Flashbulb Memories for the September 11\textsuperscript{th} Terrorist Attacks:
Long-Term Retention, Confidence, and the Influence of Rehearsal and Emotion

Olivia Bucci & Maria Larsson
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Abstract/sammanfattning

Flashbulb memories are memories for circumstances in which one first learned of a surprising, consequential, and emotional event. Classic flashbulb memory research suggests that this memory is well-retained despite the passage of many years, however this has been disputed by more recent studies. The purpose of this study was to investigate long-term retention of flashbulb memories in Swedish participants for the September 11th terrorist attacks, how confidently these memories are held, and what factors influence retention and confidence. The current study used translated surveys from an American study, which were sent out 1 week, 11 months, 35 months, and 10 years after the attacks. The study replicated some of the findings in the American study. Specifically, it was found that after a rapid decay in the first year, the rate of forgetting stabilizes. Also, different aspects of a flashbulb memory may be forgotten at different rates. As predicted and in line with previous findings, confidence ratings were generally high. No clear patterns emerged when examining factors hypothesized to influence retention and confidence. Since few participants responded to all four surveys, further studies on flashbulb events are needed to replicate and draw general conclusions based on the findings in this study.

Keywords: confidence, emotional intensity, flashbulb memories, long-term retention, rehearsal

Nyckelord: emotionell intensitet, flashbulbminnen, konfidens, repetition, retention över lång tid
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1. Introduction

1.1 Flashbulb memories

Memories of emotional and highly significant events are often perceived as extremely vivid and seem to persist despite the passage of many years (Brown & Kulik, 1977). Brown and Kulik (1977) introduced the term flashbulb memory to describe this type of memory and defined it as “…memories for the circumstances in which one first learned of a very surprising and consequential (or emotionally arousing) event” (p. 73). When investigating flashbulb memories, Brown and Kulik (1977) found six categories of information which seemed more likely to be recalled than any other content. These categories are referred to as canonical features and include information about (1) the place in which a person first learned about the event, (2) the ongoing activity, (3) the informant (e.g. family, friends, colleagues, media), (4) own as well as (5) others’ emotional reaction upon hearing the news, and (6) the immediate events after hearing the news. In order to examine the retention of flashbulb memory, the present study employed a test-retest method to measure consistency of participants’ responses to questions based on the six canonical features mentioned above. A consistency score was calculated since a direct measure of accuracy is not possible when investigating flashbulb memories (due to their subjective nature). Numerous studies have investigated flashbulb memories, and in some cases their associated event memories, concerning important public events such as the Challenger explosion (Bohannon, 1988), the verdict of the O.J. Simpson trial (Levine, Prohaska, Burgess, Rice, & Laulhere, 2001), the death of Olof Palme (Christianson, 1989), the death of the Pope John Paul II (Tinti, Schmidt, Sotgiu, Testa, & Curci, 2009), and most recently, the events of September 11th (Conway, Skitka, Hemmerich, & Kershaw, 2009; Hirst et al., 2009; Talarico & Rubin, 2003). Whereas flashbulb memory refers to memory for the circumstances in which one first learned of the event, event memory refers to memory for the facts about the event, such as the order in which the September 11th attacks occurred. In contrast to flashbulb memory, a direct measure of accuracy is possible when investigating event memory since participants’ responses can be corroborated against objective records (e.g. media reports). In the present study, accuracy will therefore refer to event memory and the term consistency will apply to flashbulb memory.

We have had the opportunity to take part of an international research project aimed at investigating long-term memory for the terrorist attacks of September 11th. The design of the current study was modeled after Hirst et al. (2009) who examined the American sample and included extensive analyses on flashbulb and event memory during a retention interval of three years. The current study examined the Swedish sample and includes a few selected analyses on flashbulb memory during a retention period of ten years. The purpose of this study was to investigate: (1) long-term retention of flashbulb memories for the September 11th attacks, (2) how confidently these memories are held, and (3) what factors influence retention and confidence.
1.2 Long-term retention of flashbulb memories

Brown and Kulik (1977) assumed that participants’ vivid recollections of a significant event were accurate several years after the event occurred. Therefore, they concluded that flashbulb memories are particularly long-lasting and constitute a distinct form of memory. However, studies which have examined consistency using the test-retest method have concluded that the rate of forgetting for flashbulb memories is similar to that found for ordinary autobiographical memories (Christianson, 1989; Hirst et al., 2009; Talarico & Rubin, 2003; Weaver, 1993). Indeed, Weaver (1993) reported an overall consistency of 69 percent for flashbulb memories after one year and an overall consistency of 71 percent for ordinary autobiographical memories. Hirst et al. (2009) found that 11 months after the September 11th attacks, the participants offered consistent answers about their flashbulb memories on average 63 percent of the time. This rate of forgetting markedly decreased during the subsequent two years, suggesting that the memory stabilized between the first and third year. Studies have also found that flashbulb memories and autobiographical memories are subject to the same reconstructive errors (Christianson, 1989; Lanciano, Curci, & Semin, 2010), which further argues against the assumption that the retention of flashbulb memories is unique.

To our knowledge, there is no literature on the retention of flashbulb memories over a period of ten years. In fact, few studies have investigated a retention interval of more than one year. However, Berntsen and Thomsen (2005) investigated memories relating to the invasion of Denmark during World War II in Danish participants and found that participants recalled context-related details, such as the weather, the day of the week and the time of an announcement, relatively accurately. More than 50 years after the events the participants provided accurate answers to 55 percent of the questions. However, it should be noted that this was not a test-retest study and the memory attributes which were investigated are more suitably classified as event memory rather than flashbulb memory.

In line with more recent flashbulb memory research we predict that flashbulb memories are not well-retained. Specifically, we predict a retention curve similar to that found by Hirst et al. (2009). Since the rate of forgetting seems to stabilize after the first year, we expect only a small decay in flashbulb memories between the first and tenth year after the attacks. In addition, Hirst et al. (2009) found that memory for the initial emotional reaction upon hearing the news was poor in comparison to other features of the flashbulb memory. We therefore also predict a lower consistency of the emotional reaction in contrast to the consistency of other features.

In sum, flashbulb memories have been shown to be no more consistent than ordinary autobiographical memories. However, there may be other factors than consistency that make flashbulb memories unique. Talarico and Rubin (2007) found that in comparison to everyday memories, flashbulb memories exhibit an enhanced confidence.

1.3 Confidence characterizes flashbulb memories

It is a recurring finding that individuals are highly confident in their flashbulb memories (Conway et al., 2009; Hirst et al., 2009; Talarico & Rubin, 2003; Weaver, 1993), although few studies have investigated why people hold these memories so confidently. Talarico and Rubin (2003) found that highly confident memories may be due to high ratings of vividness and a strong sense of reliving the event. The emotional reaction upon hearing the news of an important event can enhance these characteristics, including confidence (Phelps & Sharot, 2008). Research has also shown that emotional arousal can improve memory of an event, due to the physiological changes which enhance retention via the interaction of the amygdala and hippocampus (Phelps & Sharot, 2008). However, emotional arousal has a stronger impact on confidence, vividness, and the sense of reliving the event in comparison to the actual flashbulb memory (Phelps & Sharot, 2008). This can explain the dissociation between ratings
of confidence and consistency of flashbulb memory found in some studies (Hirst et al., 2009; Talarico & Rubin, 2003). Conversely, a positive association was found in Weaver (1993) and Conway et al. (2009) found that participants with consistent memories were more confident than participants with inconsistent memories. Despite conflicting results regarding the relation between consistency and confidence, several studies have shown that participants tend to report inconsistent flashbulb memories and provide high confidence ratings. These general findings intuitively suggest a dissociation between confidence and consistency. We therefore predict that flashbulb memories will be rated with high confidence and that the level of confidence will be unrelated to the consistency of the memories.

Attentional processes may also underlie an enhanced confidence. Amygdala activity is associated with a stronger memory for a few details or the gist of emotional events (Phelps & Sharot, 2008). Peripheral details, on the other hand, tend to be forgotten. This may be due to the narrowing of attention that occurs when experiencing a highly emotional event. It is possible that the stronger memories for a few details may be driving the enhanced confidence (Phelps & Sharot, 2008). Flashbulb memory research has further confirmed that people tend to remember the gist of an event whereas more detailed information tends to be forgotten (Christianson, 1989). For example, in Christianson’s study (1989) participants recalled where they were when they heard the news regarding the assassination of the former Swedish Prime Minister Olof Palme, but had poor memory for irrelevant details such as what they were wearing. Based on the findings by Phelps and Sharot (2008), we predict that there will be a positive relationship between the intensity of the initial emotional reaction upon hearing the news of the terrorist attacks and the level of confidence.

From an evolutionary perspective, highly confident memories for a few details may be more adaptive in guiding future actions in emotional and potentially dangerous situations by enabling faster decision-making, leading to more quick and decisive actions (Phelps & Sharot, 2008). Weaver (1993) suggested a social explanation for highly confident memories; “We realize the significance of the event and hold those memories of our personal relationship to ‘History’ quite confidently. I suspect that this high level of confidence will be maintained as the event becomes part of an individual’s personal folklore” (p. 45). Hirst et al. (2009) found that social practices such as following news reports and conversing with others in relation to an important event affected the level of confidence. In convergence with these results, a study by Schwartz (1982) has shown that when statements are repeated, the repetition tends to strengthen the belief that the statement is true. Thus, the level of conversation in response to an event can affect the confidence with which certain statements are held. We predict that the rehearsal of an event via media attention and ensuing conversation can positively affect the confidence of flashbulb memories.

