

# The Flashbulb Memory of the Positive and Negative Events: Wenchuan Earthquake and Acceptance to College

Aiping Liu, Xiaoping Ying, Jing Luo

**Abstract**—53 college students answered questions regarding the circumstances in which they first heard about the news of Wenchuan earthquake or the news of their acceptance to college which took place approximately one year ago, and answered again two years later. The number of details recalled about their circumstances for both events was high and didn't decline two years later. However, consistency in reported details over two years was low. Participants were more likely to construct central (e.g., Where were you?) than peripheral information (What were you wearing?), and the confidence of the central information was higher than peripheral information, which indicated that they constructed more when they were more confident.

**Keywords**—flashbulb memory; consistency; reconstructive error; confidence

## I. INTRODUCTION

PEOPLE are able to provide detailed memories for the circumstance surrounding their reception of important and emotional public events, such as the space shuttle [1-3], and the September 11th terrorist attacks [4-6]. In other words, people have vivid recollections of when they heard the news, where they were, what they were doing, how to know, etc. Brown and Kulik (1977) first described this phenomenon and gave it the suggestive label of flashbulb memory (FBM). These memories are thought to be more detailed and veridical than everyday memories and particularly immune from forgetting. Support for the flashbulb memory hypothesis can be found in numerous studies [7-10], but numerous researchers have argued all memories, even those for highly emotional and consequential events are subject to reconstructive errors [2, 11] and Schmidt (2004) found that participants were more likely to construct central than peripheral details. Moreover, researchers suggested that the consistency of the FBM was not perfect [2, 3, 12] but the confidence was high [13-15].

The target events in flashbulb memory studies have almost always been upsetting events, such as the assassination of President Kennedy [7], Olof Palme [9], the explosion of the space shuttle Challenger [1], the Estonia ferry disaster [16], September 11th terrorist attacks [4-6]. Indeed, Brown and Kulik's original selection of flashbulb memory consisted only of negative events. Moreover, Brown and Kulik found that a personal event such as the death of a friend or a relative could also contribute to flashbulb memory.

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However, whether the positive personal event could bring flashbulb memory? Scott and Ponsoda (1996) selected 10 positive and 10 negative public events (one for each year between 1982 and 1991). They found that the recent events remembered better than those events earlier and there was no difference in memory for the details of personal circumstances for the positive and negative events [17]. As Wright and Anderson (1996) pointed out, however, these events may differ on characteristics (such as the intensity of emotion or surprise) that may influence the formation of these memories [18], for which Scott and Ponsoda (1996) did not collect information. For instance, some events labeled as positive by Scott and Ponsoda (1996) may be irrelevant to some participants. Teckon (2001) selected two events that took place approximately two years prior: the beginning of Operation Desert Storm and the news of their acceptance to college. The number of details recalled about their own their circumstance for both events was very high and not different for the two events [19]. Yan and Liu (2004) selected two positive events (zhonghua team won Japan team and obtained the third place in the 34th World Baseball championship, acceptance to college) took place six month and 34 months ago, respectively; they also selected two negative events (the September 11th terrorist attacks, the September 21th earthquake) from the same period. They found that on the whole the participants remembered negative events better than the positive events and with more confidence, however, further analysis showed that the memories of the positive and negative events which occurred six months ago were not different [20].

The present study has two purposes. First, we will provide a comparison of recall of personal circumstances for a negative and a positive event that expected to remember well. More specifically, students' recollection for two events that took place at approximately the same time one year before testing were compared and then retest two years later. One of the events was the Wenchuan earthquake, which occurred on May 12, 2008, the magnitude was 8.0. The other event was the reception of the news that participants were accepted into the college in which they later enrolled and at which they were tested. Hence, the news of acceptance to college was assumed to be positive for all the participants. This personal event was considered to be a good event for comparison because the target events were the same for all the participants and the dates of the two events were close to each other. Second, the study was to assess the consistency of flashbulb memories over time by collecting data twice. Whether people reconstruct their memories and are more likely to construct central details? What is the relationship of the constructive errors and confidence?

