Europe's Journal of Psychology, 7(2), pp. 323-336
www.ejop.org

Memory for emotional events: The accuracy of central and peripheral details

Tiziana Lanciano
University of Bari

Antonietta Curci
University of Bari

Abstract
The emotional intensity of an event is a significant predictor for vividness of event memory. Nevertheless, during the last few decades, there has been some confusion in literature as to whether emotional events are poorly or well retained. It is important to consider that not all details of emotional events are equally remembered: Memory for the central details seems to be relatively good, whereas memory for peripheral details appears to be relatively poor. The aim of the present study was to investigate the accuracy of central vs. peripheral details of an emotional event in a natural but controlled context: the emotional event is a simulated life event, the central and peripheral details of the emotional event were controlled. Indeed previous research work was simply based on the induction of an emotional state in an experimental context and subsequent assessment of a performance memory task. Results showed that, following an emotional event, individuals provided a vivid and accurate recollection not only of the central gist of the event, but also of the context and peripheral details. Implications for literature on emotional autobiographical memories were discussed.

Keywords: emotional memories, emotional details, memory accuracy.

The relationship between memory and emotions is very complex and largely still unknown. A high memory performance for emotionally arousing events has been demonstrated (Deffenbacher, 1983; Deffenbacher, Bornstein, Penrod, & McGorty, 2004). A number of studies have indicated that the emotional intensity of an event is a significant predictor for how *vividly* the event is recalled (e.g. Reisberg & Heuer,

2004; Rubin & Kozin, 1984; Talarico, Bernsten, & Rubin, 2009). What these studies have shown us is that emotional events are remembered with great richness of details, although no information has been provided on the *accuracy* of these remembered details. Indeed, during the last few decades, there has been some confusion in literature as to whether emotional events are poorly or well retained. Whereas laboratory research has shown mixed results concerning memory for emotional events (Christianson, 1984; Heuer & Reisberg, 1990; Deffenbacher, 1983; Loftus & Burns, 1982), research on real-world events has usually demonstrated that details of emotional events are relatively well retained in memory (Bohannon, 1988; Brown & kulik, 1977; Rubin & Kozin, 1984). For a clear investigation of the link between memory and emotion, it is important to consider that not all details of emotional events are remembered equally well. More specifically, it is thought that memory for the gist (central details) of an emotional event is well retained, whereas memory for irrelevant information (peripheral details) is poorly recalled (see, for overviews, Christianson, 1992; Heuer & Reisberg, 1992). Some studies have found that, whereas memory for peripheral details seems to be diminished by high levels of arousal, memory for central details (emotion-related and plot-relevant details) appears to be facilitated (e.g., Burke, Heuer, & Reisberg, 1992; Christianson & Loftus, 1991; Christianson, Loftus, Hoffman, & Loftus, 1991; see Christianson, 1992, for a review). The idea that high arousal and negative affect enhance recall of central aspects of events has been supported in several research fields: autobiographical memory (Berntsen, 2002; Christianson & Loftus, 1990; Strube & Neubauer, 1988; Wessel & Merckelbach, 1994), eyewitness memory (Steblay, 1992; Yuille & Cutshall, 1986), event memory (Christianson & Loftus, 1991; Reisberg & Heuer, 2004), episodic memory (Kensinger & Corkin, 2003; MacKay et al., 2004), animal learning (Easterbrook, 1959) and perception (O¨hman, Flykt, & Esteves, 2001). However, a number of laboratory studies on episodic memory have recently shown that also contextual and peripheral information are enhanced for emotional stimuli, such as colour (Kensinger & Corkin, 2003; MacKay et al., 2004), spatial location (MacKay & Ahmetzanov, 2005), or temporal context (D'Argembeau & van der Linden, 2005).

