



12-22-2013

Private Flashbulb Memories: The Case of Coming Out Memories

Gabrielle Weber
Butler University

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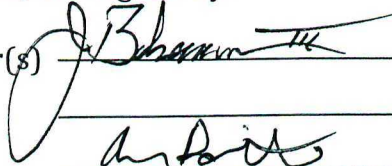
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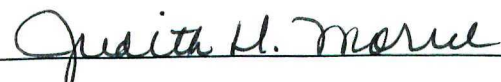
Thesis title Private Flashbulb Memories: The Case of Coming Out Memories

Intended date of commencement December 22, 2013

Read, approved, and signed by:

Thesis adviser(s)  12/5/2013
Date

Reader(s)  12/5/13
Date

Certified by  5-13-14
Date
Director, Honors Program

For Honors Program use:

Level of Honors conferred: University Magna Cum Laude
Departmental Highest Honors in Psychology

Private Flashbulb Memories:

The Case of Coming Out Memories

A Thesis

Presented to the Department of Psychology

College of Liberal Arts and Sciences

and

The Honors Program

of

Butler University

In Partial Fulfillment

of the Requirements of Graduation Honors

Gabrielle Weber

December 22, 2013

Abstract

Participants ($N = 83$) from Butler University and communities in Indianapolis, IN answered a three part questionnaire regarding their experience revealing their homosexual identity to their parents that included: a narrative, a set of probe questions, and a short demographic section. The narrative and probed recall data were scored in a similar fashion to flashbulb memory narratives with canonical features. The memory of revealing homosexuality to parents displayed flashbulb-like qualities. We found that those most confident in their probed recall answers were those with moderate arousal and few recounts. Also, those reporting moderate affect and fewer recounts had better memory elaboration of their coming out experience. As predicted, if the story of revealing one's homosexuality is retold and rehearsed many times, the effects of the initial arousal disappear. Contrary to our hypothesis, an effect of affect on vividness was not found. The current study provides evidence toward the memories of homosexuals coming out having flashbulb-like characteristics.

Private Flashbulb Memories: The Case of Coming Out Memories

Flashbulb memories (FBM) are engrams of the discovery of surprising, consequential, or emotionally arousing events. FBMs are vivid, detailed, confidently held, and seemingly impervious to forgetting. Most FBM studies examined recollections of discovering public events, such as assassinations of prominent political figures (Brown & Kulik, 1977), the Challenger explosion (Bohannon, 1988) or September 11th (Talarico & Rubin, 2003). Ever since 1977, memory research has investigated people's discovery of horrific public events (Pezdek, 2003). For example, Rubin and Kozin (1984) investigated private events and showed that these types of pleasant and aversive events are equally memorable if equally arousing (see also John Robinson 1980). In 1967, Livingston used rats to argue that events attaining certain thresholds of surprise and biological significance trigger a special neurobiological mechanism intended to make an indelible record of them. This research contributed to the belief by Brown and Kulik (1977) that a similar process might explain the vividness of FBMs.

Autobiographical memories such as first sexual encounters, car accidents, parental divorce announcements, and first kisses are also categorized as FBM (Bohannon, 2010) because they were recalled with same the canonical narrative features as public FBM as first described by Brown and Kulik (1977). These "highly accessible and vivid personal memories help to give meaning and structure to our life narratives and help to anchor and stabilize our conceptions of ourselves" as social creatures in the world and across our life span (Berntsen & Rubin, 2006, p. 1196). Hence, these types of private autobiographical memories can look like the types of

flashbulb memories seen with public events. The experience of coming out has been investigated and is thought to yield the characteristics of flashbulb memories (Rossi, 2010).

Reconstructive Recall

Two conflicting views exist regarding flashbulb memories: One view emphasizes the importance of emotion at the point of encoding (Bohannon, 1988); the other holds that perceptual vividness is reconstructed at recall, which can undermine accuracy (Neisser & Harsch, 1992; Talarico & Rubin, 2003; McCloskey, Wible, & Cohen, 1988). In sum, the primary FBM mechanism is believed to be arousal at encoding or reconstructive recall.

According to Hirst et al., (2009), the reconstructive recall hypothesis has more evidence than the encoding affect hypothesis. In his study, over 3,000 people from various cities in the United States reported their memories of learning of the terrorist attacks on September 11, 2001. In addition, participants reported details of the attack one week, eleven months, and 35 months after it took place. Results supported the reconstructive recall hypothesis. The rate of forgetting for FBMs was shown to slow down after a year. In addition, flashbulb events were poorly remembered when said events involved strong emotional reactions as compared to non-emotional. Lastly, the content of FBMs was shown to stabilize after a year.

Other support for the reconstructive recall hypothesis came from Mahmood, Manier, and Hirst (2004). Their study focused on deaths of loved ones from AIDS that various homosexual men had experienced. They aimed to disprove the idea that factors, such as event distinctiveness, personal importance, surprise, etc., predict vividness and elaborateness of memories. To investigate this idea, eighty homosexual men filled out surveys about friend's death related to AIDS. Vividness and elaborateness of the memory of the first death was contrasted with that of

the most recent death. In addition, distinctiveness was treated as the number of intervening deaths. Results supported their hypothesis in that no support was found for distinctiveness predicting vividness and elaborateness. The only predictor of memory characteristics was found to be emotional change, or change of affect.

Affect at Encoding

According to Brown and Kulik (1977), emotional arousal is related to personal significance. However, it is important to remember that these terms are not interchangeable. It is possible for an event to be very arousing, but not personally significant (Fivush, Bohanek, Marin, & McDermott-Sales, 2008). In addition, personal significance has the potential to affect the recall of FBMs independent of emotion (Neisser et al., 1996). In this study, subjects from both California and Atlanta were asked to recall their personal experiences of the Loma Prieta earthquake in California in 1989. The subjects recalled the event shortly after it happened and one and a half years later. Results showed that those from California recalled their earthquake experiences much better than those from Atlanta. Their findings demonstrate that personal significance related to the earthquake led to greatly improved recall. In addition, personal impact of an event leads to an increase in emotion which leads to more attention and deeper encoding of a specific event (Conway, 1995). Unfortunately, Neisser did not measure affect at encoding to determine if the California participants had a stronger emotional reaction than the Atlanta participants.