## II. METHOD

### A. Participants

Participants were first-year students at Fuzhou University, China. The students were divided into two groups, one recalled the context of hearing the news of Wenchuan earthquake, and one recalled the context of hearing news of acceptance to college, that is, they were admitted by the Fuzhou University. The participants completed the questionnaire on April 2009, May 2011, respectively. The data which were valid in the first and second questionnaires were included in the analysis. Finally, 53 participants were included in the analysis, in which the earthquake group consisted of 30 students (21 male, 9 female), the admitted group consisted of 23 students (19 male and 4 female).

### B. Questionnaire

Two flashbulb memory questionnaires were prepared which similar to those used in previous research [1, 5, 7, 10, 19], one about news of Wenchuan earthquake and one about news of acceptance to college. The questionnaires were identical except for the events involved and each questionnaire contained 23 questions. Eleven of these were about the participants' memory of the circumstances, and include the first thought, what they were doing, informant (Internet, TV, other people, etc.), the date, the day of the week, the time of the day, where they were, the other person present, doing what after hearing the news, the clothes they were wearing at the time, the weather. There were twelve questions about their reactions to the two news events: intensity of emotion, intensity of surprise, vividness, intensity of influence, social sharing (three questions), rumination, importance (four questions, for themselves, for their family and friends, for their country, at the international level). Confidence judgments were also collected about the memory for the reception context. The second questionnaire similar to the first questionnaire but the second questionnaire asked the present reactions except for the influence question and rehearsal dimension. The complete questionnaires can be found in the Appendix.

### C. Procedure

The questionnaires were first distributed to the students on April 2009, and the students completed the questionnaires during one of their elective course. Approximately 2 years later, the second questionnaire was distributed to the same students on May 2011 and they completed the questionnaire in their dormitory.

### D. Scoring

For each participant, main dependent variable was the number of the details recalled. An answer was considered acceptable and thus received 1 point if it was clear and specific. If there was no answer provided for a question ("Don't remember") or if the answer was clearly based on reconstruction or guessing ("should", "maybe", "probably"), that question was received 0 point. Because participants had different understand about "the first thought", so this question was not included in the analysis. The total scores were 0 to 10 points.

### E. Consistency Encoding

In order to provide a more sensitive test for constructive processes, we classified the answers into seven categories similar to Schmidt (2004). Questions that were left blank on both surveys were scored as blanks, which imply that people have forgotten in the first test and not included in the analysis. Responses that were essentially the same on both questionnaires were scored as consistent. Responses were judged as more specific, on the second test, details were added to the answer. For example, one participant noted that she was "in the classroom" in the first time and was "in the west-3 classroom" in the second time. The question that was left blank of the first test but answered on the second test was also scored as more specific. A fourth scoring category was used for responses that were more general. More general responses are simply the converse of more specific responses. A fifth category was reserved for responses on the second test that were inconsistent with, contradicted, or did not share anything in common with the first test responses. For example, one student wrote on the first test that "reading", on the second test she wrote "sleeping". The sixth category was omission; these are simply questions that were answered on the first test, but not on the second test. The final category of memory errors was more specific and more general. For example, one participant answer "Yellow T shirt" in the first test and answered "T shirt and jean" in the second test.

The recall data were scored and encoded by two independent raters. Disagreements in scoring and coding were resolved by discussion. Reliability between the two coders was 0.97 for the scoring and 0.85 for the coding.

## III. RESULTS

The presentation of the results is broken down into two sections. In the first section, the participants' reactions to the events, including the number of details reported, their emotional responses, and their confidence ratings, are summarized. In the second section, consistency in reported autobiographical memories is evaluated.