What exactly are "central" or "peripheral" details? Where is the boundary between the center of an event and its periphery? Burke Heuer, and Reisberg (1992) proposed the categorization of to-be-remembered material in four categories of information. The first two are commonly considered as central details and contain a) details pertaining to the gist or plot of the emotional event and b) the materials visually central to the event. The second two categories are designed to categorize what have been considered peripheral details and include c) details that are attached to the visually central materials and d) details from the background and the context of the event. An alternative to Burke and colleagues' categorization

(Burke, Heuer, & Reisberg, 1992) was proposed by Christianson and Loftus (1991). According to the authors, central characters could be identified in terms of their centrality to the subject's attention, rather than relevance to the plot. In this definition, "central" details would be those details associated with material central to attention, independent of whether they are also associated with material central to the event's plot (Christianson & Loftus, 1991). For the purpose of the present study, we considered the Christianson and Loftus's categorization: The centrality of details refers to the centrality for the subject's attention, rather than to the relevance to the plot. A common explanation of the link between emotion and the type of remembered details is based on the attentional narrowing hypothesis (Christianson, 1992), according to which physiological arousal results in attention being directed towards central rather than peripheral characteristics of the situation. Consequently, memory for central details would be relatively good, whereas memory for peripheral information would be impaired. There is empirical evidence to support Christianson's attentional narrowing hypothesis. Field studies examining the memory of witnesses for robberies (Christianson & Hübinette, 1993), or that of college students for emotional events (Christianson & Loftus, 1990; Wessel & Merckelbach, 1994) suggest that central information is, indeed, better remembered than peripheral information.

However, a limit of this attentional narrowing hypothesis concerns the ecological validity of the procedures employed to assess emotional memory. A general criticism of laboratory studies on emotion and memory is that they are too far removed from real life and that generalising experimental data to emotional life events (e.g. trauma) is not acceptable (e.g. Terr, 1994; Yuille & Tollestrup, 1992). In other words, this implies that emotional memory can only be examined in field studies. However, on the other hand, field studies may suffer from problems such as retrospective bias due to post-encoding categorisation of central and peripheral information (Christianson & Loftus, 1990; Wessel & Merckelbach, 1994). In sum, field studies on emotional memory may suffer from retrospective and report biases, whereas experimental studies may not be generalized to real-life situations. Because these problems can be circumvented in controlled experiments, it seems worthwhile to find approaches that increase the ecological validity of laboratory studies on emotion and memory.

Overview and hypotheses

As can be seen from the aforementioned, empirical research concerning the accuracy of emotional memory details has reached controversial and debatable results. The aim of the present study was to investigate the accuracy of remembered central and peripheral details of an emotional event; more specifically we

considered memory for the gist of the event itself as memory for the central information, and memory for the surrounding context as memory for peripheral details (Brown & Kulik, 1997). The strength of the present study is to explore the accuracy of emotional memory details in a natural but controlled context, whereas previous reserch work has mainly focused on the induction of an emotional state in an experimental setting and, then on the assessment of a performance memory tasks (Reisberg & Huer, 1992; Christianson, 1992). The novelty of this research is the attempt to overcome, at the same time, the limit of the experimental studies - by choosing an emotional life event - and the limit of the field studies - by adopting a controlled procedure -. Indeed, in the present study, the emotional event is a real-life emotional event simulated with the help of an accomplice, and central details of the emotional event and peripheral details of the context of the event were controlled.

The main characteristics of this study were the following: a) it concerned a negative emotional event that had been simulated with the help of an accomplice; b) participants' memories for both central and peripheral details were collected (Burke, Heuer, & Reisberg, 1992; Christianson & Loftus, 1991; Reisberg & Heuer, 1992); c) participants' memories for the emotional event were assessed in both a free and probed recall procedure (Bohannon, 1988; Bohannon & Symons, 1992; Brown & Kulik, 1977), and d) participants' memories for the emotional event were assessed both immediately after the event (Time 1), and a 5-month delay (Time 2) (Christianson, 1984; Levonian, 1967).