The encoding hypothesis has gained support from FBM source effects. Those who heard factual information concerning an event through the media had more elaborate factual details, whereas those who heard the news from another person were more likely to process their

discovery context, thus, enhancing recall of their personal details (Bohannon, Gratz & Cross, 2007; Rice, Fritz, & Bohannon, 2010). Also, those who were personally involved in an event recounted the event more with others. One's autobiographical memory can continually evolve through recounting the event because there is no veridical verification on these types of memories.

Regarding arousing events, the intensity of the emotion may be the most important factor in FBM, not the actual type of emotion. Robinson (1980) showed a series of words and asked subjects to recall the first personal incident that came to mind. He found that the intensity of the emotion was the only significant factor that predicted the speed at which the participant recalled an incident. In short, the stronger the emotions, the faster the memory came to mind. Multiple explanations have been introduced regarding the findings. More details may have been encoded because more emotion may lead to more attention being paid to details. In addition, more emotion may trigger a mechanism in the brain to remember information quickly (Robinson, 1980).

Many studies have supported the notion that affect effects memories (Er, 2003; Hornstein et al., 2003; Schmolck, Buffalo, & Squire, 2000; Christianson, 1992; Christianson & Lindholm, 1998; Reisberg & Hertel, 2003). Further, higher affect was associated with enhanced quantity, consistency, and accuracy (Julian, Bohannon, & Aue, 2008). In contrast, other researchers have questioned whether extremely high levels of emotion actually inhibit memory. According to Christianson and Hubinette (1993), a forgetting curve corresponded to the amount of emotion during encoding, such that the extent of detail recalled was affected by the level of arousal. An extremely high level of emotion can be so overwhelming that it leads to forgotten details. In addition, extremely low levels of emotion could also lead to remembrance of few details.

Because remembrance of details is characteristic of FBMs, research suggested that they are best formed when the level of arousal isn't extremely high or extremely low, but moderate (See Paul Gold 1987). These effects regarding low, moderate, and high arousal on memory are best explained with a Yerkes-Dodson inverted-U function, which stated that performance increases with physiological or mental arousal, but only up to a point (Yerkes & Dodson, 1908). According to Gold (1987), glucose injected in rats immediately after training enhanced their memory the next day. Supporting the superiority of moderate arousal, an inverted-U function was found for glucose in the dose-response curve. The work done by Gold (1987) expanded upon the already established support for the enhancement of memory after adrenaline. It was found that the rise of plasma glucose levels acted on memory. This research not only supported the Yerkes-Dodson inverted-U function, but the importance of arousal in the forming of new memories.

It has also been hypothesized that surprise may play a role in FBMs. According to Brown and Kulik's (1977) study on people's memories of JFK's assassination, the news of JFK's death was rated by participants as having high levels of surprise. These high levels of surprise were one of the determinants they believed correlated with the highly detailed and vivid account for their discovery of JFK. However, Vaclavik (2011) found that those who planned an event (first sexual encounter) actually had better memories for said event. Because coming out is a planned event, these findings predict better coming out memories.

Neuroscience and Emotion

To further investigate the influence of emotion/affect on memory it is important to turn to neuroscience. The question is whether the brain consists of structures that are specifically

designed to process emotional memories. If specific brain structures are involved only with emotional memory, then the affect hypothesis would gain strength. Much of the work involving specific emotional memory mechanisms involved animals, but a few do involved human subjects (Buchanon & Adolphs, 2004).

Ledoux (1996) first investigated fear learning with rats with both unilateral and bilateral amygdaloid destruction. Classical conditioning was used, and the rats were taught to respond to a white noise. It was found that these rats with amygdaloid destruction had a reduction in fear learning, while the rats without lesions showed no reduction. In sum, the amygdala was shown to receive emotional input. Another animal study was conducted with primates by Buchanon & Adolphs (2004). They argued that brain mechanisms that encode, consolidate, and retrieve memories may operate differently in emotional and nonemotional contexts. Once again, the amygdala was the brain structure upon which the researchers focused. It was found that bilateral amygdala damage in primates affected emotional processing and behavior and not anterograde amnesia as expected.

Similarly, according to Cahill and McGaugh (1998), human-subject studies have confirmed the prediction of previous animal work that the amygdala is involved in the formation of enhanced declarative memory for emotionally arousing events. The emotional reactions of patients with damage to their amygdala were investigated along with the results of numerous studies regarding amygdala damage in animals. Because many patients with amygdala damage had normal emotional reactions, Cahill and McGaugh (1998) suggested that the amygdala in humans “might not be critical for an emotional reaction per se, but for processes translating an emotional reaction into enhanced long term recall.” This research into the amygdala contributes to the view that emotion indeed does impact memory.

Fortunately, human-subject studies do not end with the amygdala, but investigate emotion in many ways. In a study done by Gold (2003), evidence for cholinergic regulation of memory systems was established. Subjects were given lemonade that was either sweetened or saccharine and then were asked to do some complex memory tasks. As mentioned previously with his work on glucose, Gold (2003) found that higher plasma glucose led to better performance on the memory tasks. This supports the importance of glucose on memory (Gold, 1987).

