Bowles, Mirsattari, Poppenk & Köhler, 2010). This theory designates the infantile amnesia barrier as a result of failed recall as opposed to failed storage. Opposing views provide that memory storage is incredibly fragile early in life and infantile amnesia is the direct result of this delicate storage system. (Kohler,1929). This theory indicates that the storage is the failed faculty, rather than the retrieval. The inability to store a memory entails that any sort of recall would be impossible.

As the current population of high school students was between these vulnerable ages of 3-6 at the time of 9/11, their flashbulb memory of the event may be impaired as a consequence of their age at the time. By distributing a questionnaire on the individual 9/11 experience, this study aimed to analyze a number of different aspects involving flashbulb memories, in conjunction with age for this target population.

- (1) How old do you have to be before a flashbulb memory can form?
- (2) Can flashbulb events breach the infantile-amnesia barrier?
- (3) Do these memories have "flashbulb" qualities?

Methods

Population

The recruitment population consisted of the current range of high school students, more specifically, ages 14-18. This is the age group that borders the infantile amnesia barrier in regards to 9/11. By analyzing this particular age group, the data will reveal how the individual's age at the time affected his/her current recall and the "flashbulb" attributes of this same memory. The participants consisted of both male and female studies taken from two high socio-economic suburban New York high schools.

Gender: M: 18 F: 35 Total: 53

Age Range: 14-18

Procedure

By advertising this survey through several different approaches, 53 participants were obtained. These approaches consisted of door-to-door visits and the distribution of consent forms throughout high schools.

Once parental consent was received, participants were sent a link via email to partake in the survey. There was no information required that would jeopardize their anonymity. Some sample questions can be seen in Figure 1 below:

Figure 1

*** Please evaluate this separate memory on the same seven point scale.**

	Not At All 1	2	Vaguely 3	4	Distinctly 5	6	As much for any memory or as clearly as it's happening right now 7
As I remember the event, I feel as though I am reliving it.	<input type="radio"/>						
As I remember the event, it comes to me as a coherent story and not as an isolated fact, observation, or scene.	<input type="radio"/>						
When I think about the memory, I see it through my own eyes.	<input type="radio"/>						
When I think about the memory, I see it from the perspective of an outside observer.	<input type="radio"/>						
While remembering the event, the emotions I feel are extremely intense.	<input type="radio"/>						
While remembering the event, the emotions I feel are positive.	<input type="radio"/>						
While remembering the event, the emotions I feel are negative.	<input type="radio"/>						
As I remember the event, I can see it in my mind.	<input type="radio"/>						
As I remember the event, I can hear it in my mind.	<input type="radio"/>						
As I remember the event, I can recall the setting in which it occurred.	<input type="radio"/>						
As I remember the event, it comes to me in words.	<input type="radio"/>						
Sometimes people know something happened to them without being able to remember the event. As I think about the event, I can actually remember it rather than just knowing it happened.	<input type="radio"/>						
Since it happened, I have thought or talked about this event.	<input type="radio"/>						
As I remember the event, people in the memory are talking.	<input type="radio"/>						

* Indicates Response Required

Preview

Upon the completion of the survey, the submitted results were added to a data base, without names or any identifying factors. Individuals were only given access to this survey after parental consent was received, thus assuring the participants are qualified. In order to attain the largest study population, consent forms were also administered at local camps and theater groups. Door to door visits were also a method used to attain more participants. At the approval of their parents, they too were emailed a link to the online survey. Students were only given access to the online survey once parental consent was received.

Results

The mean age from this sample study population was 5.06 (SD=1.03), the median age of was 5.36. Participants were grouped into two categories, “flashbulb” and “non-flashbulb”, dependent upon their memory score. This method, as used in prior research by Neisser and Harsch (1992), determines the occurrence of a flashbulb memory, judged on a 0-7 scale. The seven determining factors pertain to seven questions, as presented in the 9/11 survey.

Where were you when you first learned of the 9/11 attacks?

When did you first hear the news?

What were you doing at the time?

How did you hear about the news?

How did you react?

Who were you with at the time, and how did they react?

What happened afterwards?