Participants were expected to remember not only the gist of the emotional event (central details) but also the contextual details (peripheral details) (Brown and Kulik, 1977; D'Argembeau & van der Linden, 2005; Kensinger & Corkin, 2003; MacKay & Ahmetzanov, 2005; MacKay et al., 2004). Both central and peripheral details would be subject to the effect of time (Heuer and Reisberg, 1992). In line with the emotional memory studies, peripheral details were expected to be better stored through probed recall than free recall, since individuals remember more accurately contextual details when they are asked to do this (Bohannon & Symons, 1992; Nachson & Zelig, 2003).

Method

Design

The present study used a 2x2 repeated-measure design with Retention Interval (Time 1 vs. Time 2) and Type of Details (Central vs. Peripheral Details) as within subjects

factors. Dependent variables were Accuracy of remembered details score in the free recall task, and Accuracy of remembered details score in the probed recall task.

Participants

The sample was composed of 95 undergraduate students from the University of Bari, Italy (93,7% women). M_{age}= 19.32 (*SD* = 1.21).

Measures and Procedure

Students were recruited during a psychology class and requested to write a diary and answer several questions for seven days as soon as an emotional event (positive or negative) had happened in their life in the days following the delivery of the diary (cover story). Immediately after this delivery, a state of emotional stress and alarm was simulated in the class: An accomplice suddenly came into the room, shouting nonsensically and moving around the class for a few minutes provoking panic among the students. As soon as he went out, all students agreed to write in their diaries about this negative event. This situation was planned in order to have a standard stimulus event to which all students might have responded. The event has been chosen on the basis of features of displeasure, surprise, personal importance, and negative emotional intensity, as so as a real life event. In order to check the accuracy of peripheral details, many details of the context were controlled: the position of the teacher and her assistants, their clothing, the position of particular objects in the classroom, and a specific sound.

The questionnaire used for the present study was composed of several sections: 1) Free recall of the event, 2) Probed recall for central details, 3) Probed recall for peripheral details, 4) Emotional feeling state, 5) Novelty, 6) Importance.

Free recall. Following the simulated emotional event, participants were requested to write a diary for seven days about it. The written accounts were submitted to a content analysis in order to estimate the occurrence frequency of remembered central vs. peripheral details. The content analysis entailed independent coding of narratives by two different judges (95% of inter-judge agreement). Details referring to the protagonist of the event were considered as central: a) his physical characteristics, b) his clothing, c) what he did, and d) what he said. The proportion given by the number of remembered central details divided by the number of total remembered details was considered in data analysis as the Accuracy for central details score in the free recall task scale, ranging from 0 to 1.

Details referring to the context were considered as peripheral: a) date (day, month, year), b) day of week, c) time of day, d) position of other people, e) other people's clothing, f) weather outside, g) a particular smell or sound, and h) the position of a particular object (i.e., chair) in the room. The proportion given by the number of remembered peripheral details divided by the number of remembered total details was considered in data analysis as the Accuracy for peripheral details score in the free recall task scale, ranging from 0 to 1.

Probed recall for central details. Two questions assessed the recall of central details. Participants were asked the following questions about: a) who the protagonist of the event was, and b) how he dressed. For item a), the value 2 was assigned if participants answered something like "*a crazy/strange man*", a value 1 if respondents answered "*a man*", and a value 0 if respondents did not provide an answer, or if the answer was totally incorrect. For item b) the value 4 was assigned if participants provided an exact description of the protagonist's clothing, i. e. "*brown leather jacket, purple scarf, red hat and jeans*"; the value 3 was assigned if participants provided at least three of these details; the value 2 was assigned if they provided at least two details; the value 1 was assigned if they provided at least one detail; the value 0 if they did not provide an answer, or if the answer was totally incorrect. Item scores of this section were added up to get the Accuracy for central details score in the probed recall task scale, ranging from 0 to 6.