In addition to plasma glucose, McGaugh and Izquierdo (2000) studied stress hormones and neurotransmitters. They criticized the way that researchers were administering drugs before training in animal studies. If administered before training, it is difficult to determine if the drugs actually act on memory processes. In order to solve this problem, they administered drugs after training. By using this method, they studied whether epinephrine, corticosterone, noradrenaline, GABA, and glutamate could modulate memory. In line with their method, Abercrombie, Kalin, Thurow, Rosenkranz, and Davidson (2003) performed a study in which they investigated cortisol and its effect on emotional memory. Ninety men were given either a placebo or 20 or 40 mg of cortisol. In addition, the men were shown either emotional or neutral stimuli. Within one hour of cortisol administration, those who received cortisol made fewer errors on memory tests. More importantly, memory was best for the 20 mg group after two days. These results show a Yerkes-Dodson inverted-U function, with a moderate level of cortisol leading to the greatest memory. This cortisol research corresponds with previously discussed evidence for moderate arousal (Christianson & Hubinette, 1993; Gold, 1987; Yerkes & Dodson, 1908)

Another aspect of neuroscience and memory involves neuroimaging studies. First investigated was metabolism with fMRI (functional magnetic resonance imaging). Canli, Zhao,

Desmod, Kang, Gross, and Gabrieli (1999) used fMRI and emotional images to determine which areas of the brain show increased activity. Better recognition of emotional images was found. In addition, during initial exposure, increased activity was recorded in the amygdala, the insula, and the right middle frontal gyrus. These findings suggest that it is more than just the amygdala that responds to emotion in memory.

Another type of neuroimaging involves PET (positron emission tomography). Cahill, Haier, Fallon, Alkire, Tang, Keator, Wu, and McGaugh (1996) used PET and investigated the activity of the amygdala with the storage of memory for emotionally arousing events. Subjects were shown either arousing or neutral videos and asked to rate their emotional reaction. After three weeks, subjects were called back and their memory was tested. It was found that many more emotional videos were recalled, and higher emotional reactions were recorded for emotional videos. Results showed that the glucose metabolic rate of the right amygdala and the memory of emotional videos were positively correlated after three weeks. Once again, the amygdala was implicated in emotion and memory formation.

The last neuroscience aspect that has been investigated involving emotion is electrical differences. According to Dolcos and Cabeza (2002), emotional events were remembered better than nonemotional events. To investigate this, they measured two event-related potentials: the emotion effect and the subsequent memory effect. As described by the researchers, “The emotion effect: more positive ERPs for pleasant or unpleasant stimuli) and the subsequent memory effect: more positive ERPs for subsequently remembered items).” Event-related potentials were measured while participants rated unpleasant, pleasant, and neutral images. Results showed that recall was better for pleasant and unpleasant pictures, which was associated centroparietal activation. This provided evidence for increased processing for emotional information.

Overall, neuroscience has suggested that the brain has specific structures that support the processing of emotional memory. Research suggested that emotion does indeed impact memory, which supports the possibility that affect at encoding is important in establishing FBMs.

Accuracy and FBM

One of the biggest, longest lasting debates regarding FBMs involves accuracy. Ever since the first FBM studies, research has been conducted regarding accuracy of memories and both support and opposition have been found. McCloskey, Wible, and Cohen's (1988) study regarding memories of the Challenger explosion opposed the notion that FBMs are more accurate than regular memories. They suggested that if flashbulb memories were special, they should be resistant to forgetting. Nine months after their first test regarding the explosion, participants showed as much as 7% inconsistency and had a very high confidence in their inaccurate answers. Because of their results, the researchers concluded that FBMs were no more confident or vivid than regular memories and the idea of FBMs should be discarded (however, for a more complete discussion see Schmidt & Bohannon, 1988). On the other hand, Bohannon and Symons (1992) found very consistent results regarding the same disaster over 36 months. Further, these recollections were associated with more confidence in the memories, more extensive memories, and a stronger emotional response at encoding to the flashbulb event.

Other studies have also supported the accuracy and consistency of FBMs. Assessment of the Marmara earthquake found consistent, detailed memories, especially when arousal was involved at encoding, which further supports the encoding hypothesis (Er, 2003). Furthermore, Hornstein, et al. (2003) found that emotional arousal at the time of discovery and recounts of the memory were related to consistency three months and 18 months after the flashbulb event. Thus,

although FBM accounts appear to be vulnerable to distortions, heightened arousal was associated with more consistent memories. Studies supporting the opposite view either did not have scales to measure arousal (Neisser & Harsch, 1992) or had very small sample sizes (McCloskey et al., 1988; Neisser & Harsch, 1992; Talarico & Rubin, 2003).

Consistency has been held as the best way to measure accuracy in FBM, but no research actually supports this notion. Julian, Bohannon, and Aue (2009), which consisted of over 1,300 participants, showed that in cases of autobiographical memories, accuracy was strongly correlated with memory quantity and consistency over time. In their study, consistency was measured for the discovery narrative, discovery probe, fact narrative, and fact probe portions of the questionnaires regarding various flashbulb events (e.g., Princess Diana's death, 9/11, the Columbia space shuttle disaster, and the capture of Saddam Hussein). In the narratives, consistency was examined for each of the canonical narrative features mentioned above and for the probes, consistency was found for each of the questions. The researchers found that memory consistency predicted accuracy as well as the elaborate quantity of recall. Also shown was that, regardless of delay, the more a person rehearsed, the more likely the memory would have more details and last longer over time. The results of Julian et al (2009), provided evidence for the accuracy and consistency of the memories recorded when they were correlated with highly detailed memory quality and frequent rehearsal.

Consequentiality and FBM

Another aspect that affects the establishment of FBMs is consequentiality. According to Brown and Kulik (1977), people tended to remember events based on their level of consequentiality. As mentioned previously, memory research has investigated people's discovery

of horrific public events. Both public and private events have been found to elicit strong emotions with the same type of memory elaboration. Hence, something personal, like a first kiss, can be remembered in as much detail as a public event, like a terrorist attack. Both types of events have led subjects to remember very specific details months after the event had occurred (Christianson & Hubinette, 1993).