The successful recollection of 6 or 7 of these points constitutes a flashbulb memory. Conversely, successful recall of any number below 6 concludes that it is not a flashbulb memory. (Neisser & Harsch, 1992). These factors determined the flashbulb, and non- flashbulb groups, respectively.

Figure 2: Neisser and Harsch Scale (Neisser &Harsch, 1992)

Memory Score	Number	Percentage
0	6	11.32
1	3	5.66
2	3	5.66
3	3	5.66
4	3	5.66
5	3	5.66
6	10	18.87
7	22	41.51

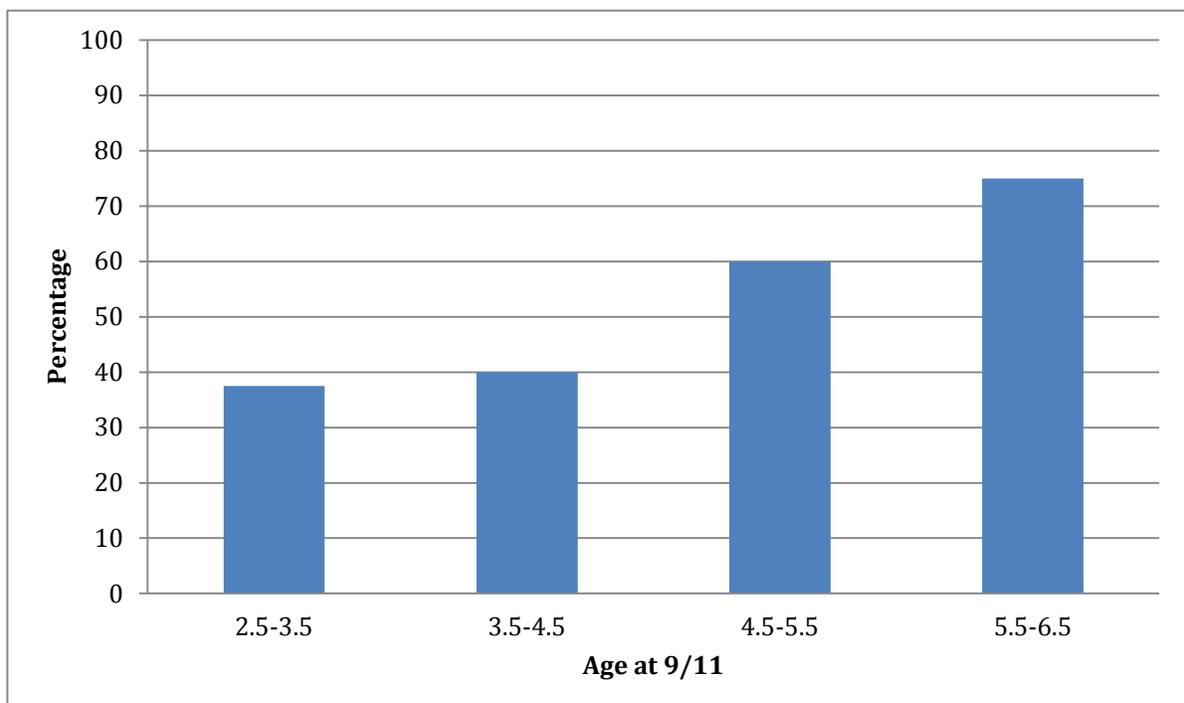
The “success” of responding to said prompts was judged based on the confidence in the participant’s response. Short answer responses that presented speculation were not deemed as “successful”, and thus did not contribute to the overall memory score. For example, in response to the prompt, “Where were you when you first learned of the 9/11 attacks?”, certain responses lack the definite recall that a flashbulb memory should contain. “I *must* have been in school at the time” or “I *think* I was at home” were common responses, not counted in the overall

memory score. While 9/11 recall for the US population was almost 100%, the data for this particular age group still presents a high percentage of flashbulb recall.