Probed recall task for peripheral details. Eight questions assessed recall of the peripheral details. Participants were asked the following questions about: a) date (day, month, year), b) day of week, c) time of day, d) position of other people, e) other people's clothing, f) weather outside, g) a particular smell or sound, and h) the position of a particular object (i.e., chair) in the room. For items a), b), and c) the value 2 was assigned if respondents provided a totally accurate answer, 1 if they provided a partially accurate answer, and 0 if they did not provide an answer or if the answer was totally incorrect. For items d), e), f), g), and h) the value of 1 was assigned if participants provided an accurate detail, and the value 0 if they provided inaccurate details, or if they did not provide any answer. Only context details whose accuracy could be checked were considered. It follows that personal details (i.e., one's own clothing or own feeling and emotions) were not considered for the analyses. Item scores of this section were added up to get the Accuracy for peripheral details score in the probed recall task scale, ranging from 0 to 11.

Emotional feeling state. Participants rated the extent to which they felt displeasure/pleasure on a scale ranging from 0 (*displeasure*) to 6 (*pleasure*).

Additionally, participants rated the extent of emotional intensity of the event on a scale ranging from 0 (*not at all*) to 10 (*very much*).

Novelty. Participants rated the extent to which the event was expected on a scale ranging from 0 (*not at all*) to 10 (*very much*).

Importance. Participants rated on three scales ranging from 0 (*not at all*) to 10 (*very much*): a) the importance of the event, b) its personal consequences, and c) its consequences for other people's lives. Item scores of this section were added up to get the Importance Scale ranging from 0 to 30 (Cronbach's alpha = .81).

When participants handed back the diary, they were debriefed. After five months - the delay concerned the accessibility to the sample - , participants were contacted and instructed to answer again some questions concerning the emotional event. Participants were asked to fill in only the sections concerning the free recall and the probed recall for central and peripheral details.

Results

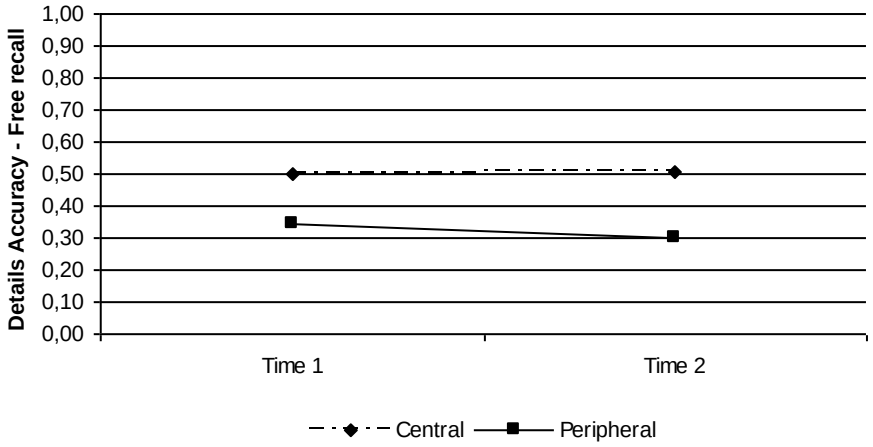
Descriptive analyses

Descriptive analyses showed that participants evaluated the event as very unpleasant (range 0-6; *M* = .33, *SD* = .63), emotionally intense (range 0-10; *M* = 8.65, *SD* = 1.60), unexpected (range 0-10; *M* = .03, *SD* = .23), and important (range 0-30; *M* = 24.55, *SD* = 6.62). Additionally, individuals remembered peripheral details with accuracy, even if better in the probed recall task than in the free recall task (respectively, range 0-1; *M* = .34, *SD* = .17; range 0-11 *M* = 9.66, *SD* = .96).