Demonstrating consequentiality, Brown and Kulik (1977) found that black subjects were significantly more likely to recall the circumstances of their discovery of the death of Martin Luther King Jr. than white subjects. As previously mentioned, Conway (1995) found that Americans remembered the resignation of Margaret Thatcher much poorer than British subjects. These results demonstrating consequentiality provide evidence for the encoding hypothesis because of the effect of personal significance at encoding. The reconstructive recall hypothesis is refuted in this context because of the importance of emotion/significance in memory. Thus far most research on private FBMs has focused on either physical threat (childhood injuries or car accidents) or sexual events (kisses, sex or infidelity).

Current Study

Coming out to one's parents is distinct because it involves neither physical threat nor reproductive opportunity. However, informing parents of their same sex preference is a defining moment in a homosexual's life, often involving great fear and arousal. Although a negative event in the sense that one's parents may not approve, the coming out experience cannot be assumed to be a negative event for all. According to Savin-Williams (1989), for many gay and lesbian youths, the most difficult decision to make after recognizing and then accepting to some degree,

their nontraditional sexual orientation is to reveal to their parents that they will not be fulfilling the heterosexual dreams of their parents.

According to Rossi (2010), much can be learned from examining the content people remember about their autobiographical episodes. These episodes help people both structure their lives and stabilize their self-conceptions. In her study, it was found the 5-6% of 7-12th graders identify as homosexual. This amounts to approximately 2.25 to 2.7 million children. Also reported was the average age of coming out to parents, which was 17. Common fears of coming out to parents involved feeling rejected, provoking parental guilt, being blamed, and disappointing parents.

The purpose of the current study was to examine a potentially negative, arousing, private event that is not surprising to see if it evoked flashbulb canonical features in people's memories. Thus far research regarding coming out memories being FBMs has focused on mere suggestions and predictions, so this study is breaking new ground. By testing specifically for memories of coming out to parents, we will further research about both homosexuals and the coming out experience. The effect of affect and recount on the vividness and confidence of autobiographical memories of the revelation of sexual identity by homosexuals will be investigated. The central hypotheses in this study were as follows:

1. If moderate arousal evokes greater recall of details regarding FBMs as proposed by Christianson and Hubinette (1993), then those reporting moderate affect during the coming out experience will remember more details and rate their memories as more vivid.

2. Those reporting moderate affect during coming out will also have more confidence in their memories.
3. Those with low affect will also be those reporting more recounts/rehearsals of coming out. The initial effects of the arousal at encoding will diminish due to frequent retelling of the event.

Method

Participants

Participants ($N = 83$), including undergraduates from Butler University and residents of communities in Indianapolis, IN, participated in this study. Extra credit was offered to student participants enrolled in psychology classes of Butler University. Those not enrolled were given no incentive.

Design

This study was a 3 (affect: calm/moderate/upset) x 2 (memory measures: narrative/probe) x 2 (recount: few/many) x 2 (experimenter: Weber/Jennings) cross-sectional, mixed-model design. The memory measures variable was within subjects and also constituted the elements of measured memory. The other three variables were between subjects. The criterion dependent variables were memory elaboration (measure), confidence ratings, and vividness ratings.

Materials

We used a questionnaire that consisted of several parts: a narrative and a set of probe questions regarding the experience of revealing one's homosexual identity to their parents and a short demographic section. Participants also reported the number of times they recounted their

coming out story to others. The questionnaire was distributed to different participants as they agreed to take part in the study. See Appendices A, B, C, and D for the complete protocol.

Procedure

Participants first read and signed an informed consent agreement (See Appendix A) and began their narrative of how they revealed their homosexual identity to their parents (See Appendix B). Participants were not allowed to continue on to the other parts of the questionnaire until they finished their coming out narrative.

After completing the narrative, the participants moved on to the discovery probe questions regarding what the participants were wearing and doing at the time of their coming out experience, what the date and time were, what the weather was like, etc. (See Appendix C). For each question, the participants rated their confidence in their answers on a scale of one to five, with one meaning “not sure at all” and five meaning “extremely confident.” Also asked was the amount of times participants recounted their coming out experience to others.

Upon completion of the probed questions, participants moved on to the final part of the questionnaire: the demographic section (See Appendix D). Questions were asked regarding sexual orientation, birthday, sex, and to whom the participant revealed their homosexuality. Again, participants were not allowed to move on to the demographic section until they had completed the probed questions. Participants took roughly 10-20 minutes to complete the questionnaire.

Scoring

The coming out narrative was scored for the presence of flashbulb canonical features (see Julian et al., 2008) and the presence or absence of answers to our detailed probe questions, all of which were scored on a scale ranging from 0-3 (see Appendix D). The more detailed the narratives were, the higher the score they received on the 0-3 scale. For example, a score of 0 indicated a lack of response, a score of 1 was given for an implied response, and scores of 2 and 3 were for more elaborate responses.

In addition, modified scoring rules were used between free and probed recall with the same canonical features (see Appendix F for complete scoring rules and examples). To establish inter-rater reliability, each of our 12 lab members blindly scored a set of four narratives and probes. Disparities among scores were discussed for each section and amendments were made to the scoring rules. The scoring rules were amended until at least 90% accuracy was maintained between all of the scorers. The remainder of the protocols was scored using the amended scoring rules.

Results

Participants were grouped regarding their reported affect (high affect vs. low affect) and how many times they recounted/rehearsed their stories of revealing their homosexuality to their parents (high recount vs. low recount). Our study involved two experimenters: Jennings and Weber. Experimenter Jennings collected 60 subjects, and experimenter Weber collected 23 subjects. To account for possible error present due to the use of two experimenters, we examined the means of each of our variables: narrative, probed, probed confidence, vividness, recount, arousal, and surprise. When the means for a variable were significantly different between experimenters, the mean difference was added remove/normalize the possible experimenter

differences. Experimenter Jennings consistently had lower means than experimenter Weber, so mean differences were added to Jennings each time a significant difference was found.