In sum, emotional intensity, level of media attention, and level of ensuing conversation can affect the confidence with which flashbulb memories are held. These factors, among others, have also been shown to influence the consistency of flashbulb memories.

1.4 Predictors of flashbulb memories

Four main theories have been developed which suggest factors that may be important for the formation and retention of flashbulb memories (Brown & Kulik, 1977; Conway, et al., 1994; Er, 2003; Finkenauer et al., 1998). Brown and Kulik (1977) proposed the first model of flashbulb memory, which argues for the existence of an underlying biological mechanism that allows for the memory to be recorded permanently. According to this model, the formation of a flashbulb memory requires a high level of surprise, consequentiality (i.e. direct and indirect consequences of the event for the individual), and emotional arousal. In addition, rehearsal is an important mediating process which facilitates the maintenance of a flashbulb memory. Higher consequentiality for an individual results in both covert (thinking about the event) and
overt rehearsal (conversation with others). The other three theoretical models concerning the formation of flashbulb memories generally agree with Brown and Kulik’s model in that surprise, importance/consequentiality, emotional intensity, and rehearsal are predictors of flashbulb memories.

When investigating predictors of flashbulb memories, Hirst et al. (2009) found that consequentiality (as assessed by residency and the combination of personal loss and inconvenience), emotional intensity, and rehearsal (as assessed by media attention and ensuing conversation) had no influence on consistency. The authors suggested that predictors may interact differently for different people and may therefore cause difficulty in finding correlations between predictors and consistency on a group level. Consequentiality and rehearsal were, however, associated with the accuracy of event memory. Unlike flashbulb memories, the content of event memories was more likely to be corrected rather than repeated over time. According to the authors, this finding illustrates how the media is capable of correcting inaccurate event memories.

The results regarding predictors of consistency in Hirst et al. (2009) contradict findings in other studies. Tinti et al. (2009) concluded that the importance/consequentiality attributed to an event is largely determined by people’s attitudes and appraisals. Importance/consequentiality predicted the emotional reaction which both directly and indirectly, through rehearsal, influenced accuracy of event memory. In turn, event memory was an important predictor of the consistency of flashbulb memory. Similarly, Conway et al. (2009) found that the amount of anxiety experienced in response to the event and the amount of covert rehearsal seemed to predict consistency. It was suggested that the participants who experienced more anxiety/fear after the attacks also perceived greater future risk, which may have resulted in more rehearsal and better memory performance. In sum, both Tinti et al. (2009) and Conway et al. (2009) found that emotional intensity and rehearsal positively affected the consistency of flashbulb memory. In addition, appraisals seem to affect rehearsal in both studies. Based on the theoretical models of flashbulb memory formation (Brown & Kulik, 1977; Conway, et al., 1994; Er, 2003; Finkenauer, et al., 1998) and findings in previous studies (Conway, et al., 2009; Tinti, et al., 2009), we predict that emotional intensity, level of media attention, and level of ensuing conversation will positively affect the consistency of flashbulb memories. Based on findings in Tinti et al. (2009), we predict that the consistency of flashbulb memories will be lower in the Swedish sample in comparison to the American sample, as a result of different levels of perceived consequentiality due to the geographic location of the events.

1.5 Predictions

Based on the literature reviewed in this introduction, we hypothesize a similar retention curve of flashbulb memories as found in Hirst et al. (2009), which suggests that after a rapid decay in the first year following the event, the rate of forgetting stabilizes. However, we expect that the consistency of flashbulb memories will be lower in the Swedish sample in comparison to the American sample. We predict that the consistency of the memory for the initial emotional reaction will be lower than other features of flashbulb memory. We also predict that flashbulb memories will be rated with high confidence and that the level of confidence is unrelated to the consistency of the memory. Furthermore, we predict that both consistency and confidence will be influenced by emotional intensity, level of media attention and level of ensuing conversation.
2. Method

2.1 Participants, recruitment, and procedure
The current study was approved by NYU’s International Review Board\(^1\). The survey used in Hirst et al.’s (2009) study was translated to Swedish and distributed by email and post among university students, university faculty and staff. Participants who were contacted by email received a web-based version but had the option to either download a pdf file of the paper version or receive the paper version in the post. Participants who were contacted by post received a paper version along with a stamped return envelope, but had the option to fill out the web survey using a link provided in the paper survey. Participants were recommended to fill out the entire survey in one session and return it within 24 hours, however all returned surveys were accepted. No monetary incentive was provided for completing the surveys.

Four rounds of surveys were included in the study; Survey 1, Survey 2, Survey 3, and Survey 4 were sent out 1 week, 11 months, 35 months, and 10 years following the September 11\(^{th}\) attacks, respectively. The time intervals were chosen to minimize potential effects of anniversary commemorations. Additional participants were recruited for the second, third, and fourth surveys. However, when analyzing consistency of flashbulb memories we confined our analyses to participants who responded to Survey 1 and at least one other survey.

Table 1 contains the total number of participants who completed each survey, as well as the total number of participants who responded to Survey 1 and at least one other survey. Table 1 also reveals the descriptive values regarding age and gender for the participants. A total of 34 participants responded to the first two surveys, 20 participants responded to the first three, and only eleven participants responded to all four. The eleven participants who responded to all four surveys comprised eight women and three men.

Table 1. Descriptive values regarding age and gender for participants in each survey and participants who responded to Survey 1 and at least one other survey (S12, S13, S14).

<table>
<thead>
<tr>
<th>Survey</th>
<th>(N)</th>
<th>(M)</th>
<th>Range</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>70</td>
<td>24.5</td>
<td>18-57</td>
<td>37</td>
<td>33</td>
</tr>
<tr>
<td>2</td>
<td>36</td>
<td>25.7</td>
<td>19-39</td>
<td>22</td>
<td>13(^2)</td>
</tr>
<tr>
<td>3</td>
<td>32</td>
<td>28.2</td>
<td>22-60</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>29</td>
<td>34.3</td>
<td>28-67</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td>S12</td>
<td>34</td>
<td>25.4</td>
<td>19-39</td>
<td>22</td>
<td>12</td>
</tr>
<tr>
<td>S13</td>
<td>29</td>
<td>27.9</td>
<td>22-60</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>S14</td>
<td>25</td>
<td>33.8</td>
<td>28-67</td>
<td>16</td>
<td>9</td>
</tr>
</tbody>
</table>

2.2 Surveys
The surveys were approximately 17 pages and took about 30-45 minutes to complete. A copy of the survey used in the fourth round can be found in Appendix I. All surveys began with general information about the aims of the study, followed by a consent form. The participants were given the option to provide their contact information if they were interested in participating in future follow-up surveys. Prior to the coding of responses, the contact information was removed from the survey and stored separately as to ensure anonymity. Each participant was given an identification code that would allow the experimenters to match surveys across the four survey periods.

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\(^{1}\) Please contact Robert Meksin at The New School for Social Research (MeksinR@newschool.edu) for the IRB number.

\(^{2}\) One participant did not state their gender.
All four surveys consisted of 58 items. Questions 1-10 pertained to the consistency of flashbulb memories. Questions 11-21 concerned predictors of flashbulb and event memories, specifically consequentiality (as assessed by personal loss or inconvenience), the intensity of the emotional reaction, and rehearsal (as assessed by attention to the media and ensuing conversation). The predictors were rated on a scale from 1 to 5, with 5 being the highest. Surprise and novelty were not included as potential predictors, since uniformly high scores were expected. Questions 22-29 were relevant to establishing the accuracy of event memory. The last page of the survey contained ten demographic questions. In addition, there were various other questions regarding appraisals of the attacks. Table 2 lists the questions in the surveys that were used in our analyses.