ANOVA on the Accuracy of remembered details score in the free recall task

A 2*2 repeated-measure ANOVA was run on the Accuracy of remembered details score in the free recall task scale, with the Retention Interval (Time 1 vs. Time 2) and Type of Details (Central vs. Peripheral) as within subjects factors (see figure 1). A significant main effect of Type of Details was found to be significant ($F_{1,94}$ = 50.92, p < .001) in that central details were more accurately remembered than peripheral details. Neither the main effect of Retention Interval ($F_{1,94}$= 1.66, p = n.s) nor the interaction effect of Retention Interval by Type of Details ($F_{1,94}$= 1.26; p = n.s.) were found to be significant.

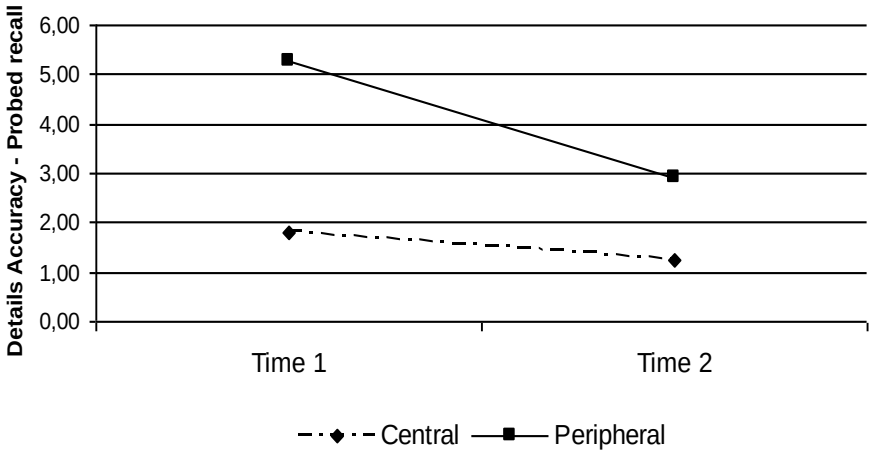
Figure 1: ANOVA Retention Interval by Type of Details on the Accuracy of remembered details score in the free recall task.



ANOVA on Accuracy of remembered details score in the probed recall task

A 2*2 repeated-measure ANOVA was run on the Accuracy of remembered details score in the probed recall task, with the Retention Interval (Time 1 vs. Time 2) and Type of Details (Central vs. Peripheral) as within subjects factors. A significant main effect of Retention Interval was found to be significant ($F_{1,94}$= 322.13, p < .001), in that the accuracy of remembered details declined over time (see figure 2). A significant main effect of Type of Details was also found to be significant ($F_{1,94}$= 852.16, p < .001), with peripheral details more accurately remembered than central details (see figure 2). Finally, a significant interaction effect of Retention Interval by Type of Details was found on the number of remembered details ($F_{1,93}$= 150.06, p < .001) since memory decline was found to be more evident on the average amount of recalled peripheral details, compared to central details (see figure 2).

Figure 2: ANOVA Retention Interval by Type of Details on the Accuracy of remembered details score in the probed recall task.



Discussion

Although the distinction between central and peripheral details of an emotional event is not clear yet, it is thought that memory for central details is well retained, whereas memory for peripheral details is relatively poorly recalled (Christianson, 1992; Heuer & Reisberg, 1992). The aim of the present study was to answer the problem of accuracy of emotional memories, by investigating the accuracy of the remembered central and peripheral details. The strength of this study was to investigate the emotional memory phenomenon in a natural but controlled setting, where the event is an emotional life event, and central details/peripheral details were controlled. The novelty of this study was the attempt to overcome at the same time the limit of experimental studies – by choosing a negative life event–and the limit of field studies–by checking and manipulated the central and peripheral details.