Significant mean differences were found for four variables: probed, narrative, probed confidence and vividness (see Table 1). Once the means were equalized, it was possible to analyze the data using mixed measures ANOVAs.

To observe memory recall differences as a function of affect, we employed ANOVA, 3 (affect: calm/moderate/upset) x 2 (memory measure: narrative/probe). Memory measure was a within subjects variable. We found a significant main effect of affect on probed memory, $F(2,78) = 3.596, p = .0321$, such that those with moderate affect ($M = 1.741$) remembered more on the probes than those with calm affect ($M = 1.437$) and upset affect ($M = 1.443$). A Cohen's f^2 post hoc test was run and demonstrates this effect, $f^2 = 0.223$. As is evident through the data, the effect of affect on probed memory showed an inverted U relationship. These results are consistent with the view that moderate arousal is best to form flashbulb memories (Gold, 1987). However, there was no significant interaction or main effect of affect on narrative memory, $F(2,78) = 1.455, p = .2398$ (see Table 2).

We also analyzed the dependent variables of recount and confidence using the same mixed measures ANOVA as stated above. A significant main effect of affect on probed confidence was found, $F(2,78) = 3.692, p = .0294$, such that those with moderate affect ($M = 3.718$) were more confident in their memories than calm ($M = 3.222$) or upset ($M = 3.382$) subjects. A Cohen's f^2 post hoc test demonstrated this effect, $f^2 = 0.253$. Once again, the effect of affect showed an inverted U relationship, suggesting that a moderate affect is the most beneficial going into the coming out experience. This finding was in opposition to our second hypothesis regarding higher affect leading to more confidence. In addition, we found a

significant affect by recount interaction on probed confidence, $F(2,78) = 3.284, p = .0427$ (see Figure 1). Once again, a Cohen's f^2 post hoc test demonstrated the effect, $f^2 = 0.233$. A marginally significant affect by recount interaction was also found in the narrative, $F(2,78) = 2.311, p = .1059$, such that those with few recounts and moderate affect ($M = 1.952$) displayed the greatest memory elaboration in the narrative (see Figure 2). A Cohen's f^2 post hoc test demonstrated this effect as well, $f^2 = 0.177$. This finding is in line with our third hypothesis, which states that the more subjects recount their coming out, the lower the affect.

Lastly, we conducted a one-way ANOVA for affect (calm/moderate/upset) on the dependent variable of vividness (see Table 2). We predicted a significant affect effect on vividness, but no significant effect was found, $F(2,81) = 1.785, p = .1743$. A trend emerged, but this effect was not nearly strong enough to attain significance.

To analyze the flashbulb memory features present in the narrative, another ANOVA was run. We found a significant difference between flashbulb memory features, $F(5, 390) = 3.373, p = .0054$. A Scheffe post hoc test showed that two flashbulb memory features, activity and time, varied significantly, $p = .0024$, such that, in the narrative, the activity of the narrator during coming out was significantly different than the time the narrator came out.

Discussion

This study investigated whether a nonsurprising, arousing private event could display flashbulb-like qualities like public events. Few flashbulb memory studies have examined private events (Rubin & Kozin, 1984; Robinson, 1980; Vaclavik, 2011). The current study, however, focused on the revealing of one's homosexual identity to one's parents, and found that the coming out experience elicited characteristics of flashbulb memories. In many cases in our study,

individuals were able to report canonical flashbulb features, such as the activity leading up to the announcement, the location at the time of the announcement, the time of the announcement, etc. (see Appendix E for all canonical features).

We found support that homosexual's coming out to their parents characterize a FBM. Those with moderate affect who recounted their experience on few occasions were significantly more confident in their memories than those with calm or upset affect who frequently recounted. Similarly, those with moderate affect who recounted their experience on few occasions were marginally more elaborate in their memories than those with calm or upset affect who frequently recounted. It is important to mention that sample sizes of the affect groups were unequal, with much more being calm (See Table 2). Lastly, our third hypothesis was not supported in that we did not find an effect of affect on vividness.

Our analyses supported that a moderate level of affect is best to forming FBMs. An affect effect was found for the probed measure. In line with the research, the most elaborate memories in the probed section were found when affect was at a moderate level. A possible explanation of our findings refers back to the suggestion that emotion effects evoked by an event at the time of encoding are best explained with a Yerkes-Dodson inverted-U function. The majority of studies have used only two levels of arousal: low and high. Because this study included three levels of arousal, the inverted-U function was able to be adequately investigated. The research suggested that performance increases with physiological or mental arousal, but only up to a point (Yerkes & Dodson, 1908). In this view, arousal could be so overwhelming that people fail to encode many details, which inhibits memory performance (Christianson & Hubinette, 1993). The amount of glucose released during the coming out process may have inhibited rather than contributed to the memory process because of the high arousal level (Gold, 1987). In this case,

participants coming out to their parents could have been so overwhelmed/aroused by the experience that their ability to encode details of the experience could have been negatively affected. The Yerkes-Dodson inverted-U function was found in a number of our analyses and characterizes our findings.

Also in line with the inverted-U function, we predicted that those reporting moderate affect would be more confident in their coming out memories. Our results indicated that those most confident in their memories were indeed those with moderate affect. These findings were significant and were presented as an inverted-U function (Yerkes & Dodson, 1908). Memory confidence, like elaboration, was inhibited when arousal was at a very high level during coming out. It seems as if the coming out experience is highly susceptible to the negative consequences proposed of very high affect.