Table 2. Questions in the surveys that were used in the analyses

<table>
<thead>
<tr>
<th>Item type</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flashbulb memory:</td>
<td>1. How did you first learn about it (what was the source of the information)?</td>
</tr>
<tr>
<td></td>
<td>2. Where were you?</td>
</tr>
<tr>
<td></td>
<td>3. What were you doing?</td>
</tr>
<tr>
<td></td>
<td>4. How did you feel when you first became aware of the attack?</td>
</tr>
<tr>
<td></td>
<td>5. Who was the first person with whom you communicated about the attack?</td>
</tr>
<tr>
<td></td>
<td>6. What were you doing immediately before you became aware of the attack?</td>
</tr>
<tr>
<td>Confidence:</td>
<td>For each of the above questions concerning flashbulb memory, participants were asked to rate on a 1-5 scale;</td>
</tr>
<tr>
<td></td>
<td>1. How confident is your recollection?</td>
</tr>
<tr>
<td>Predictors:</td>
<td>For the following questions participants were asked to rate their current feelings concerning the attack on a 1-5 scale. It was possible to indicate partial numbers (e.g. 3.5).</td>
</tr>
<tr>
<td></td>
<td>1. At this moment, how strongly or intensely do you feel sad about the attack?</td>
</tr>
<tr>
<td></td>
<td>2. At this moment, how strongly or intensely do you feel angry about the attack?</td>
</tr>
<tr>
<td></td>
<td>3. At this moment, how strongly or intensely do you feel fear about the attack?</td>
</tr>
<tr>
<td></td>
<td>4. At this moment, how strongly or intensely do you feel confusion about the attack?</td>
</tr>
<tr>
<td></td>
<td>5. At this moment, how strongly or intensely do you feel frustration about the attack?</td>
</tr>
<tr>
<td></td>
<td>6. At this moment, how strongly or intensely do you feel shock about the attack?</td>
</tr>
<tr>
<td>Level of media attention and ensuing conversation</td>
<td>1. How closely did you follow the media coverage? (Rate on a 1-5 scale.)</td>
</tr>
<tr>
<td></td>
<td>2. How much have you talked about the attack since the announcement? (Rate on a 1-5 scale.)</td>
</tr>
</tbody>
</table>
The surveys in all four rounds had similar formats, with a few exceptions regarding the flashbulb memory questions. In the first survey, for each question pertaining to flashbulb memory, participants were asked to give a rating from 1 to 5 on how accurately they thought that they would remember their answer in the following year. This rating is called forecasted accuracy. In contrast, participants who completed Surveys 2 and 3 were asked to rate how confident they were in the accuracy of their recollections. This rating is called confidence. Survey 4 comprised two versions in which participants were asked, in equal numbers, to rate either forecasted accuracy or confidence. For the purpose of this study, we have interpreted the forecasted accuracy ratings in Survey 1 as a form of confidence rating and have thus included this measure when analyzing confidence. Since Survey 1 was distributed in close temporal proximity to the event, forecasted accuracy was a more suitable measure due to the fact that confidence ratings would presumably be high for all respondents. However, the forecasted accuracy ratings in Survey 4 were not included in the analyses. The questions assessing level of media attention and level of ensuing conversation asked how much the participants had followed the news and talked about the event since the attacks. However, there was an additional question in the fourth survey which asked the participants how much they had attended to the media and talked about the event in the last month. This question was included due to the increased media coverage of the upcoming ten year commemoration of the September 11th attacks.

2.3 Coding

The coding of responses was based on a coding manual developed by the 9/11 Memory Consortium. There were separate coding manuals for the short-answer questions and the open-ended questions. Coding was completed for the short-answer questions only, since the coding manual for the open-ended questions in the fourth survey was not finalized. Hence, the analyses are based on data from the short-answer questions. Table 3 contains examples of the coding scheme and prior versions of the coding manual can be found on http://911memory.nyu.edu. Since the coding manual was originally based on the American version of the surveys, it was not always compatible with the Swedish surveys. Additionally, there was some ambiguity regarding the coding of certain responses. Please see Appendix II for notes on how these issues were resolved. The coded answers were entered into a Microsoft Office Excel grid. The coding of the responses from Survey 4 was completed by the authors of the current study. To ensure that we understood the instructions in the coding manual correctly, we coded two surveys together. The remaining 27 surveys were coded separately. Earlier surveys (1, 2, and 3) had already been coded by research assistants. The slightest uncertainties or disagreements regarding coding were discussed. Any remaining concerns which could not be resolved through discussion amongst the coders were further taken up with one of the developers of the coding scheme, Robert Meksin.

2.4 Statistical analyses

Similar to Hirst et al. (2009), the responses to the six flashbulb memory questions which were based on the canonical features found by Brown and Kulik (1977), were used to obtain an overall consistency score. The responses in Survey 1 were used as a baseline to which we compared the responses in the other three surveys. Consequently, three consistency measures were calculated that contrasted Survey 2 with Survey 1 (S12), Survey 3 with Survey 1 (S13), and Survey 4 with Survey 1 (S14). A response was coded as consistent if it had been coded in the same manner as in Survey 1. A “1” was assigned if the answer was consistent, and a “0” if it was inconsistent. If a participant did not provide an answer in Survey 1 and a following survey (i.e. both answers were coded “Not Stated”), the response was considered inconsistent.
The consistency scores on the six flashbulb memory questions were averaged to form the overall consistency score, ranging from 0 to 1.

Table 3. Examples from the coding manual

<table>
<thead>
<tr>
<th>Question</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>What were you doing? (Only code for first response)</td>
<td>0 = Not stated, 1 = Awaking,</td>
</tr>
<tr>
<td></td>
<td>2 = Preparing for the day,</td>
</tr>
<tr>
<td></td>
<td>3 = Running errands/Doing Chores,</td>
</tr>
<tr>
<td></td>
<td>4 = Traveling/Commuting,</td>
</tr>
<tr>
<td></td>
<td>5 = Communicating,</td>
</tr>
<tr>
<td></td>
<td>6 = Working,</td>
</tr>
<tr>
<td></td>
<td>7 = Recreationally engaged,</td>
</tr>
<tr>
<td></td>
<td>8 = Leisure Activities,</td>
</tr>
<tr>
<td></td>
<td>9 = Live Information Gathering,</td>
</tr>
<tr>
<td></td>
<td>10 = Other (Enter response in addendum)</td>
</tr>
</tbody>
</table>

| How did you feel when you first became aware of the attack? (Only code for first response) | 0 = Not stated, 1 = Angry, 2 = Sad,                                     |
|                                                                                         | 3 = Fearful, 4 = Confused, 5 = Frustrated,                              |
|                                                                                         | 6 = Shocked, 7 = Other (Enter response in addendum), 8 = Not Applicable,|
|                                                                                         | 9 = Anxious/Distressed,                                                 |
|                                                                                         | 10 = Worried/Concerned/Preoccupied/Distraught,                         |
|                                                                                         | 11 = Physically Disturbed,                                              |
|                                                                                         | 12 = Sympathy/Empathy/Compassion/Pity,                                 |
|                                                                                         | 13 = Numb, 14 = Neutral, 15 = Surprised,                               |
|                                                                                         | 16 = Guilt/Shame/Ashamed/Embarrassment,                                |
|                                                                                         | 17 = Excited/Intrigued/Fascinated/Curious,                             |
|                                                                                         | 18 = Proud/Patriotic,                                                   |
|                                                                                         | 19 = Hopeful/Optimistic                                                |

Since we were interested in the responses in each survey as well as how the responses changed over time, we did analyses both within surveys and across surveys. Therefore the number of participants varied depending on the analysis. First, we separately calculated the overall consistency scores for S12, S13, and S14. Hence, we included the participants who responded to the first survey and at least one other survey. The independent-samples t-test was used to investigate if there was a gender difference in consistency score within each survey. In order to investigate if the consistency of responses changed over time, a one-way within-subjects ANOVA was performed on the consistency scores of participants who responded to all four surveys (N = 11). The dependent variable was overall consistency and the independent variable was survey round (S12, S13, and S14). In addition, one-sample t-tests were conducted to investigate whether the overall consistency scores found in the Swedish sample differed from the consistency scores found by Hirst et al. (2009). Paired-samples t-tests were used when comparing the overall consistency with the consistency score of responses to questions which appeared to be most consistent and least consistent.

Pearson’s correlation was calculated to investigate the relationship between consistency and predictors of consistency, i.e. media attention, ensuing conversation and emotional intensity. Since we were mainly interested in participants’ initial emotional reactions we focused on the responses from Survey 1. Following Hirst et al. (2009), we calculated two measures of overall emotional intensity from Survey 1’s six questions regarding emotional reactions: the average rating of the six emotions, and the highest rating given to the six emotions.
An overall measure of confidence was calculated for each survey by computing the average of the confidence ratings given to the six questions which were used to assess consistency. Measures of confidence violated the assumption of normality, due to extreme values and negatively skewed distributions. The Shapiro-Wilk test of normality was significant for the measure of overall confidence in Surveys 2, 3, and 4 \((p < .05)\). Due to the larger sample size in Survey 1, the Kolmogorov-Smirnov test was used to test the normality of overall confidence which also yielded a significant result \((p < .05)\). Therefore, non-parametric tests were used when analyzing confidence. The Mann-Whitney \(U\)-test was used to investigate if there was a gender difference in overall confidence within each survey. Spearman’s correlation was calculated to investigate the relation between confidence and consistency, as well as between confidence and predictors (level of media attention, level of ensuing conversation, and emotional intensity). The Friedman test is a non-parametric equivalent of the one-way within-subjects ANOVA (Brace, Kemp, & Snelgar, 2009) and it was used to investigate if there was an effect of survey round on participants’ confidence ratings. The dependent variable was confidence ratings and the independent variable was survey round (S1, S2, S3, and S4). In addition, the Wilcoxon matched-pairs signed-ranks test was used to investigate if the difference in confidence scores between two surveys (specifically, between S1 and S2 as well as between S3 and S4) was significant. Finally, the relationships between the predictors were computed with Pearson’s correlation.

In order to interpret significant differences found between samples, we calculated Cohen’s \(d\), for which .20 is indicative of small effect size, .50 a medium effect size, and .80 a large effect size.

3. Results

3.1 Consistency

As shown in Table 4, participants offered consistent answers about their flashbulb memories on average 51 percent of the time 11 months after the attacks. The percentage of consistent responses three years and ten years after the attacks was on average 52 percent and 47 percent, respectively. When comparing the overall consistency scores of men and women in each survey, no significant differences were found (for S12, \(p > .10\), for S13, \(p > .10\), for S14, \(p > .05\)). Equality of variances was not assumed for the t-test of S14, since Levene’s test was significant \((p = .005)\). There was no significant effect of survey round on consistency scores for the participants who responded to all four surveys, \(p > .10\). These results indicate that after a substantial decay in flashbulb memory during the first year following the attacks, the rate of forgetting stabilizes. Hirst et al. (2009) found a consistency score of .63 and .57 for Surveys 2 and 3, respectively. In comparison to American participants, the average consistency score in Survey 2 for the Swedish participants was significantly lower, \(t(33) = -2.64, p = .01, d = .45\). The consistency score on Survey 3, however, did not significantly differ from the consistency score found by Hirst et al. (2009), \(p > .10\).