Participants evaluated the event as unpleasant, important, and unexpected, and they experienced high level of emotional intensity. The present results showed and confirmed that, following an emotional event, people were able to remember not only the gist of the event, but also the contextual and peripheral details (Brown and Kulik, 1977; D'Argembeau & van der Linden, 2005; Kensinger & Corkin, 2003; MacKay & Ahmetzanov, 2005; MacKay et al., 2004). Concerning the accuracy of remembered details, the present findings need to be interpreted on the basis of the memory task adopted. Indeed, the recollection from the free recall task showed that people remembered more accurately the gist of the event rather than peripheral details (Christianson, 1992; Heuer & Reisberg, 1992); on the contrary, the recollection from probed recall task showed that peripheral details were better remembered than central details.

There is a possible explanation for this result. Emotional memory studies showed that individuals provided more peripheral details when they were asked to remember these in a probed recall task rather than in a free recall task (Bohannon & Symons, 1992; Nachson & Zelig, 2003). Indeed, when people are asked to describe an emotional event, generally they narrow their attention on some central perceptual details of an event, leaving out peripheral information (Reisberg & Heuer, 1992). Additionally, several contextual details were controlled in order to guarantee their accuracy, therefore in the probed recall task, participants were asked to remember this type of information. On the other hand, in their free recalls, participants were free to write about the event and generally mentioned personal details whose accuracy was impossible to establish. These details were not considered in the analyses.

Additionally, the present results showed that both central and peripheral details declined over time, even if central details declined more slowly. This effect finds confirmation in several studies on emotional memory. Taking into consideration the role of attention, the role of retention interval, and the type of remembered details, Heuer and Reisberg (1992) suggested that emotion leads to a narrowing of attention on some central perceptual details of an event, and this attentional focus seems to slowly decline over time.

This study tried to contribute to research work on emotional memories. First of all, the main strength of the research is that it applied a procedure which preserved both the ecological validity of the field studies and the controlled setting of the experimental studies. A general criticism of laboratory studies on emotion and memory is that they are too far removed from real life and that generalising experimental data to emotional life events is not justified (e.g. Terr, 1988; Yuille & Tollestrup, 1992). In other words, this position implies that emotional memory can only be examined in field studies. However, this type of study may suffer from problems such as retrospective bias or circularity due to post-encoding categorisation of central and peripheral information (Christianson & Loftus, 1990; Wessel & Merckelbach, 1994). In the present study, the emotional event is a real-life emotional event simulated with the help of an accomplice, and central details of the emotional event and peripheral details of the context of the event were controlled. Second, the present study showed that, after an emotional event, also peripheral and contextual details may be stored, and that memory of these details is influenced by the memory task adopted. The present findings also have precious implications for the literature on Flashbulb Memories (FBMs; Brown & Kulik, 1997). Indeed, the distinction between central and peripheral details reflects a key aspect for research on FBMs. They represent a special type of emotional autobiographical memories: the personal circumstances under which a person first learned about an unexpected, emotionally-arousing, and important event are encoded and stored in memory in a different way to the memory of the event itself (event memory, EM; Brown & Kulik, 1977). Traditional FBMs studies investigated them in terms of memories of contextual and peripheral details, whereas EMs may be considered as memories for central details. Although the central–peripheral distinction is not clear-cut (as said before), it seems that EM is more closely associated with the central, emotionally arousing event (Christianson, 1992), than with the circumstances in which participants learned about it. The present findings – above all concerning the probed recall task - supported the general idea of FBM "accuracy superiority" over EM (Bohannon & Symons, 1992), and contradicted the idea for which central details of emotional events are more accurately preserved than their peripheral ones (Burke, Heuer, & Reisberg, 1992; Christianson, 1992; Heuer & Reisberg, 1990). In other

words, following an emotional event, individuals provided a vivid and accurate recollection not only of the central gist of the event but also of the context and peripheral details, especially if they were forced to remember this type of details.

The present study showed also the key role of the procedures employed to assess memory accuracy. It investigated the influence of the methodological procedures on the type of remembered details for which it seemed to be easier and more frequent that individuals provided more peripheral details (such as FBM details) when they were asked to remember these in a probed recall task rather than in a free recall task (Bohannon & Symons, 1992; Nachson & Zelig, 2003).