60.38% of participants had a flashbulb memory, based on the Neisser and Harsch scale(1992). Although this is lower than the general US population recall, it is not zero. Thus, implying that flashbulb memory formation is possible during this age range, but it's not obligatory

Nearly *all* US adults have some sort of flashbulb memory. However, as presented in the data, a majority of the participants possess a flashbulb memory, but not all. This evokes the question: What affects flashbulb memory formation? The key variable is age. A correlation coefficient was calculated between the presence or absence of a flashbulb memory and the participants' age. A positive association was found between memory and age, $r=0.28$. Older participants were more likely to form a flashbulb memory, due to their age at the time of 9/11

Figure 3: Percentage of Participants with a Flashbulb Memory



The percentage of participants with a flashbulb memory (Fig. 3) increased with age. The flashbulb group was further divided into four age groups, 2.5-3.5, 3.5-4.5, 4.5-5.5, and 5.5-6.5. As presented by the correlation coefficient, the youngest age group was also the smallest. Of all the participants at the age of 2.5-3.5 at the time of 9/11, approximately 37% of them formed a flashbulb memory. This is an underwhelming figure when analyzed in conjunction with the oldest age group, furthermore, the largest component of the flashbulb group. Of all the participants that were 5.5-6.5 at the time of 9/11, nearly 75% of them successfully formed a flashbulb memory. The 50% mark for this data arrived at approximately 4.5 years old.

While Neisser and Harsch's 0-7 scale effectively deems a memory as either flashbulb or non-flashbulb, it fails to evaluate the vividness of a memory. In addition to determining the presence, or absence, of a flashbulb memory, the distributed survey also investigated the qualities and intensity of the memory. A similar 7-point scale was used to evaluate a number of factors. The means of the respective variables are presented below.

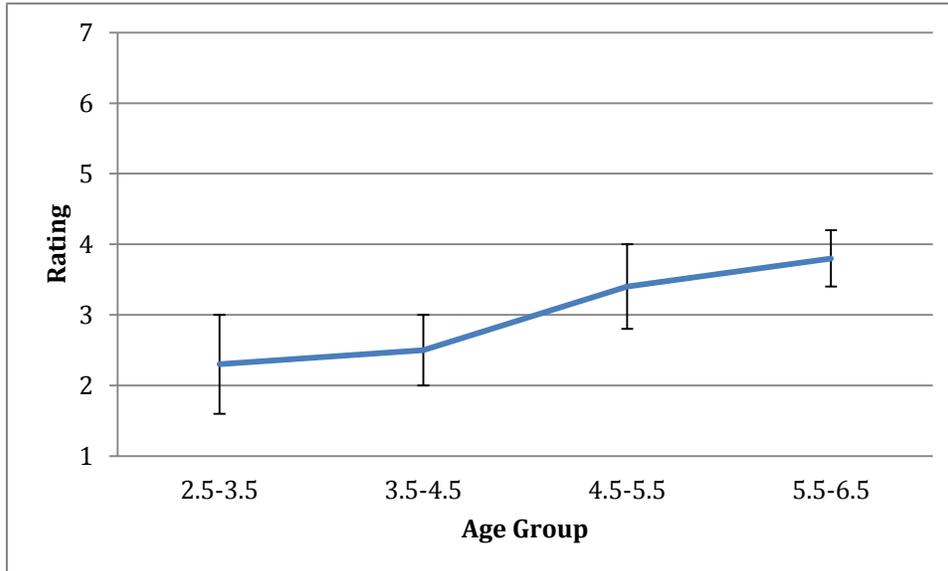
Figure 4: Components of a Flashbulb Memory

Variable	Mean	SD
Reliving	3.44	1.78
Narrative coherence	3.56	1.79
Own eyes	3.84	1.97
Outside observer	3.47	1.80
Emotional intensity	3.34	1.68
Positive emotions	1.63	1.36

Negative emotions	5.28	1.82
Visual imagery	4.94	1.70
Auditory imagery	3.31	1.77
Setting	5.47	1.72
In words	3.28	1.57
Remember/know	4.75	1.80
Rehearsal	5.97	1.56
Talking	3.34	2.18
Confidence	5.19	1.47
Mergext	1.72	0.63
Reliving	3.44	1.78

Figure 4 refers exclusively to the flashbulb group. The analysis of the means allows a quantitative look at the intensity of a memory. Receiving a score of a 7 would essentially embody the feeling of “reliving” the experience. Although all of these participants formed a flashbulb memory, the intensity of their memory is presented as mediocre in accordance to the mean values. A flashbulb memory is characterized by the ability to relive the event, however, the data indicates that these flashbulbs did not exhibit that expected. Although they can technically be considered as a flashbulb, they lack the richness and detail of a typical flashbulb. As ranked on a 7 point scale, a 3.44 ranking indicates that most participants do not actually feel as if the memory is being recreated or happening again. The most successful categories were visual imagery and confidence, receiving average means of 4.94 and 5.97, respectively.