Table 4. Consistency scores for each survey, including overall consistency scores and consistency scores for the individual questions about the initial emotional reaction and the location of the participant.

<table>
<thead>
<tr>
<th>Rating</th>
<th>S12 M</th>
<th>S12 SD</th>
<th>S13 M</th>
<th>S13 SD</th>
<th>S14 M</th>
<th>S14 SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall consistency</td>
<td>.51</td>
<td>.27</td>
<td>.52</td>
<td>.26</td>
<td>.47</td>
<td>.21</td>
</tr>
<tr>
<td>Emotional consistency</td>
<td>.21</td>
<td>.41</td>
<td>.28</td>
<td>.45</td>
<td>.32</td>
<td>.48</td>
</tr>
<tr>
<td>Location consistency</td>
<td>.74</td>
<td>.45</td>
<td>.69</td>
<td>.47</td>
<td>.68</td>
<td>.48</td>
</tr>
</tbody>
</table>
When comparing the consistency of responses to the individual questions that were used to compute the overall consistency in each survey, a pattern emerged. Generally, the response to the question regarding the first emotional response was the least consistent whereas the answer to the question regarding the location of the participants upon hearing the news of the attacks was the most consistent. Table 4 contains the overall consistency scores for each survey, and the consistency scores for the individual questions regarding the initial emotional response and the location of the participant. When comparing the overall measure of consistency (excluding the consistency score for the question regarding the emotional reaction) with the emotional consistency score, there was a significant difference in Surveys 2 and 3 (for S12, t(33) = 4.40, p < .001, d = 1.03, for S13, t(28) = 2.99, p < .01, d = .77), suggesting that the overall measure of consistency was greater than the emotional consistency. However, a significant difference was not found in Survey 4 (p > .01). In addition, in each survey the overall measure of consistency (excluding the consistency score for the question about the location of the participant) was significantly lower than the measure of consistency associated with the question about the location of the participant (for S12, t(33) = -3.73, p = .001, d = .75, for S13, t(28) = -2.64, p < .05, d = .57, for S14, t(24) = -2.20, p < .05, d = .68). In sum, participants had poor recollections of their initial emotional reaction, but a greater recollection of their location upon hearing the news.

3.2 Confidence

The overall confidence ratings in each survey were generally high (see Table 5). When comparing the confidence ratings of men and women in each survey, no significant differences were found (for each survey, p > .10).

<table>
<thead>
<tr>
<th>Survey</th>
<th>Overall</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.77</td>
<td>.85</td>
</tr>
<tr>
<td>2</td>
<td>4.41</td>
<td>.58</td>
</tr>
<tr>
<td>3</td>
<td>4.41</td>
<td>.57</td>
</tr>
<tr>
<td>4</td>
<td>4.08</td>
<td>.82</td>
</tr>
</tbody>
</table>

We investigated if the level of confidence varied significantly over time by analyzing the confidence ratings of participants who responded to all four surveys. It was found that the effect of survey round on participants’ confidence ratings was almost significant at the .05 significance level, \( \chi^2 (3, N=8) = 7.50, p = .058 \). Since we noted that the overall confidence ratings in Surveys 1 and 4 were lower compared to Surveys 2 and 3, we tested if the difference in confidence ratings between Survey 1 and Survey 2, as well as between Survey 3 and Survey 4, was significant. The Wilcoxon matched-pairs signed-ranks test showed that Survey 1 displayed significantly lower confidence ratings than Survey 2, \( z = -3.72, N - Ties = 31, p < .001 \). Also, Survey 4 displayed significantly lower confidence ratings than Survey 3, \( z = 2.18, N - Ties = 11, p = .03 \).

3.3 Predictors of consistency

Table 6 contains correlations between predictors of flashbulb memory (level of media attention, level of ensuing conversation, and emotional intensity) and consistency. A significant correlation was found between level of media attention in Survey 3 and consistency in Survey 3 (S13). In addition, there was a significant correlation between level of
media attention in Survey 4 and consistency in Survey 3 (S13). No other correlations were significant.

Table 6. Pearson’s correlation between predictors and consistency in each survey

<table>
<thead>
<tr>
<th></th>
<th>S12</th>
<th>N</th>
<th>S13</th>
<th>N</th>
<th>S14</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Emotional intensity</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Average rating</td>
<td>.21</td>
<td>34</td>
<td>.12</td>
<td>29</td>
<td>-.01</td>
<td>25</td>
</tr>
<tr>
<td>Highest rating</td>
<td>.34</td>
<td>34</td>
<td>.15</td>
<td>29</td>
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<td>25</td>
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<tr>
<td><strong>Media</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>.16</td>
<td>34</td>
<td>.24</td>
<td>29</td>
<td>.36</td>
<td>25</td>
</tr>
<tr>
<td>S2</td>
<td>.03</td>
<td>34</td>
<td>.25</td>
<td>20</td>
<td>-.12</td>
<td>16</td>
</tr>
<tr>
<td>S3</td>
<td>.01</td>
<td>20</td>
<td>.38*</td>
<td>29</td>
<td>-.12</td>
<td>16</td>
</tr>
<tr>
<td>S4</td>
<td>.17</td>
<td>16</td>
<td>.59*</td>
<td>16</td>
<td>.07</td>
<td>25</td>
</tr>
<tr>
<td>S4 – Last month</td>
<td>-.07</td>
<td>16</td>
<td>-.09</td>
<td>16</td>
<td>.12</td>
<td>25</td>
</tr>
<tr>
<td><strong>Conversation</strong></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
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<td>.05</td>
<td>25</td>
</tr>
<tr>
<td>S2</td>
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<td>34</td>
<td>.44</td>
<td>20</td>
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<td>16</td>
</tr>
<tr>
<td>S3</td>
<td>.38</td>
<td>20</td>
<td>.33</td>
<td>29</td>
<td>-.01</td>
<td>16</td>
</tr>
<tr>
<td>S4</td>
<td>.06</td>
<td>16</td>
<td>.23</td>
<td>16</td>
<td>.06</td>
<td>25</td>
</tr>
<tr>
<td>S4 – Last month</td>
<td>.00</td>
<td>16</td>
<td>-.18</td>
<td>16</td>
<td>.11</td>
<td>25</td>
</tr>
</tbody>
</table>

* p ≤ .05

3.4 Correlations between confidence, consistency, and predictors

Table 7 reveals that there was no significant correlation between consistency and confidence ratings in Survey 2 or in Survey 3. However, there was a significant association between consistency and confidence ratings in Survey 4. In addition, we investigated if any of the predictors were correlated with confidence ratings (see Table 7). There was a significant correlation between level of media attention in Survey 1 and confidence ratings in Survey 2. The predictors level of media attention in Survey 1 and emotional intensity (specifically, the highest rating given to the six emotions) were significantly correlated with forecasted accuracy in Survey 1. No other correlations between predictors and confidence were significant.

3.5 Associations between predictors

Table 8 reveals the correlations between the predictors, several of which were significant. The two measures of emotional intensity (average rating and highest rating) were associated with each other. As mentioned in the method section, the measures of emotional intensity were calculated by averaging the ratings given to the six emotions in Survey 1, and by taking the highest rating given to these emotions. Both measures of emotional intensity were also correlated with the level of ensuing conversation in Surveys 1 and 2. Level of media attention in Survey 1 was correlated with the average rating of the emotions. Within each survey, level of media attention was correlated with level of ensuing conversation. In addition, level of media attention in Survey 3 was correlated with level of ensuing conversation in Survey 4, and level of media attention in Survey 4 was correlated with level of ensuing conversation in Survey 3. Table 8 does not include the relationship between level of media attention in one survey with the level of media attention in the following survey. For example, media attention
Table 7. Spearman’s correlation between predictors and confidence, and between consistency and confidence, in each survey

<table>
<thead>
<tr>
<th></th>
<th>S1</th>
<th>N</th>
<th>S2</th>
<th>N</th>
<th>S3</th>
<th>N</th>
<th>S4</th>
<th>N</th>
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</thead>
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<tr>
<td>Emotional intensity</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average rating</td>
<td>.22</td>
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<td>.22</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>.27*</td>
<td>70</td>
<td>.50**</td>
<td>34</td>
<td>-.10</td>
<td>29</td>
<td>.23</td>
<td>13</td>
</tr>
<tr>
<td>S2</td>
<td>.21</td>
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<td>.24</td>
<td>36</td>
<td>.12</td>
<td>21</td>
<td>-.04</td>
<td>9</td>
</tr>
<tr>
<td>S3</td>
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<td>29</td>
<td>-.19</td>
<td>21</td>
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<td>16</td>
<td>.06</td>
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<td>.17</td>
<td>16</td>
</tr>
<tr>
<td>S4 – Last month</td>
<td>.15</td>
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<td>.24</td>
<td>16</td>
<td>.01</td>
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<td>.30</td>
<td>16</td>
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<tr>
<td>Conversation</td>
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<td></td>
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<td></td>
</tr>
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<td>34</td>
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</tr>
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<td>-.13</td>
<td>18</td>
<td>-.13</td>
<td>16</td>
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<td>16</td>
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<tr>
<td>Consistency</td>
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<td>-</td>
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</tr>
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<td>-</td>
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<td>29</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S14</td>
<td>-</td>
<td>-</td>
<td>.58*</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p ≤ .05 ** p ≤ .01