We also hypothesized that the participants who recounted their coming out experience with others often would lose the initial effects of arousal at encoding due to habituation to said arousal. We posited that rehearsing a story over and over would lead to a much less emotionally charged story. As with many activities, frequent rehearsal leads to a habituation to the task being rehearsed (Bohannon, Gratz, & Cross, 2007; Rice, Fritz, & Bohannon, 2010). Our results showed a significant affect by recount interaction in probed confidence, and a marginally significant affect by recount interaction in the narrative measure. Once again, the moderate affect condition was found to have the best memory elaboration and memory confidence. However, this time, those with moderate affect were significantly less confident in their memories when they recounted their coming out experiences many times as opposed to few. The same was found regarding memory elaboration in the narrative measure, but this effect was only marginal. Our

hypothesis was supported, which suggested that frequent rehearsal of the coming out experience leads to habituation and the loss of initial arousal effects present at encoding.

Our third hypothesis regarding affect and vividness also stemmed from previously discussed research which showed that moderate affect leads to increased remembrance of details in regards to FBM (Christianson & Hubinette, 1993; Gold, 1987). This research raised the issue that very high affect can actually damage the quality of the memory. In addition, very low affect can lead to remembrance of fewer details as well. We predicted that those with moderate affect would rate their memories as more vivid. Contrary to our predictions, we found no significant effects of affect on vividness, which counteracts with the research regarding moderate arousal (Christianson & Hubinette, 1993; Gold, 1987; Abercrombie et al., 2003). It is very possible that the coming out process differs in some way from other private events, but this difference is not clear.

In studying flashbulb memories, the question of whether memory effects are due to the variables measured or due to error, often arise. In addition, the issues of accuracy for reported memories are of concern. However, the findings in this study should be considered as valid. Julian, Bohannon, and Aue (2008) showed that memory consistency predicted accuracy as well as the elaborate quantity of recall. The results of Julian et al (2009), provided evidence for the accuracy and consistency of the memories recorded when they were correlated with highly detailed memory quality and frequent rehearsal. The current study used established scales to measure arousal (see Appendix C) and investigated recounts as a means of accuracy.

Limitations

Like all studies, this study was definitely not without its limitations. The independent variables studied (i.e., measure, affect, recount, and experimenter) were not true independent variables because they could not be randomly assigned. This may have allowed for other unmeasured variables to be responsible for the results found. When interpreting the results, one should be cautious.

Another limitation was that the majority of the participants in this study were college students. We did not measure if this had any influence over the participants' responses and could have potentially ignored a significant variable on measures of the study. A third limitation was the small sample size. Because of the difficulty in finding subjects, our data is not as strong as it could be. If more subjects had been found, some of the effects reported could have disappeared and new effects could have developed.

Lastly, all of the participants in this study were homosexuals who came out to their parents. Each participant reported their parents' affect during the coming out experience. It would have been beneficial to send protocols to the parents to see what they report as their affect during the experience. Getting information from the parents could lead to a much wider range of information. In addition, protocols of homosexuals could be compared to that of their parents and additional effects could develop.

As a result of our research, homosexual's coming out to their parents can now be thought of as a flashbulb memory. It is best to be moderately aroused during the coming out process because this level of arousal leads to the best memory elaboration. Initial arousal effects also decrease when the coming out story is recounted multiple times. Because the coming out

process has never been fully investigated in relation to flashbulb memories, our findings are new and contribute a large amount to the FBM research.

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Tables*Table 1. Mean narrative, probe, probed confidence, recount, surprise, arousal, and vividness as a function of experimenter*

Variables	Jennings N= 60	Weber N= 23	F (2,81)	P <	Mean Difference Added
Narrative	1.178	1.435	2.782	.0992	.266
Probed	.922	1.489	19.086	.0001	.508
Probed Confidence	2.727	3.332	9.239	.0032	.622
Vividness	3.267	4.000	6.723	.0113	.733
Recount	10.183	9.652	.056	.8133	0
Surprise	2.950	2.478	2.921	.0912	0
Arousal	3.100	3.087	.002	.9668	0

Table 2. Mean narrative, probe, probed confidence, and vividness as a function of affect

Variables	Affect: Calm N= 53	Affect: Moderate N= 17	Affect: Upset N= 14	F (2,78)	P <
Narrative	1.395 SD= .555	1.635 SD= .778	1.397 SD= .655	1.455	.2398
Probed	1.437 SD= .482	1.741 SD= .429	1.443 SD= .309	3.596	.0321
Probed Confidence	3.222 SD= .840	3.718 SD= .560	3.382 SD= .808	3.692	.0294
Vividness	3.827 SD= 1.127	4.208 SD= .983	4.400 SD= 1.293	1.785	.1743