### A. Reactions to the Events

Table I includes a summary of some of the reactions to the events of Wenchuan earthquake and admitted by Fuzhou University that was tapped by the questionnaire. Focusing on the Wenchuan earthquake group, the participants tended to rate themselves high on the surprise ( $M=4.27$  on a 5-point scale), importance ( $M=4.00$ ), vividness ( $M=3.93$ ), emotion ( $M=3.90$ ) in the first test. Focusing on the admitted group, the participants tended to rate themselves middle on the emotion ( $M=3.22$  on a 5-point scale), vividness ( $M=3.22$ ), and report that the event had some influence on their life ( $M=3.35$ ) in the first test. Some interesting difference emerged from the comparison of the first and the second test. For example, significant declines were observed in ratings of emotion ( $t=2.408$ ,  $p=0.023$ ), surprise ( $t=4.075$ ,  $p=0.000$ ), social sharing ( $t=2.425$ ,  $p=0.022$ ), importance ( $t=5.248$ ,  $p=0.000$ ) for the earthquake group; a

marginal significant declines were observed in ratings of importance ( $t=2.064, p=0.052$ ), however, a significant increase was observed in ratings of vividness ( $t=-2.102, p=0.047$ ) for admitted group over 2 years (see Table 1). Moreover, participants' confidence increased slightly but not significantly for the two events, suggested that participants were always confident about their answers.

TABLE I  
 DESCRIPTIVE STATISTICS FOR THE TWO GROUPS, INCLUDING REACTION TO THE EVENTS AND CONFIDENCE RATINGS ON THE MEMORY QUESTIONS

|                             | Earthquake group (n=30) |      | Admitted group (n=23) |      |
|-----------------------------|-------------------------|------|-----------------------|------|
|                             | 2009                    | 2011 | 2009                  | 2011 |
| <i>M</i> emotion            | 3.90                    | 3.40 | 3.22                  | 3.00 |
| <i>M</i> surprise           | 4.27                    | 3.30 | 2.17                  | 2.17 |
| <i>M</i> vividness          | 3.93                    | 3.63 | 3.22                  | 3.65 |
| <i>M</i> influence          | 2.80                    | 2.73 | 3.35                  | 3.04 |
| <i>M</i> rehearsal          | 3.53                    | 3.30 | 2.88                  | 2.91 |
| <i>M</i> social sharing     | 3.64                    | 3.31 | 3.02                  | 3.03 |
| <i>M</i> rumination         | 3.17                    | 3.27 | 2.44                  | 2.61 |
| <i>M</i> importance         | 4.00                    | 3.33 | 3.17                  | 2.82 |
| <i>M</i> average confidence | 4.18                    | 4.27 | 4.00                  | 4.02 |

The mean numbers of autobiographical details reported on both memory questionnaires are summarized in Table 2. Comparing the first and the second questionnaires, there was a slightly increase in the number of details reported, a trend that was observed in the two events. For the earthquake group, the mean number of features reported in 2009 was 8.27 (out of 10 possible features), and in 2011 that mean increased to 8.67,  $t=-1.309, p=0.201$ . For the admitted group, the number of features increased from 7.67 to 8.29,  $t=-1.194, p=0.247$ . Moreover, the number of details reported didn't have significant difference between the two groups in the first ( $t=1.254, p=0.216$ ) and second ( $t=0.670, p=0.506$ ) questionnaire.

#### B. Consistency in Flashbulb Memory

Table 3 contains a summary of the consistency scoring for the 10 memory questions. The summary data revealed a low level of consistency. Considering the number of the details and the high confidence, we postulate that the flashbulb memory was not immune to forget and reconstruct.

TABLE II  
 PROPORTION OF PARTICIPANTS REPORTING EACH OF THE 10 AUTOBIOGRAPHICAL DETAILS OF THE EVENTS

|                     | Earthquake group (n=30) |      | Admitted group (n=23) |      |
|---------------------|-------------------------|------|-----------------------|------|
|                     | 2009                    | 2011 | 2009                  | 2011 |
| What were you doing | 0.97                    | 0.93 | 1.00                  | 0.87 |
| Informant           | 1.00                    | 1.00 | 1.00                  | 1.00 |
| Date                | 0.83                    | 0.87 | 0.32                  | 0.48 |
| The day of the week | 0.40                    | 0.57 | 0.36                  | 0.70 |
| The time of the day | 0.73                    | 1.00 | 0.83                  | 0.96 |
| Where               | 1.00                    | 0.97 | 1.00                  | 1.00 |
| Others present      | 1.00                    | 1.00 | 1.00                  | 1.00 |
| Doing what later    | 0.90                    | 0.83 | 0.82                  | 0.78 |
| Clothing            | 0.70                    | 0.60 | 0.65                  | 0.74 |
| Weather             | 0.73                    | 0.90 | 0.78                  | 0.87 |