Table 8. Pearson’s correlation between predictors: Average rating of emotions, the highest rating given to the emotions, level of media attention, and level of ensuing conversation

<table>
<thead>
<tr>
<th></th>
<th>Emotional intensity</th>
<th></th>
<th></th>
<th></th>
<th>Media attention</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>S4 Last month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average rating</td>
<td></td>
<td></td>
<td></td>
<td>Highest rating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional intensity</td>
<td></td>
<td>Average</td>
<td>Highest</td>
<td></td>
<td>S1</td>
<td>S2</td>
<td>S3</td>
<td>S4</td>
<td>S4 Last month</td>
<td></td>
</tr>
<tr>
<td>Average rating</td>
<td>-</td>
<td>.81***</td>
<td>.25*</td>
<td>.22</td>
<td>-.32</td>
<td>.25</td>
<td>.35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest rating</td>
<td>-</td>
<td></td>
<td>.20</td>
<td>.18</td>
<td>-.25</td>
<td>.26</td>
<td>.29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conversation</td>
<td></td>
<td>.40***</td>
<td>.33**</td>
<td>.42***</td>
<td>.31</td>
<td>.13</td>
<td>.02</td>
<td>-.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>.36*</td>
<td>.44**</td>
<td>.29</td>
<td>.53***</td>
<td>.32</td>
<td>.17</td>
<td>.09</td>
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<td>.31</td>
<td>.45*</td>
<td>.66**</td>
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<td>.04</td>
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<td>.08</td>
<td>.10</td>
<td>.28</td>
<td>.69***</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p ≤ .05 ** p ≤ .01 *** p ≤ .001
in Survey 1 was positively associated with media attention in Survey 2 and so on (each correlation \( p < .01 \)). This suggests that participants who followed the media extensively in one survey also tended to do so in the next survey. This pattern of findings was not found for level of ensuing conversation, however, level of conversation in Survey 2 was positively correlated with level of conversation in Survey 3 (\( p < .01 \)).

4. Discussion

4.1 Summary of results

The purpose of the present study was to investigate: (1) long-term retention of flashbulb memories for the September 11th attacks, (2) how confidently these memories are held, and (3) what factors influence retention and confidence. We found a rapid decay in flashbulb memories 11 months after the attacks, after which the rate of forgetting stabilized. Additionally, it was found that different aspects of flashbulb memories were forgotten at different rates. Confidence ratings were generally high. Regarding predictors of consistency and confidence, no clear patterns emerged. However, interesting relationships were observed between predictors.

4.2 Consistency of flashbulb memories

The results in the present study lend support to Hirst et al. (2009) regarding the retention curve of flashbulb memories. Specifically, after an initial rapid decay in the first year, the rate of forgetting stabilizes. This study further extends the findings in Hirst et al. (2009) by demonstrating that even after ten years the rate of forgetting is stabilized. To further conclude that flashbulb memory stabilizes after the first year, consistency measures contrasting Surveys 3 and 4 with Survey 2 could have been obtained. High consistency scores between Survey 2 and Survey 3, as well as between Survey 2 and Survey 4, would confirm that memory stabilizes after Survey 2, i.e. one year following the attacks. Due to a limited time-frame this analysis was not performed in the current study. However, a comparable analysis was conducted in Hirst et al. (2009) and the results indicated that in Survey 3 participants tended to repeat their inconsistencies, rather than correct the inconsistencies or provide an alternative answer.

As predicted, the average consistency score for the Swedish participants was significantly lower in comparison to the American participants. However, this difference was only significant in Survey 2, not Survey 3. In addition, the difference in consistency scores between the Swedish and American sample in Survey 2 had only a moderate effect size. This finding may nonetheless imply a small difference in consistency of flashbulb memories due to lower levels of importance/consequentiality attached to the event for the Swedish sample. Indeed, Tinti et al. (2009) found an association between the appraisal of importance/consequentiality attached to an event and the memory for the event. The World Trade Center and Pentagon were symbolic buildings that represented America’s financial and military influence in the world. As a result, many Americans perceived the attacks as a threat to the entire nation and therefore may have appraised the event as highly consequential. In addition, the likelihood of being directly or indirectly affected by the attacks was greater for American participants in comparison to the Swedish participants. Hirst et al. (2009) found that 40.4 percent of the participants who completed all surveys experienced personal loss or inconvenience. This percentage is likely to be lower in the Swedish sample. A possible explanation for why a difference between the samples was not found in Survey 3 is that importance/consequentiality may have a stronger effect on consistency in the first year compared to consistency in the following years. In order to confirm the importance of
national membership on consistency, the relation between importance/consequentiality and consistency in the Swedish sample needs to be investigated. The reason why the present study did not include such an analysis was because importance/consequentiality was assessed by two open-ended questions which were not coded.

When comparing the consistency of individual questions assessing flashbulb memory, the consistency of participants’ recollections for their initial emotional reaction upon hearing the news was generally lower than the remaining questions. This finding converges with the study by Hirst et al. (2009), which suggests that different aspects of a flashbulb memory may be forgotten at different rates. Specifically, Hirst et al. (2009) found that memories of initial emotional reactions tend to be forgotten more quickly than other aspects of flashbulb memory. Perhaps this impaired memory of emotional reactions is due to the subjective nature of emotional experiences. Emotional experiences may be difficult to label since a variety of emotions can surface simultaneously. In contrast, objective features of a flashbulb memory (e.g. a place, person, or an activity) may contain more cues and possibly give rise to supporting memories, resulting in a more accessible memory (Johnson, 2006). Indeed, in the current study the consistency of participants’ recollections for their location upon hearing the news was the highest. This may be partially due to reconstructive techniques employed by participants. By knowing the approximate time of the attacks, participants may have deduced where they would have been at that particular time. For example, it is likely that Swedish participants were at work or in school when they received the news of the attacks. Based on this knowledge, participants can provide a consistent response despite not being able to remember their actual location.

4.3 Confidence

Confidence ratings were generally high, however an attenuation was observed in Survey 4. Thus, while the consistency stabilizes after one year, the level of confidence decreases between the third and tenth year after the attacks. In accordance with previous findings (Hirst, 2009; Talarico & Rubin, 2003) consistency in the present study was not significantly related to confidence in Surveys 2 and 3. However, consistency was positively related to confidence ten years after the attacks. The confidence with which a memory is held may be evaluated in terms of how long ago the remembered event took place. Specifically, as more time passes, confidence ratings may be based on what is actually remembered, thus leading to more realistic ratings. This may explain why a relationship was found between consistency and confidence in Survey 4, but not in earlier surveys. Indeed, Weaver (1993) found that the association between consistency and confidence increased over time. However, it should be noted that the decrease in confidence between Survey 3 and Survey 4, as well as the association between consistency and confidence found in Survey 4, only reached a significance level of .05. This implies that precaution should be taken when interpreting the relationship found between consistency and confidence in Survey 4.

Additionally, the forecasted accuracy ratings in Survey 1 (which was a form of confidence measure), was significantly lower than the confidence ratings in Survey 2. This may be due to a higher level of uncertainty in predicting future memory consistency in comparison to making a current judgment on the consistency of one’s memory. As mentioned in the method section, since Survey 1 was distributed in close temporal proximity to the event, forecasted accuracy was a more suitable measure due to the fact that confidence ratings would presumably be high for all respondents.

4.4 Predictors of consistency and confidence

When examining predictors of consistency, a significant correlation was found between media attention in Survey 3 and consistency in Survey 3. In addition, there was a significant
correlation between media attention in Survey 4 and consistency in Survey 3. These results hint to an association between rehearsal and consistency, which is suggested by the theoretical models of flashbulb memory formation (Brown & Kulik, 1977; Conway, et al., 1994; Er, 2003; Finkenauer, et al., 1998) and results in previous studies (Conway, et al., 2009; Tinti, et al., 2009). However, since no correlations were found between ensuing conversation (i.e. the second measure of rehearsal) and consistency, we should be careful when drawing conclusions from the associations between media attention and consistency. An additional reason for concern is that in several cases media attention was not correlated with consistency. Also, the significant correlations between media attention and consistency only reached the .05 significance level which is less impressive when considering the large amount of significance tests conducted in this study. Thus, our results are more in line with Hirst et al. (2009) who found no correlations between predictors and consistency.

When analyzing predictors of confidence, Hirst et al. (2009) found significant correlations between rehearsal (media attention and ensuing conversation) and confidence within each survey. Conversely, a similar pattern was not found in the present study. Regarding the association between media attention and confidence, significant correlations were only found between media attention in Survey 1 and confidence in Survey 2. Additionally, media attention in Survey 1 was significantly correlated with forecasted accuracy. No significant correlations were found between ensuing conversation and confidence. In contrast to our prediction based on findings by Phelps and Sharot (2008), no pattern of associations was found between emotional intensity and confidence. Despite the significant results found between predictors and confidence, similar results were not found in all surveys which imply that our findings regarding predictors of confidence are inconclusive. These contradicting results in comparison to Hirst et al (2009) may be due to the small sample size in the current study.