Figures

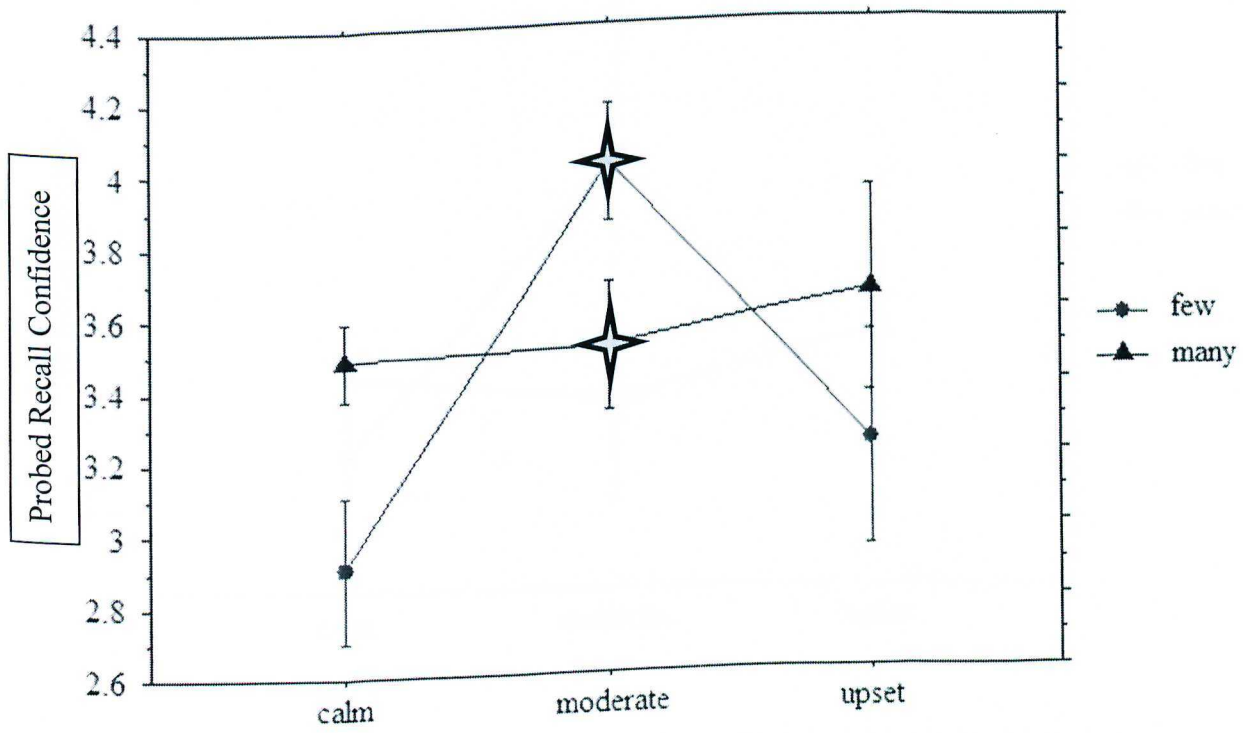


Figure 1: Significant affect by recount interaction on memory confidence, as indicated by stars.

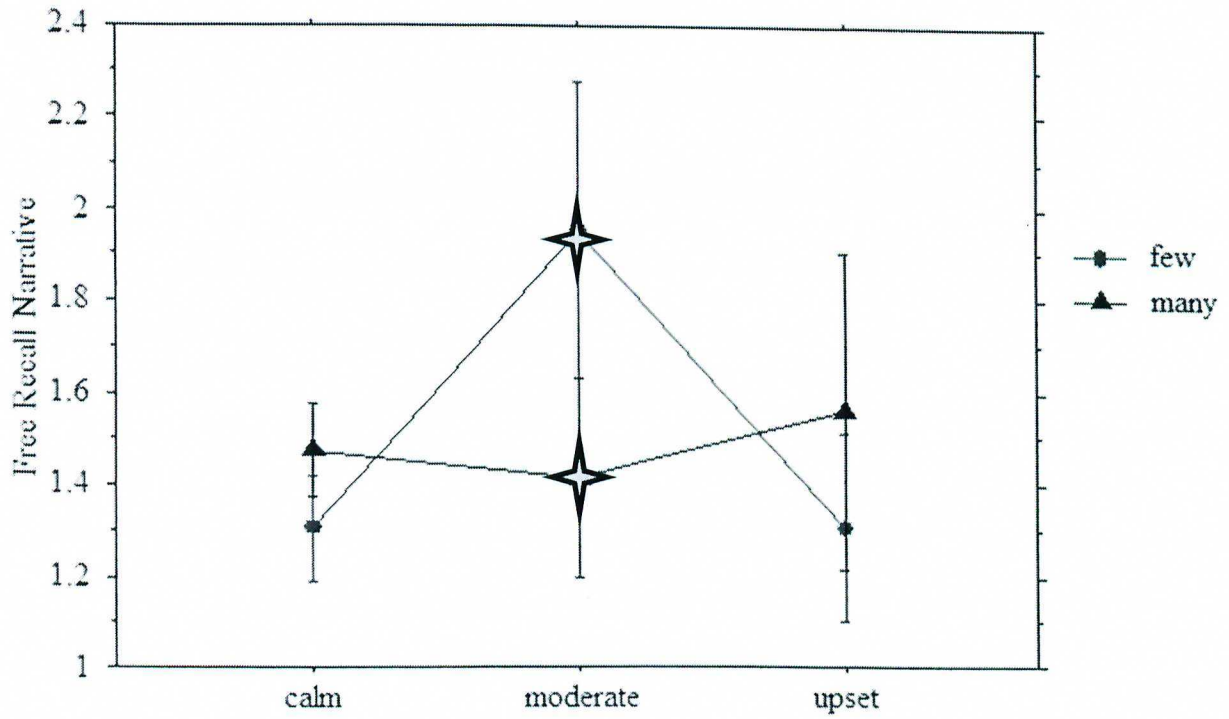


Figure 2: Marginally significant affect by recount interaction on memory elaboration, as indicated by stars.

Appendix A

Statement of Informed Consent for Speaker

I have read the below statement, understand my rights, and agree to these conditions.

Signature _____ Date _____

Name (please print) _____

Address _____

Phone Number _____

Professor _____ Class _____

Tear along the above line and keep the bottom portion for you records.

This psychology experiment examines memories of the coming-out event to parents. The coming-out event is meant to represent the exact moment that homosexuals/bisexuals told their parent(s) about their non-heterosexual identity. All responses will be kept confidential and will be used only for the purposes of this experiment. Your personal data will be removed from the questionnaire and stored separately from the data. Questionnaires will be scored and stored in a locked research laboratory that only investigators will have access to. No third parties will have access to the information. However, if confidentiality is breached in any way, the data will be discarded and disposed of immediately.

Each participant will answer various questions concerning the revelation of sexual preference to their parents. The entire process should take approximately 30 minutes. This experiment is entirely voluntary. You may discontinue your participation at any time, without any penalty, and any information you provide will not be used. It should also be noted that some participants are offered extra credit for their participation by certain professors.

Please do not discuss the study with anyone during or after the experiment. At your request, we will fully inform you of the results of this experiment. Thank you.