In order to explore the reconstructive errors of central information (what were you doing, informant, when, where were you) and peripheral information (clothes, weather) of the two groups, each person could earn a score for each type of information (score 0 to 4 for central vs. score 0 to 2 for peripheral) for each of six memory types (consistent, more specific, more general, inconsistent, omission, more specific and more general). A repeated measure of general linear model (GLM) was calculated, treating type of information (central vs. peripheral) as a within-subjects factor and context recollection (earthquake vs. admitted) as a between-subjects factor. The dependent variables were the proportion of questions answered (out of four for central and out of two for peripheral) in each of the six memory categories. Summaries of these results are reported in Table 4.

For the earthquake group, memory was marginally more general [ $F(1,29)=3.082, MSe=0.051, p=0.090$ ], more inconsistent [ $F(1,29)=11.131, MSe=0.459, p=0.002$ ] and included fewer omissions [ $F(1,29)=6.991, MSe=0.176, p=0.013$ ] for central than for peripheral information, which provided support for the constructive prediction; for the admitted group, memory was marginally more consistent [ $F(1,22)=3.149, MSe=0.196, p=0.090$ ] and more inconsistent [ $F(1,22)=6.302, MSe=0.230, p=0.020$ ] for central than for peripheral information, which also confirmed the constructive prediction. Finally, independent samples t-test shows that, the memory of the central information was marginally more general [ $t=2.005, p=0.051$ ] for the earthquake group than the admitted group, other proportion were not significantly different, which means that the reception memories of the admitted and earthquake event was similar.

TABLE III  
 CONSISTENT MEMORIES AND MEMORY ERRORS FOR THE MAJOR COMPONENTS OF PARTICIPANTS' AUTOBIOGRAPHICAL MEMORIES

|                     | Context Recollection | Consistent | More specific | More general | Inconsistent | Omission | More specific and more general |
|---------------------|----------------------|------------|---------------|--------------|--------------|----------|--------------------------------|
| What were you doing | Earthquake           | 0.27       | 0.20          | 0.13         | 0.37         | 0.03     | 0.00                           |
|                     | Admitted             | 0.30       | 0.31          | 0.00         | 0.31         | 0.04     | 0.04                           |
| Informant           | Earthquake           | 0.47       | 0.23          | 0.07         | 0.20         | 0.00     | 0.03                           |
|                     | Admitted             | 0.35       | 0.26          | 0.09         | 0.30         | 0.00     | 0.00                           |
| Date                | Earthquake           | 0.40       | 0.13          | 0.07         | 0.34         | 0.03     | 0.03                           |
|                     | Admitted             | 0.04       | 0.31          | 0.04         | 0.35         | 0.18     | 0.04                           |
| The day of the week | Earthquake           | 0.07       | 0.30          | 0.07         | 0.27         | 0.03     | 0.00                           |
|                     | Admitted             | 0.04       | 0.39          | 0.00         | 0.26         | 0.04     | 0.00                           |
| The time of the day | Earthquake           | 0.17       | 0.33          | 0.10         | 0.40         | 0.00     | 0.00                           |
|                     | Admitted             | 0.35       | 0.35          | 0.04         | 0.26         | 0.00     | 0.00                           |
| Where               | Earthquake           | 0.47       | 0.23          | 0.13         | 0.14         | 0.00     | 0.03                           |
|                     | Admitted             | 0.65       | 0.09          | 0.00         | 0.22         | 0.00     | 0.04                           |
| Others present      | Earthquake           | 0.47       | 0.33          | 0.07         | 0.03         | 0.00     | 0.10                           |
|                     | Admitted             | 0.31       | 0.17          | 0.09         | 0.30         | 0.00     | 0.13                           |
| Doing what later    | Earthquake           | 0.10       | 0.30          | 0.10         | 0.40         | 0.07     | 0.03                           |
|                     | Admitted             | 0.04       | 0.31          | 0.13         | 0.35         | 0.13     | 0.04                           |
| Clothing            | Earthquake           | 0.30       | 0.23          | 0.03         | 0.07         | 0.23     | 0.00                           |
|                     | Admitted             | 0.09       | 0.26          | 0.13         | 0.17         | 0.13     | 0.09                           |
| Weather             | Earthquake           | 0.53       | 0.27          | 0.07         | 0.13         | 0.00     | 0.00                           |
|                     | Admitted             | 0.48       | 0.35          | 0.04         | 0.09         | 0.04     | 0.00                           |