4.5 Associations between predictors

Regarding the correlations between predictors, two interesting patterns were observed. First, emotional intensity was significantly associated with ensuing conversation in Surveys 1 and 2. Second, a significant correlation was found between media attention and ensuing conversation within each survey. Greater emotional intensity may elicit a stronger need for disclosing emotional reactions, resulting in a higher level of conversation. Indeed, highly emotional experiences tend to be shared with others, often shortly after the event, even when culture, gender and different emotional experiences are taken into account (Rimé, Finkenauer, Luminet, Zech, & Phillpot, 1998). A possible motive for social sharing may be to clarify and regulate the emotions associated with an event (Pasupathi, 2010; Rimé et al., 1998). The association between media attention and ensuing conversation seems intuitive, as an interest in the event would likely influence both factors. In addition, according to Hirst et al. (2009) media attention and ensuing conversation are both memory practices which a community employs to rehearse important past events.

4.6 Limitations

Due to the small sample size in the present study, precautions should be taken when interpreting the results. Specifically, the analyses which were conducted across all four surveys included only eleven participants and may therefore have limited power. Additionally, significant results found in this limited sample may not generalize to the population. Another limitation is that the sample in this study may not be representative of the population due to the fact that a majority of the participants had some form of higher education.
Regarding the findings presented in this study, numerous significance tests were conducted which can produce misleading results. Thus, results with a significance level of .05 should be interpreted conservatively. We have also interpreted single significant results with caution and have instead aimed to draw conclusions based on recurring patterns found across surveys. It is important to note that a significant correlation between two variables does not guarantee a causal relationship. For example, if a significant correlation would have been found between media attention and consistency, this may have been explained by an underlying positive relationship between individuals’ memory capacity and media consumption. In this particular case, in order to draw the conclusion that media attention predicts consistency, future studies would need to control for “everyday media attention”. Additionally, when interpreting confidence ratings, we have considered ratings of four and five to be high. However, the results do not guarantee that flashbulb memories are rated with high confidence, since a comparison was not made between flashbulb and ordinary autobiographical memories.

The time intervals for each survey were chosen to avoid the potential effect of memory commemorations. However, since all surveys were accepted, this effect may not have been avoided in some cases. Media attention may trigger rehearsal of the individual’s own experiences when hearing the news of the attacks (the flashbulb memory) and in turn improve the consistency of the memory. If media attention predicts consistency, participants who completed the survey around the time of a memory commemoration may have potentially scored higher in consistency of flashbulb memories. Consequently, this may have affected the overall consistency score. However, Conway et al. (2009) compared the consistency scores and confidence ratings of participants who responded to the survey several weeks before the anniversary of the September 11th attacks, with participants who completed the survey shortly after the anniversary. It was concluded that the anniversary of the event did not seem to have an effect on either consistency or confidence. Thus, the fact that all surveys were accepted may have been of minor importance for the outcome of the analyses in the current study. It would presumably have a larger effect if analyses of accuracy had been included, since event memory comprises memory for factual information concerning the event.

Despite the clear instructions in the coding manual, the coding of responses may be susceptible to subjective bias. This may have created discrepancies in the coding, which can cause misleading results. Calculating the interrater reliability of the coding would be optimal in this case in order to estimate the level of bias. Due to insufficient time, it was not assessed in the present study. Even though a reliability measure was not computed, Hirst et al. (2009) provided interrater reliability measures for each survey by calculating either kappas or Cronbach’s alphas for each question. Reliability ratings were good and all exceeded .80. Since the coding manual used in this study deviates only slightly from the one used in Hirst et al. (2009), the reliability ratings demonstrate that the coding manual was only to a small extent prone to subjective interpretations.

Additionally, we observed that certain survey questions were unclear and misunderstood by participants. Participants may therefore have scored lower than their potential in flashbulb memory consistency. More specifically, participants seemed to be confused by the question “What were you doing immediately before you became aware of the attack?” since this question was preceded by the question “What were you doing?” Due to the similar nature of these questions, participants tended to report an event that did not occur immediately before hearing the news but rather reported an event which took place earlier in the day. However, if the participants repeatedly misunderstood these questions across the surveys this would result in consistent answers and therefore would not affect the overall consistency score. Another concern regarding overall consistency scores is that they may be deceptively lower due to participants who completed all the flashbulb memory questions in
the first survey but did not complete the flashbulb memory questions in a following survey (two participants in both Surveys 2 and 3). It seems unlikely that, during a follow-up survey, participants would have no recollection of the circumstances in which they learned of the attacks. However, since the remaining questions in the survey were completed, we can only speculate as to why participants chose not to complete the six questions regarding flashbulb memory. Consequently, these participants were included in our analyses.

Another limitation in this study concerns whether or not the September 11th attacks are an ideal event for investigating flashbulb memory. According to Conway et al. (2009), the attacks consisted of at least seven shocking moments that created confusion and spanned over three hours. In comparison to flashbulb memories of single shocking events, flashbulb memories may be worse for the September 11th attacks due to the complexity of the events. Conversely, Hirst et al. (2009) found a similar rate of forgetting to that observed in other flashbulb memory studies investigating single events suggesting that the September 11th attacks may nevertheless be suitable for flashbulb memory research.

4.7 Reflections regarding the field of flashbulb memory research

A major limitation in the field of flashbulb memory research is that the methods and measurements used to operationalize flashbulb memory vary considerably across studies. These discrepancies make it difficult to compare results from different studies. Consistency of flashbulb memories is assessed by including questions which correspond to the canonical features identified by Brown and Kulik (1977). However, studies tend to replace one or two features with a new feature or use only five out of the six features. As we have demonstrated in this study, different features can vary considerably in consistency which can affect the overall consistency score.

Another limitation in studies is when a test-retest methodology has not been employed, leading to conclusions based on the vividness or the degree of detail, instead of the consistency, of the reported flashbulb memory (see Berntsen & Thomsen, 2005; Kulkofsky et al., 2011). Additionally, predictors of flashbulb memory are operationalized differently depending on the study. For example, importance/consequentiality is defined as personal loss or inconvenience and proximity to the attacks in Hirst et al. (2009), whereas the same predictor can be defined as an interruption in the current activity (Christianson, 1989), or as consequences for the individual and for society (Tinti et al., 2009). In sum, when interpreting results from different studies, it is important to take into consideration which definitions and methods have been used when investigating consistency and predictors of flashbulb memories.

4.8 Conclusions and future directions

The results in the current study replicate some of the findings in Hirst et al. (2009). Specifically, it was found that after a rapid decay in the first year, the rate of forgetting stabilizes. As predicted, Swedish participants were less consistent in their flashbulb memories in comparison to the American participants. This may be explained by lower levels of importance/consequentiality attached to the event for the Swedish sample. Also, different aspects of a flashbulb memory may be forgotten at different rates due the fact that some features may contain more cues and may therefore be more easily reconstructed. In line with previous findings, confidence ratings were generally high. No clear patterns emerged when examining factors which were hypothesized to influence consistency and confidence. Since few participants responded to all four surveys, further studies on flashbulb events are needed to replicate and draw general conclusions based on the findings in this study.

We hope that future studies will be able to clarify what factors, if any, may affect consistency and confidence. It would be interesting to investigate the effects of specific
emotions, such as anger, fear, or sadness, on consistency and confidence since Conway et al. (2009) found that specifically anxiety experienced in response to an event seemed to predict consistency of flashbulb memories. In addition, future studies should include analyses on accuracy of event memory and how it relates to flashbulb memory. Although the results in this study regarding the retention curve are limited due to the small sample size, they are in line with the findings in Hirst et al. (2009). In order to conclude if this is a universal finding, additional studies should consider investigating longer retention intervals of flashbulb memories similar to those selected in Hirst et al. (2009) and the current study.

Acknowledgements

We would like to thank Andreas Olsson for supervising this study and Robert Meksin for providing extensive guidance in the coding of surveys.

References


Hej!


Den här studien bygger vidare på forskning gjort för att studera minnen av 11 september strax efter attacken, 11 månader efter och 35 månader efter attacken. Studien är en del i ett internationellt forskningsprojekt, som leds av Chandan Vaidya (Georgetown University), William Hirst (The New School for Social Research) och Elizabeth Phelps (New York University), i samarbete med ett antal forskare inom psykologi från olika universitet i framför allt USA: Boston University, Columbia University, Harvard University, MIT, Stanford University, University of California, University of Cambridge, University of Michigan, University of Southern California, Yale University och Washington University. Den svenska delen av forskningsprojektet leds av Andreas Olsson (Karolinska Institutet).


Syftet med denna studie är att undersöka olika aspekter av människors minnen och upplevelser av attackerna den 11 september 2001 mot mål i USA, och hur dessa minnen ändras över tiden. Studien syftar till att öka förståelsen av hur minnen av stora livshändelser skapas och formas över tiden. Vi planerar att följa upp denna studie med en ny enkät om tio år.


Om du föredrar att fylla i enkäten på internet så finns den på följande adress: http://www.emotionlab.se/911ca

**OBS! Fyll endast i en enkät (antingen den här eller på hemsidan). Observera att enkäten är tryckt även på baksidorna.**
Innan du börjar med studien, vänligen läs och skriv under dokumentet ”Samtycke om att deltaga i forskningsstudie” och om du vill, ”Kontaktinformation”. Det finns två samtyckesblanketter, och det ena kan du spara för egen del. När du är klar med dessa kan du börja med enkäten.