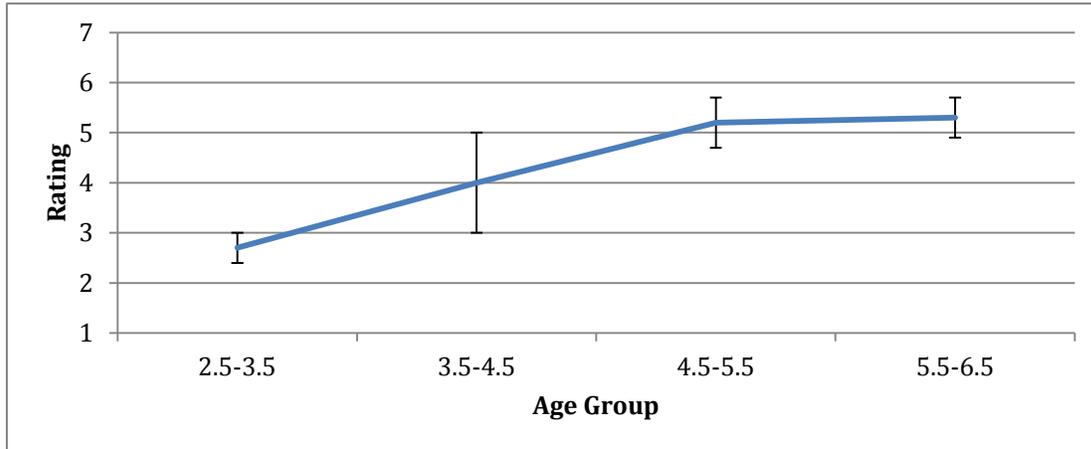
Figure 5: Feeling of Reliving



Reliving: $r = 0.28$, $p = 0.04$

Although most participants did not experience the expected “reliving” of the event, the older groups faced more success. The 5.5-6.5 age group, their age at the time of 9/11, indicated the highest numbers on the memory scale. Similarly, the youngest age group exhibited the lowest mean on the memory score. Once again, the 50% mark arrived at about 4.5, confirming the previously theorized age of the infantile amnesia barrier.