Despite these interesting findings, the present research presents a limitation concerning the sample involved: An investigation with a sample prevalently composed by female undergraduate students might raise some doubts on the generalisation of results, and on the ecological validity of the research. A more representative sample may be involved in further research, to allow researchers to get a broader generalization of their results.

References

Berntsen, D. (2002). Tunnel memories for autobiographical events: Central details are remembered more frequently from shocking than from happy experiences. *Memory & Cognition, 30*, 1010 - 1020.

Bohannon, J. N. (1988). Flashbulb memories for the Space Shuttle disaster: A tale of two theories. *Cognition, 29,* 179-196.

Bohannon III, J.N., & Symons, V.L. (1992). Flashbulb memories: Confidence, consistency, and quantity. In E. Winograd & U. Neisser (Eds.), *Affect and accuracy in recall: Studies of "flashbulb memories"* (pp. 65-95). Cambridge University Press: Cambridge.

Brown, R. & Kulik, J. (1977). Flashbulb memories. *Cognition*, *5*, 73-99.

Burke, A., Heuer, F., & Reisberg, D. (1992). Remembering emotional events. *Memory and Cognition, 20*, 277–290.

Christianson, S. (1984). The relationship between induced emotional arousal and amnesia. *Scandinavian Journal of Psychology,* 25, 147-160.

Christianson, S.-Å. (1992). Do flashbulb memories differ from other types of emotional memories? In E. Winograd, & U. Neisser (Eds.), *Affect and accuracy in recall* (pp. 191-211). Cambridge: Cambridge University Press.

Christianson, S.-AÊ & Hübinette, B. (1993). Hands up! A study of witnesses' emotional reactions and memories associated with bank robberies. *Applied Cognitive Psychology, 7*, 365-379.

Christianson, S.-AÊ., & Loftus, E.F. (1987). Memory for traumatic events. *Applied Cognitive Psychology, 1*, 225–239.

Christianson, S.-AÊ ., & Loftus, E.F. (1990). Some characteristics of people's traumatic memories. *Bulletin of the Psychonomic Society, 28*, 195–198.

Christianson, S.-AÊ ., & Loftus, E.F. (1991). Remembering emotional events: The fate of detailed information. *Cognition and Emotion, 5*, 81–108.

Christianson, S.-AÊ ., Loftus, E.F., Hoffman, H., & Loftus, G.R. (1991). Eye fixations and memory for emotional events. *Journal of Experimental Psychology: Learning, Memory and Cognition, 17*, 693–701.

Curci, A. & Luminet, O. (2006). Follow-up of a cross-national comparison of flashbulb and event memory for the September 11th attacks. *Memory, 14*, 329-344.

D'Argembeau, A., Comblain, C., & van der Linden, M. (2003). Phenomenal characteristics of autobiographical memories for positive, negative, and neutral events. *Applied Cognitive Psychology, 17,* 281-294.

Deffenbacher, K.A. (1983). The influence of arousal on reliability of testimony. In S. Lloyd-Bostock & B. Clifford (Eds.), *Evaluating witness evidence* (pp. 235-252). New York: John Wiley & Sons.

Deffenbacher, K.A., Bornstein, B.H., Penrod, S.D., & McGorty, E.K. (2004). A meta-analytic review of the effects of high stress on eyewitness memory. *Law and Human Behavior, 28*, 687-706.

Easterbrook, J.A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review*, 66, 183-201.

Heuer, F., & Reisberg, D. (1990). Vivid memories of emotional events: The accuracy of remembered minutiae. *Memory and Cognition, 18,* 496–506.

Kensinger, E. A., & Corkin, S. (2003). Memory enhancement for emotional words: Are emotional words more vividly remembered than neutral words? *Memory & Cognition, 31,* 1169-1180.

Levonian, E. (1967). Retention of Information in Relation to Arousal During Continuously-Presented Material. *American Educational Research Journal, 4,* 103-116.