Vi ber dig att fylla i enkäten så fort som möjligt, och helst inom ett dygn från det att du mottagit det. Enkäten måste fyllas i vid ett sammanhängande tillfälle.


Om du har frågor eller kommentarer som rör studien, hör av dig till Andreas Olsson (andreas.olsson@ki.se, 08 – 524 824 59). Om du är intresserad delger vi dig gärna våra resultat så snart studien är avklärad. Hör av i så fall av dig till oss.

Vänligen,

The 9/11 Memory Consortium
Samtycke om deltagande i forskningsstudie

Du tillfrågas härmed om att delta i en forskningsstudie om minnen i anslutning till terroristattacken mot USA den 11 september 2001. Den här studien är en del i ett internationellt forskningsprojekt, som leds av Chandan Vaidya (Georgetown University), William Hirst (The New School for Social Research) och Elizabeth Phelps (New York University), i samarbete med ett antal forskare inom psykologi: Andrew Budson (Boston University), Randy Buckner (Harvard University), John Gabrieli (MIT), Marcia Johnson (Yale University), Cindy Lustig (University of Michigan), Mara Mather (University of Southern California), Karen J Mitchell (Yale University), Kevin Ochsner, Daniel Schacter (Harvard University) och Jon Simons (University of Cambridge). Den svenska delen av forskningsprojektet leds av Andreas Olsson (Karolinska Institutet).

Om du samtycker till att delta i den här studien, kommer du bli tillfrågad att göra följande:

1. Svara på en enkät om dina minnen i samband med attacken den 11 september och dina känslor omkring dessa.
2. Tillhandahålla kontaktuppgifter som vi kan använda för att finna dig för en eventuell senare uppföljningsstudie. Om du väljer att göra detta kommer dina kontaktuppgifter att behandlas separat från enkäten så att dina enkätsvar förblir anonyma.

Deltagandet i studien kommer ta ungefär trettio minuter. Det finns inga kända risker associerade med att delta i den här studien, baserat på liknande studier som genomförts tidigare. Som deltagare hoppas vi att du kan hjälpa oss att förbättra vår förståelse för minnen av traumatiska händelser, som i framtiden kan leda till utvecklingen av terapimetoder.

Om du har några frågor kan du kontakta Andreas Olsson (andreas.olsson@ki.se).

Deltagandet är helt frivilligt. Du kan avböja från att delta eller avbryta när du vill.

Återigen, dina svar i den här studien kommer att förbliva anonyma och dina kontaktuppgifter kommer bara vara tillgängliga för de som arbetar med studien. Om resultaten blir publicerade kommer informationen förblir anonym så att ingen identifiering av enskilda personer kan ske.


Underskrift
Datum
**Kontaktinformation**

Om du väljer att skicka in det här formuläret så planerar vi att skicka dig en uppföljningsenkät om tio år. Syftet med denna är att se hur dina minnen och känslor kring dessa förändras över tid. Vänligen försök uppge något sätt som vi kan nå dig om tio år. Vi inser att det är svårt eller omöjligt att veta några säkra uppgifter om framtiden, men försök ge så tillförlitlig information som möjligt.

Notera att även om du väljer att inte skicka in det här formuläret är dina svar på resten av enkäten mycket värdefulla för oss. Var vänlig och skicka in enkäten även om du inte vill skicka med kontaktformuläret.

Tack för ditt deltagande!

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<td>Telefonnummer/email till andra personer genom vilka vi kan nå dig om tio år:</td>
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Vi vill påminna dig om att vi kommer använda ovanstående information för att skicka dig en uppföljningsstudie. Den här sidan kommer skiljas från resten av enkäten direkt när den når oss för att säkerställa din anonymitet.
I den här studien kommer vi be dig att svara på frågor om attacken mot USA den 11 september. Enkäten tar ungefär 30 minuter att besvara.

Att delta i studien är helt frivilligt och du kan när som helst avbryta om finner att frågorna väcker obehag.

För att se till att dina svar förblir anonyma, ber vi dig skapa en identifikationskod till enkäten. Vi kommer inte spara någon information som kopplar denna kod till ditt namn. Om du fyllt i tidigare enkäter i den här studien, vänligen fyll i den identifikationskod du uppgivit tidigare. Om det här är din första enkät, kommer din kod vara sju bokstäver lång och innehålla två delar som du lätt kommer ihåg. Den första delen är de fyra första bokstäverna i din mors flicknamn och den andra delen de tre första bokstäverna i orten där du föddes. Vänligen fyll i denna identifikationskod här:

ID-kod: _ _ _ _ _ _ _

När du fyller i enkäten är det viktigt att du går igenom sidorna i ordning. När du blivit klar med en sida och gått vidare till nästa, gå inte tillbaka för att tänka över dina tidigare svar.

Samtycker du till att medverka i denna studie? Ja / Nej

Besvarade du en liknande enkät för sju år sedan, tre år efter attacken, 2004? Ja / Nej / Osäker

Besvarade du en liknande enkät för nio år sedan, ett år efter attacken, 2002? Ja / Nej / Osäker

Besvarade du en liknande enkät för tio år sedan, strax efter attacken 2001? Ja / Nej / Osäker
1) Beskriv hur du först fick reda på attacken mot USA.

_OBS! Gå inte vidare till nästa sida av enkätén förrän du besvarat denna fråga._
2) Hur mycket var klockan (svensk tid) då du först fick reda på vad som hade hänt?

Hur säker är du på att du minns detta korrekt?

(inte alls) 1--------------2--------------3--------------4------------5 (helt)

3) Hur fick du först reda på det (vilken var din informationskälla)?

Hur säker är du på att du minns detta korrekt?

(inte alls) 1--------------2--------------3--------------4------------5 (helt)

4) Var befann du dig?

Hur säker är du på att du minns detta korrekt?

(inte alls) 1--------------2--------------3--------------4------------5 (helt)

5) Vad gjorde du?

Hur säker är du på att du minns detta korrekt?

(inte alls) 1--------------2--------------3--------------4------------5 (helt)

6) Vilka andra personer fanns i närheten?

Hur säker är du på att du minns detta korrekt?

(inte alls) 1--------------2--------------3--------------4------------5 (helt)
7) Hur kände du dig då du först blev varse attacken?

Hur säker är du på att du minns detta korrekt?

(inte alls) 1-------------2------------3--------------4-----------5 (helt)

8) Vem var den första person med vilken du talade med angående händelsen och hur kände sig hon/han inför vad som hänt?

Hur säker är du på att du minns detta korrekt?

(inte alls) 1-------------2------------3--------------4-----------5 (helt)

9) Vad gjorde du omedelbart innan du blev varse attacken?

Hur säker är du på att du minns detta korrekt?

(inte alls) 1-------------2------------3--------------4-----------5 (helt)

10) Vad gjorde du omedelbart efter att du blev varse attacken?

Hur säker är du på att du minns detta korrekt?

(inte alls) 1-------------2------------3--------------4-----------5 (helt)
11) Led du några personliga förluster som orsakades av attacken? Om så är fallet, var vänlig och specificera.

12) Under de två veckor som följde attacken, påverkades på något sätt dina dagliga rutiner? Om så är fallet, var vänlig och specificera.

13) Hur starkt eller intensivt kände du ledsamhet över attacken?

(låg) 1------------2------------3------------4----------5 (hög)

14) Hur starkt eller intensivt kände du ilska över attacken?

(låg) 1------------2------------3------------4----------5 (hög)

15) Hur starkt eller intensivt kände du rädsla över attacken?

(låg) 1------------2------------3------------4----------5 (hög)

16) Hur starkt eller intensivt kände du förvirring över attacken?

(låg) 1------------2------------3------------4----------5 (hög)

17) Hur starkt eller intensivt kände du frustration över attacken?

(låg) 1------------2------------3------------4----------5 (hög)

18) Hur starkt eller intensivt kände du chock över attacken?

(låg) 1------------2------------3------------4----------5 (hög)

20 a) Hur nära följde du mediabevakningen under de två veckor som följde efter attacken?

(mycket lite) 1-2-3-4-5 (väldigt mycket)

20 b) Om du följt mediabevakningen på TV, vilken kanal dominerade ditt tittande?

21) Hur mycket talade du med andra om attacken under de två veckor som följde efter attacken?

(mycket lite) 1-2-3-4-5 (väldigt mycket)

22) Hur många flygplan var involverade i attacken?

23) Vilka flygbolag eller flygplansmodeller blev kapade? Hur många från vart flygbolag?

24) För varje flygplan, vad var den ursprungliga färden (avgång, ankomst)?

25) I närheten av vilka städer störtade de olika flygplanen?

26) Var befann sig USA:s president George W. Bush när attacken ägde rum?

27) När du först blev varse attacken, vad trodde du hade inträffat?