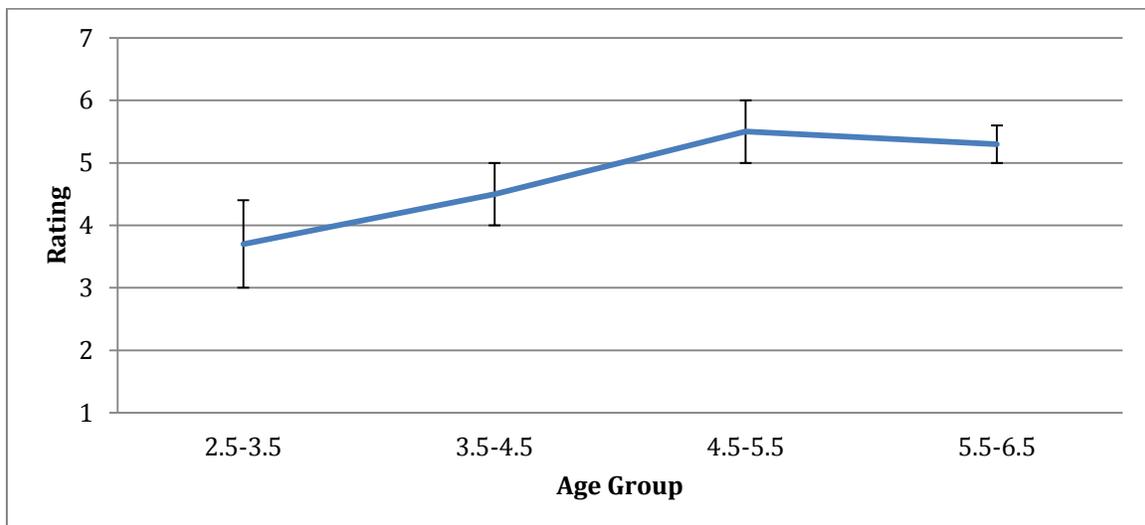
Figure 6: Visual Imagery



Imagery: $r = 0.37, p = 0.006$

Visual imagery exhibited one of the highest ratings. With a correlation of 0.37, age seems to have a fairly pressing influence on the participant's visual recall. Following the similar pattern, the 50% mark arrived at 4.5 years old.

Figure 7: Confidence



Confidence: $r = 0.38, p = 0.005$

The confidence category was determined by a series of “remember vs. know” questions, simply asking whether or not the participant remembers the occurrence themselves, or if they *know* it occurred. The difference here lies in the fact that many individuals are aware of a memory, not because of his/her personal recall, but because they have been told, this here would account for the “know” category. As presented in the data, the confidence rankings are not tremendously high. However, in flashbulb memories, confidence generally receives a score near 7. This ranking of 7 would coincide with the fact that the individual was “reliving” the experience at every recollection. However, our lower average means once again present the anomaly that although these participants are technically categorized as having flashbulb memories, they are not nearly as vivid as that of a typical flashbulb. Again, the middle percentile fell to be 4.5 years of age.

Discussion

This study provides evidence that while flashbulb memories are not mandatory for age groups below the infantile amnesia barrier, flashbulbs are still possible. Younger participants, below the barrier, were still able to form a flashbulb memory. Granted, the flashbulb group itself was mostly comprised of the older participants. The ages 5.5-6.5 were the largest contributor.

Even more so, these young adults did not experience a feeling of “reliving.” Although they were technically deemed as flashbulb memories, they do not exhibit the typical qualities that a flashbulb *should* exhibit. This provides evidence that the infantile amnesia barrier may not necessarily hinder the formation of a flashbulb

memory, but the effectiveness of one. The confidence and reliving scores, both relatively low, efficiently display this finding. Not only does the likelihood of forming a flashbulb memory decrease with age, but also the detail implied by that memory. The lowest age intervals had the least vivid recall.

These findings call for the re-evaluation of prior statements that the infantile amnesia barrier hinders any recollection before the age of 4-5 (Howe, 2008). Instead, this research further provides that age is in fact a determining factor. However, age does not entirely decimate the ability to form or recall memories. Instead, it may just hinder this formation.

Another facet brought to attention is the components of a flashbulb memory. Participants were successfully able to form a flashbulb memory, by Neisser and Harsch's standards. However, once analyzing the flashbulb group in isolation and the various assets of their recall, it was found that their flashbulb memory did not necessarily consist of flashbulb traits. Most participants from this study were successfully able to form a flashbulb, but a weak one. A weak flashbulb implies poor detailing and a lack of intensity, as shown by the means. Theoretically, a flashbulb experience should elicit all 7's on the Neisser and Harsch scale. However, this study had contrary findings. Either the requirements to form a successful flashbulb memory should be altered, or the traits of the flashbulb memory itself.

Conclusions, Limitations & Future Research

As previously mentioned, the mean age from this sample was approximately 5.06 (SD=1.03). Similarly, the median age was determined to be 5.36. 4.5 years old would have been the ideal mean for this study, as that age functions as the “brink” of infantile amnesia. More studies within a closer range to this desired mean, 4.5, would have provided for a more effective analysis of the effect of the barrier on recollection. However, due to the requirement of parental consent in addition to the willingness of participants, the range of ages within this study was indiscriminate. The collection of ages was entirely contingent upon the approval of the parent, in addition to the willingness of the participant themselves.

Sex differences should have provided for different levels of flashbulb recognition as well. Previous studies have indicated that females have earlier memories than males. However, this discrepancy between the male and female groups did not present itself in the data. Once again, this can be relayed to the study population, consisting of roughly twice the number of females as males.

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