TABLE IV  
 PROPORTION OF CONSISTENT MEMORIES AND MEMORY ERRORS AS A  
 FUNCTION OF TYPE OF INFORMATION AND CONTEXT RECOLLECTION

|                                | Earthquake group (n=30) |            | Admitted group (n=23) |            |
|--------------------------------|-------------------------|------------|-----------------------|------------|
|                                | Central                 | Peripheral | Central               | Peripheral |
| Consistent                     | 0.34                    | 0.42       | 0.42                  | 0.28       |
| More specific                  | 0.25                    | 0.25       | 0.25                  | 0.30       |
| More general                   | 0.11                    | 0.05       | 0.03                  | 0.09       |
| Inconsistent                   | 0.27                    | 0.10       | 0.27                  | 0.13       |
| Omission                       | 0.01                    | 0.12       | 0.01                  | 0.09       |
| More specific and more general | 0.02                    | 0.00       | 0.02                  | 0.04       |

What is the relationship of the constructive errors and confidence? From figure 1, we also found that the constructive difference of the central and peripheral information was related with their confidence; people constructed more when he was more confident.

Specifically, the mean confidence were higher for the central than the peripheral information for the earthquake and admitted group in the second test, and people were more likely to construct central information in the second test.

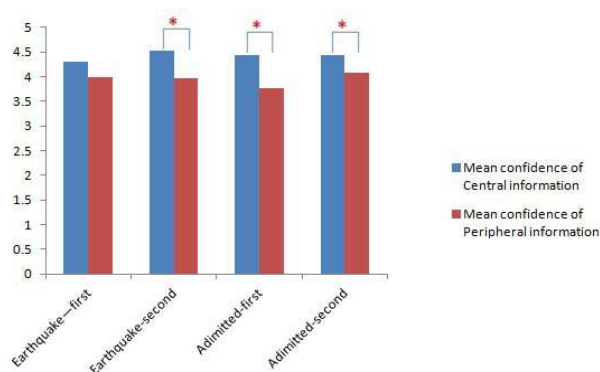


Fig. 1 The mean confidence of the central information and peripheral information (\* means  $p < 0.05$ )

#### IV. DISCUSSION

In summary, the memories for the reception context of the earthquake group and the admitted group were similar; especially the consistent proportion of the admitted was higher than the earthquake group, although which was not significant. The results showed that an event needs not to be a negative one for people to form a FBM [19]. Participants reported detailed information about their circumstance when hearing of Wenchuan earthquake and the news of acceptance to college and they were confident about their answers in the first and second test. However, the consistencies were relative low, which confirm that the flashbulb memory is not immune to forget and reconstruct, but specially in their confidence and vividness [13-15]. Although similar conclusions have been obtained before, the present study had the advantage of studying the flashbulb memory of Wenchuan earthquake in China firstly, using identical events for individuals, target events that were close in time, and having information regarding the personal reactions of the individuals. As time passed, most reactions declined.

The consistency of the FBM was low, which suggest that memory is always reconstructive; even for surprising and consequential events which would allegedly elicit vivid and persistent memories for the circumstances in which one first learned of them. It would still be possible to postulate that some aspects of these memories do have a special status characterized by a unique association linking the experience of the event with a specific spatio-temporal [21]. This unique tag may offer a clear feeling of remembering and acts as a powerful cue to retrieve autobiographical knowledge but it doesn't help to reconstruct the precise contextual circumstances with exact and consistent details. In addition, people were likely to reconstruct central than peripheral details, which confirm the attention-focusing hypothesis [8, 11]. Interestingly, the confidence of the central information was higher than peripheral information, which indicated that they constructed more when they were more confident.

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APPENDIX

Note: Only presenting the questionnaire of the Wenchuan earthquake and adding the red word in the second questionnaire.