If you have any questions feel free to contact:

Gabrielle Weber
219-380-6544
geweber@butler.edu

Dr. Bohannon
317-940-9240
nbohanno@butler.edu

Appendix B

Narrative

Please write a detailed account of the circumstances surrounding the first time you revealed your non-heterosexual orientation to your parent[s]. Please describe as much of the event you remember, including all details. Be as inclusive and accurate as possible.

Appendix C

Probe

Please answer the following questions as specifically as possible to the best of your recollection. Also, please rate your confidence in each answer according to the below scale:

1	2	3	4	5
Not sure at all	Somewhat confident	Moderately confident	Very confident	Extremely confident

What were you wearing when you told your parent[s] about your sexual orientation? _____
 _____ Confidence Rating: _____

What was your parent[s] wearing when you told them about your sexual orientation? _____
 _____ Confidence Rating: _____

What was the exact date you told your parent[s] about your sexual orientation? (Month/day/year) _____
 _____ Confidence Rating: _____

What day of the week did you tell your parent[s] about your sexual orientation? _____
 _____ Confidence Rating: _____

What time did you tell your parent[s] about your sexual orientation? (To the nearest hour, AM/PM) _____
 _____ Confidence Rating: _____

Where were you when you told your parent[s] about your sexual orientation? _____
 _____ Confidence Rating: _____

What were you doing before you told your parent[s] about your sexual orientation? _____
 _____ Confidence Rating: _____

What was the weather like the day you told your parent[s] about your sexual orientation? _____
 _____ Confidence Rating: _____

Approximately how many times have you related the story of coming-out to your parent[s] to another person? (Amount in numbers) _____

Please circle your **arousal level** at the time you told your parent[s] about your sexual preference on the scale provided below.

1	2	3	4	5
Calm/Indifferent	Somewhat aroused /agitated	Moderately aroused/agitated	Very aroused/agitated	Absolutely ecstatic/ extremely agitated

Please circle the **vividness** of your memory regarding the event of coming-out to your parent[s] on the scale provided below.

1	2	3	4	5
Extremely vague/hazy	Somewhat vague	Moderately vivid	Very vivid	Extremely vivid/ like it happened yesterday

Please circle the level of **surprise** you experienced after you told your parent[s] about your sexual preference on the scale provided below.

1	2	3	4	5
Not surprised at all	Somewhat surprised	Moderately surprised	Very surprised	Extremely surprised

Appendix D

Demographic

Please answer the following demographic questions by either filling in the blanks or circling the answer that best applies.

Birthday (Month/day/year): _____

Sex: _____

Sexual Identity: gay lesbian bisexual transgender

Parent who you revealed your sexual preference to: mother father both

Appendix E*Canonical Features Scoring Criteria for Recall*

Canonical Feature	Description	Quantity Score	Score
Activity	Subject's activity leading to the announcement		0 – 3
Location	Subject's location at time of announcement		0 – 3
Time	Time when announcement took place		0 – 3
Author's Affect	The emotional state of the subject after announcement		0 – 3
Aftermath	Any action that occurred after the announcement		0 – 3
Others Present	Anyone around subject during the announcement		0 – 3
Others' Affect	Emotional state of any others after announcement		0 – 3

Appendix F

Free Response Scoring Rules

Activity (The activity - of the narrator – what was directly happening leading into/during the coming out process. The activity is always related to the self (the narrator)).

0	There is no activity mentioned/implied
1	The activity is implied but not stated. There is a passive verb that allows you to infer what they were doing from what they write. (“I was on my way back from a party..” implies driving/walking).
2	Activity relating to the narrator is explicitly stated. Any action verb present before the event counts (‘state of being’ does not count). (“I was walking...” “we were talking...” “we were watching television...”)
3	The activity is mentioned more than once, or more than one activity is mentioned

Location (The narrator’s location during the coming out process)

0	There is no location mentioned/implied
1	The location is implied but not stated (“I was having breakfast” implies the kitchen)
2	A location is explicitly stated (“we were in my house” “we were at school”)
3	Location is explicitly stated 2 or more times, or more than one location is stated (“We were at my house on the couch ”)

Time (The time when the narrator came out to their parents)

0	No time is given/implied
1	Time is implied by naming events that happened at certain times or is vague (“Eating breakfast” “It was Dark” “rush-hour”)
2	The time was mentioned but does not have to be specifically mentioned” (“It was about 10:45” “morning” “Tuesday”)
3	The time was explicitly mentioned and/or implied more than once. (“11:00 Tuesday night”)

Author’s Affect (The emotional state of the narrator during/shortly after coming out → “I” statements)

0	No mention of state given.
1	An emotion is implied by behavior (“I cried...” implies being sad; “I will remember that day” implies high emotions) --should be a statement relating to narrator’s feelings, but an adjective describing the event counts (“it was an incredible moment” implies pleasure/awe; “It was terrifying” implies fear)
2	An emotion is explicitly stated (“I was happy”; “I was scared”; “I was shocked”)
3	Two of more explicit emotions were mentioned. (“Lindsey was in shock and became worried”)

Others’ Affect (The emotional state of others around the narrator during/shortly after coming out)

0	No mention of state given.
1	An emotion is implied by behavior (“Mary cried” implies being sad)
2	An emotion is explicitly stated for a person other than the narrator or a collective group (“My mom was happy”)
3	Two or more explicitly stated emotions are present for one person other than the narrator (“She was worried and became very scared”) --one reaction is stated separately for two people/groups (“She was scared and the other girl looked very nervous...” but NOT “both girls were nervous”)

Aftermath (Any action that occurred – by any character - after the coming out process... not as specific as rules for activity.

0	There is no aftermath explicitly mentioned or implied.
1	Activities after coming out are implied but not directly stated (“It was very cold outside” implies going outside after the experience)
2	Activities after coming out are explicitly stated (“Then we watched TV for hours” or “After that I went to class”)
3	There is more than one activity explicitly stated (“We talked some more and then we walked home”) --affect is not a part of this