Loftus, E.F., Loftus, G.R., & Messo, J. (1987). Some facts about "weapon focus". *Law and Human Behaviour, 11*, 55–62.

Loftus, E.F. & Burns, T.E. (1982). Mental shock can produce retrograde amnesia. *Memory and Cognition*, 10, 318-323.

Luminet, O., Curci, A., Marhs, E.J., Wessel, E., Constantin, T., Gencoz, F. & Yogo, M. (2004). The cognitive, emotional and social impact of the September Eleven attack: group differences in Memory for the Reception context and the Determinants of Flashbulb Memory. *Journal of General Psychology, 131*, 197-224.

MacKay, D. G., & Ahmetzanov, M. V. (2005). Emotion, memory, and attention in the taboo Stroop paradigm: An experimental analogue of flashbulb memories. *Psychological Science, 16*, 25-32.

MacKay, D. G., Shafto, M., Taylor, J. K., Marian, D. E., Abrams, L., & Dyer, J. R. (2004). Relations between emotion, memory, and attention: Evidence from taboo Stroop, lexical decision, and immediate memory tasks. *Memory and Cognition, 32,* 474-488.

Nachson, I. & Zelig, A. (2003). Flashbulb and factual memories: The case of Rabin's assassination. *Applied Cognitive Psychology, 17*, 519-531.

O¨ hman, A., Flykt, A., & Esteves, F. (2001). Emotion drives attention: Detecting the snake in the grass. *Journal of Experimental Psychology: General, 130,* 466-478.

Reisberg, D. e Heuer, H. (1992). Remembering the details of emotional events, In E. Winograd e U. Neisser (Eds.), *Affect and accuracy in recall: Studies of "flashbulb memories"* (pp.162-190). New York: Cambridge University Press.

Reisberg, D., & Heuer, F. (2004). Memory for emotional events. In D. Reisberg & P. Hertel (Eds.), *Memory and emotion* (pp. 3-41). New York: Oxford University Press.

Rubin, D.C. & Kozin, M. (1984). Vivid memories. *Cognition, 16*, 81-95.

Steblay, N. M. (1992). A meta-analytic review of the weapon focus effect. *Law & Human Behavior, 16,* 413-424.

Strube, G., & Neubauer, S. (1988). Remember that exam? In M. M. Gruneberg, J. S. Morris, & R. N. Sykes (Eds.), *Practical aspects of memory: Current research and issues*. Vol. 1: Memory in everyday life (pp. 247-252). New York: Wiley.

Talarico, M.J., Berntsen, D., & Rubin, D.C. (2009). Positive emotions enhance recall of peripheral details. *Cognition and emotion, 23*, 380-398.

Terr, L.C. (1988). What happens to early memories of trauma? A study of twenty children under age five at the time of documented traumatic events. *Journal of the American Academy of Child and Adolescent Psychiatry, 27*, 96-104.

Wessel, I. and Merckelbach, H. (1994). Characteristics of traumatic memories in normal subjects. *Behavioural and Cognitive Psychotherapy, 22*, 315-324.

Yuille, J. C., & Cutshall, J. L. (1986). A case study of eyewitness memory of a crime. *Journal of Applied Psychology, 71,* 291-301.

About the authors:

Tiziana Lanciano PhD is a research fellow at the Interdepartmental Centre of Psychology of Health, University of Bari "A. Moro", Italy. Her current research interests are emotion and memory, mental rumination, emotional intelligence, and latent-variable analysis.

Address for correspondence: Tiziana Lanciano, University of Bari "A. Moro", Department of Psychology, Piazza Umberto I, 1, 70100 Bari (Italy).
E-mail address: t.lanciano@psico.uniba.it

Antonietta Curci PhD is an Associate Professor at the Department of Psychology, University of Bari "A. Moro", Italy. Her current research interests are emotion and memory, cognitive consequences of emotion, emotional intelligence, forensic psychology, and multivariate data analysis.