(一) Please answer the following questions as much detail as possible, and assess the level of your confidence of these response, 1) very low 2) relative low 3) middle 4) relative high 5) very high.

| Question  | Answer | Confidence |   |   |   |   |
|---|--------|------------|---|---|---|---|
|   |        | 1          | 2 | 3 | 4 | 5 |
| 1、 What was your first thought of hearing the news of Wenchuan earthquake?  |        | 1          | 2 | 3 | 4 | 5 |
| 2、 What were you doing when you heard the news?   |        | 1          | 2 | 3 | 4 | 5 |
| 3、 How did you know the news? ( such as Internet, TV, other people, etc. )  |        | 1          | 2 | 3 | 4 | 5 |
| 4、 What was the date when you heard the news?   |        | 1          | 2 | 3 | 4 | 5 |
| 5、 What was the day of the week when you heard the news?  |        | 1          | 2 | 3 | 4 | 5 |
| 6、 What was the time of the day when you heard the news?  |        | 1          | 2 | 3 | 4 | 5 |
| 7、 Where were you when you heard the news?  |        | 1          | 2 | 3 | 4 | 5 |
| 8、 Who with you when you heard the news?  |        | 1          | 2 | 3 | 4 | 5 |
| 9、 What did you do that day after hearing the news?   |        | 1          | 2 | 3 | 4 | 5 |
| 10、 What were you wearing at the time?  |        | 1          | 2 | 3 | 4 | 5 |
| 11、 What was the weather?   |        | 1          | 2 | 3 | 4 | 5 |
| 1. How about your emotional intensity about the Wenchuan earthquake <b>now</b> ?<br>A. Not at all strong B. Less strong C. Middle D. Relatively strong E. Very strong                             |        |            |   |   |   |   |
| 2. How about your surprise level about the Wenchuan earthquake <b>now</b> ?<br>A. Not at all surprise B. Less surprise C. Middle D. Relatively surprise E. Very surprise                          |        |            |   |   |   |   |
| 3. How about you vividness level about the Wenchuan earthquake <b>now</b> ?<br>A. Not at all vivid B. Less vivid C. Middle D. Relatively vivid E. Very vivid                                      |        |            |   |   |   |   |
| 4. How about the influence of the Wenchuan earthquake on you at that time?<br>A. None influence B. Small influence C. Middle D. Some influence E. Much influence                                  |        |            |   |   |   |   |
| 5. How long after hearing the news you first spoke about the event?<br>A. Never B. 1 hour —1 day C. Half an hour—1 hour D. In half an hour E. In a moment   |        |            |   |   |   |   |
| 6. How many times you had thoughts, memories, or images related to the event in one month after Wenchuan earthquake?<br>A. never B.1—10times C.10—50 times D. 50—100 times E. more than 100 times |        |            |   |   |   |   |
| 7. How many times you had discussed the events in one month after Wenchuan earthquake?<br>A. never B.1—10times C.10—50 times D. 50—100 times E. more than 100 times                               |        |            |   |   |   |   |
| 8. How many people you had discussed with the events in one month after Wenchuan earthquake?<br>A. less than 5 B.5—10 C.10—20 D. 20—50 E. more than 50  |        |            |   |   |   |   |
| 9. How important the event for you <b>now</b> ?<br>Not at all important Very important  |        | 1          | 2 | 3 | 4 | 5 |
| 10. How important the event for your family and friends <b>now</b> ?  |        | 1          | 2 | 3 | 4 | 5 |
| 11. How important the event for your country <b>now</b> ?   |        | 1          | 2 | 3 | 4 | 5 |
| 12. How important the event for the international <b>now</b> ?  |        | 1          | 2 | 3 | 4 | 5 |

-----Age \_ \_ \_ Class \_ \_ \_

Gender \_ \_ \_ \_ Student ID \_ \_ \_ \_ \_ Come from \_ \_ \_ \_ province

Major \_ \_ \_ \_ \_

Welcome to participant in our follow-up study, if you would like to please write your email : \_\_\_\_\_@\_\_\_\_\_ or QQ : \_\_\_\_\_