28) Var vänlig och räkna upp de viktigaste händelserna under attacken.
29) Många anser att följande händelser var de viktigaste i samband med attacken:

a) Ett kapat flygplan kraschade i försvarshögkvarteret Pentagon
b) Ett kapat flygplan kraschade i World Trade Centers andra torn
c) Ett World Trade Center-torn rasade
d) Ett kapat flygplan kraschade i ett av World Trade Centers torn
e) Det andra av World Trade Centers torn rasade
f) Ett kapat flygplan kraschade utanför Pittsburgh

Var vänlig och indikera i vilken ordning som du blev medveten om var och en av händelserna ovan (ange de motsvarande bokstäverna a – f i den ordning du menar):

Var vänlig och indikera i vilken ordning som händelserna ovan faktiskt skedde (ange de motsvarande bokstäverna a – f i den ordning du menar):

30) Om tio år, hur starkt eller intensivt kommer du att känna ledsamhet över attacken?
   (läg) 1-------------2-------------3-------------4-------------5 (hög)

31) Om tio år, hur starkt eller intensivt kommer du att känna ilska över attacken?
   (läg) 1-------------2-------------3-------------4-------------5 (hög)

32) Om tio år, hur starkt eller intensivt kommer du att känna rädsla över attacken?
   (läg) 1-------------2-------------3-------------4-------------5 (hög)

33) Om tio år, hur starkt eller intensivt kommer du att känna förvirring över attacken?
   (läg) 1-------------2-------------3-------------4-------------5 (hög)

34) Om tio år, hur starkt eller intensivt kommer du att känna frustration över attacken?
   (läg) 1-------------2-------------3-------------4-------------5 (hög)

35) Om tio år, hur starkt eller intensivt kommer du att känna chock över attacken?
   (läg) 1-------------2-------------3-------------4-------------5 (hög)

36) Om tio år, tror du att du kommer uppleva andra känslor i anknytning till attacken? Om så är fallet, var vänlig och ange dem nedan och skatta dess intensitet:

37) Under de två veckor som följde attacken, vad trodde du om riskerna för ytterligare en terroristattack i USA under den tidsperiod som är angiven nedan? Observera att siffrorna nedan anger hur stor risk (i procent) som du trodde att det var att en ny attack skulle inträffa. Var vänlig och ange ett alternativ för varje tidsperiod.

Under månaden efter attacken

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Hur säker är du på att du minns detta korrekt?

(inte alls) 1------------2------------3------------4------------5 (helt)

Under året efter attacken

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Hur säker är du på att du minns detta korrekt?

(inte alls) 1------------2------------3------------4------------5 (helt)

Under en 5-årsperiod efter attacken

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Hur säker är du på att du minns detta korrekt?

(inte alls) 1------------2------------3------------4------------5 (helt)
38) Beskriv kortfattat vad attacken betydde för dig under de två veckor som följde efter den 11:e september.

39) Under de två veckor som följde attacken, vad oroade du dig mest över som ett resultat av attacken?

40) Under de två veckor som följde attacken, hur ansåg du att USA skulle reagera på attacken?

41) Under de två veckor som följde attacken, vem trodde du var ansvarig för attacken?

42) För ögonblicket, hur starkt eller intensivt känner du ledsamhet över attacken?
   (läg) 1-------------2--------------3--------------4--------------5 (hög)

43) För ögonblicket, hur starkt eller intensivt känner du ilska över attacken?
   (läg) 1-------------2--------------3--------------4--------------5 (hög)

44) För ögonblicket, hur starkt eller intensivt känner du rädsla över attacken?
   (läg) 1-------------2--------------3--------------4--------------5 (hög)

45) För ögonblicket, hur starkt eller intensivt känner du förvirring över attacken?
   (läg) 1-------------2--------------3--------------4--------------5 (hög)

46) För ögonblicket, hur starkt eller intensivt känner du frustration över attacken?
   (läg) 1-------------2--------------3--------------4--------------5 (hög)

47) För ögonblicket, hur starkt eller intensivt känner du chock över attacken?
   (läg) 1-------------2--------------3--------------4--------------5 (hög)

48) Upplever du några andra känslor relaterade till attacken för ögonblicket? Om så, ange dem nedan och uppskatta deras intensitet:
49 a) Under de senaste sju åren, hur nära har du följt nyhetsrapporteringen om attacken?

(mycket lite) 1--------------2---------------3-------------4-------------5 (väldigt mycket)

49 b) Om du följt mediabevakningen på TV, vilken kanal har dominerat ditt tittande under de senaste sju åren?

50) Under de senaste sju åren, hur mycket har du talat om attacken?

(mycket lite) 1--------------2---------------3-------------4-------------5 (väldigt mycket)

51) För ögonblicket, vad tror du om riskerna för ytterligare en terroristattack i USA under den tidsperiod som är angiven nedan? Observera att siffrorna nedan anger hur stor risk (i procent) du tror det är att en ny attack kommer att inträffa. Var vänlig och ange ett alternativ för varje tidsperiod.

Inom den kommande månaden

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Inom det kommande året

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Inom de kommande tio åren

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52) Beskriv kortfattat vad attacken betyder för dig just nu:
53) För stunden, vad är du mest oroad för i anslutning till vad som skett?

54) För stunden, hur anser du att USA bör reagera på attacken?

55) För stunden, vem tror du är ansvarig för attacken?
56) I och med att 10-årsdagen av attacken närmar sig, har mediebevakningen av händelsen ökat.

Under de senaste månaderna, hur mycket har du följt mediebevakningen kring 11 september?
(många) 1-----------2-----------3-----------4-----------5 (väldigt mycket)

Under de senaste månaderna, hur mycket har du pratat om händelserna den 11 september?
(många) 1-----------2-----------3-----------4-----------5 (väldigt mycket)

Under de senaste månaderna, hur mycket har du diskuterat omständigheterna kring hur du fick reda på attacken den 11 september?
(många) 1-----------2-----------3-----------4-----------5 (väldigt mycket)

57) Förändrade dödandet av Bin Laden sättet som du tänkt eller reagerat på händelserna den 11 september? I så fall, beskriv hur:
58) Hur korrekta tror du att dina minnen är idag av hur du kände dig precis efter attacken?

1--2--3--4--5
(inte alls korrekt) (väldigt korrekt)

Om du svarade på fråga 58 med en skattning mellan 1 och 3, tror du att du minns dina känslor som:

1--2--3--4--5
(mindre negativa än de faktiskt var)
(osäker)
(mer negativa än de faktiskt var)

1--2--3--4--5
(mindre intensiva än de faktiskt var)
(osäker)
(mer intensiva än de faktiskt var)
Demografisk information

1) Ålder:

2) Kön:

3) Är du student? Ja / Nej
   3a) Om ja, var studerar du?
   3b) Vilket år?
   3c) Om inte, ange eventuell examen:

4) Vad var ditt yrke vid tiden för attacken? (om du var student, uppge det)

5) Vad är ditt yrke nu?

6) Eventuell religiös tillhörighet (frivilligt):

7) Hur skulle du beskriva din politiska tillhörighet? (frivilligt)

8) Var är du uppvuxen?

9) Varifrån fick du den här enkäten?

10) Har du sett filmen Fahrenheit 9/11? Ja / Nej
    Har du sett filmen United 93? Ja / Nej
    Har du sett filmen Zeitgeist? Ja / Nej

Stort tack för ditt deltagande!
Appendix II

Notes regarding coding

- A new worksheet was added to the Excel coding grid (AddlSwe) in which questions that were included in the Swedish version, but not the American version of the survey, were coded. Separate coding instructions have been created for these questions.
- Questions in the American version of the survey which were not included in the Swedish version were coded “0 – not stated”.
- On the demographic question 3b regarding level of education, we have interpreted “student level” in the American version of the survey as corresponding to “what year” in the Swedish version. A Swedish Bachelor’s degree is coded as “Undergraduate”, and any form of higher education is coded as “Postgraduate”.
- Regarding the question “Received survey from where (Method)” we have coded “mailing (postal only)” for paper surveys and “email” for web surveys, since this question tended to be misunderstood. The participants generally answered “Karolinska Institutet” which was not a coding option.
- Due to the different political systems in America in comparison to Sweden, we coded political affiliation based on the Swedish political system which consists of two dominating “blocks”: “Alliansen” (Moderaterna, Folkpartiet liberalerna, Centerpartiet, Kristdemokraterna) and “de Rödgröna” (Socialdemokraterna, Miljöpartiet, Vänsterpartiet). If a political party was mentioned which is part of “Alliansen” we coded “Moderate Right”. If a political party was mentioned which is part of “de Rödgröna” we coded “Moderate Left”. If a participant responded with a certain political ideology we coded this answer based on an assessment of which “block” advocates this ideology. For example, if a participant answered liberal we coded this as “Moderate Right” since “Folkpartiet” has a liberal ideology and is part of “Alliansen”. We have only coded “Center” if, for instance, a participant answered “in the middle”. If a participant responded “Socialist” we coded this as “Extreme Left”, in accordance with the instructions in the manual. Similarly, if a participant would have answered “Sverigedemokraterna” this would have been coded as “Extreme Right”.
- One participant responded that he/she was not a student. However, on another question regarding current occupation, the same participant replied that he/she was a postgraduate in psychology. This answer was inconsistent with answers from other participants, since other participants who were postgraduate students replied that they were students. Robert Meksin instructed us to override the participant’s response and code the answer as “student (Postgraduate)”.  
- In certain cases we have used the information provided in question 1, which was an open-ended question, to complement the coding of question 3. For example, if a participant mentioned in question 1 that he/she heard about the terrorist attacks via a telephone call from a certain person, but in question 3 only mentioned the person who called, we coded this response as “Phone call”.

- Ratings of emotional intensity, confidence/forecasting, media attention, ensuing conversation, and accuracy of emotional memories were rounded off to the nearest quarter.