



Characteristics of memories for near-death experiences



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ABSTRACT

Near-death experiences are vivid, life-changing experiences occurring to people who come close to death. Because some of their features, such as enhanced cognition despite compromised brain function, challenge our understanding of the mind-brain relationship, the question arises whether near-death experiences are imagined rather than real events. We administered the Memory Characteristics Questionnaire to 122 survivors of a close brush with death who reported near-death experiences. Participants completed Memory Characteristics Questionnaires for three different memories: that of their near-death experience, that of a real event around the same time, and that of an event they had imagined around the same time. The Memory Characteristics Questionnaire score was higher for the memory of the near-death experience than for that of the real event, which in turn was higher than that of the imagined event. These data suggest that memories of near-death experiences are recalled as “realer” than real events or imagined events.

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1. Introduction

Near-death experiences are generally understood to be the unusual, often vivid, and sometimes profoundly life-changing experiences occurring to people who have been physiologically close to death, as in cardiac arrest, or psychologically close to death, as in accidents or illnesses in which they feared they would die (Holden, Greyson, & James, 2009). This phenomenon has been described as early as Plato's *Republic*, the Bible, the *Egyptian Book of the Dead*, and the *Tibetan Book of the Dead* (Holden et al., 2009), and has been increasingly studied over the past 40 years since Moody (1975) popularized the term *near-death experience* and the acronym *NDE*. The incidence of near-death experiences, across prospective studies in four countries, has averaged 17% when measured with a standardized instrument (van Lommel, 2010; Zingrone & Alvarado, 2009). The frequency of NDEs may be increasing with advances in resuscitation techniques, with an estimated nine million people in the US having experienced an NDE (van Lommel, 2010); and these figures may be underestimates due to the reluctance of people to report them (Holden et al., 2009). Given the increasing incidence of NDEs and their potential contribution to our understanding of consciousness, their relevance cannot be understated nor should it be ignored.

Despite the increase in incidence and interest in NDEs, we are far from understanding their etiology. This is not to suggest that research thus far has been uninformative. In fact, many questions about the phenomenology of NDEs have been answered, such as the situations that most often precipitate them, their common features, and their after-effects (Holden et al., 2009). NDEs have been reported in association with life-threatening events during surgery, childbirth, cardiac arrest, accidents, and suicide attempts; but there have also been reports of NDEs, or of features commonly seen in NDEs, when there

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is no threat of death, such as in deep meditation, during a close relative's death, and the use of drugs such as ketamine (Wilkins, Girard, & Cheyne, 2011).

Some of the most common phenomenological features include a sense of being outside the physical body, intense feelings of love and peace, an experience of meeting deceased loved ones, entering a tunnel structure leading to a bright light, and reliving one's entire life in a panoramic-like experience (Moody, 1975). Many of these features typically occur together as components of a discrete near-death experience, but others, such as the life review, may occur in other circumstances without the other NDE features (Katz, Saadon-Grosman, & Arzy, 2017). Although NDEs are usually accompanied by pleasant feelings such as peacefulness, bliss, and joy, a minority of near-death experiencers, including those with brainstem lesions, describe less pleasant feelings (Charland-Verville, Lugo, Jourdan, Donneau, & Laureys, 2015).

Near-death experiences are often transformational and life-changing. Longitudinal studies over a period of 2 and 8 years have shown that these transformational effects are sustained and may intensify over the years (van Lommel, 2010). Some of the most characteristic changes after NDEs include loss of fear of death; strengthened belief in life after death; a new sense of purpose; heightened self-esteem; increased compassion and love for others; lessened concern for material gain, recognition, or status; greater desire to serve others; increased ability to express feelings; and greater appreciation of, and zest for, life (Noyes, Fenwick, Holden, & Christian, 2009).

The search for the causes and mechanisms of NDEs has been confounded both by methodological limitations and by our limited understanding of the relationship between the brain and consciousness. Several models, both physiological and psychological, have been proposed for the origin of NDEs. Some of the most common theories include hypoxia, hypercarbia, effects of endogenous neurochemicals such as endorphins, temporal lobe excitation, REM intrusion, personality disorders, hypnotizability or suggestibility, expectation, and depersonalization; but no explanation to date has fully encompassed all aspects of NDEs or their effects (Greyson, Kelly, & Kelly, 2009).

In response to the challenge near-death experiences present to our understanding of the relationship between brain and mind (Greyson et al., 2009; van Lommel, van Wees, Meyers, & Elfferich, 2001), some have suggested that NDEs are not real but rather imagined experiences, at least in part (Blackmore, 1996; French, 2001, 2003). French and Wilson (2006) described experimental evidence that memories for anomalous experiences created in the laboratory may be influenced by manipulation, such as by verbal suggestion before the event, exposure to misleading information after the event, and demand characteristics of the experimental setting. It is unclear what relevance, if any, such experimental manipulations may have for memories of spontaneous experiences outside the laboratory.

However, several factors commonly associated with near-death experiences may cast doubt on the reliability of memories of the event: (1) NDEs often occur in the presence of cardiac arrest, which often produces some amnesia for the event (Parnia, Spearpoint, & Fenwick, 2007); (2) they may occur under the influence of potentially psychoactive medications, which can alter memories (Curran, 2000); (3) they usually occur in traumatic situations, which are known to influence the accuracy of memory (Schooler & Eich, 2000); (4) they are usually associated with strong positive emotion, which may influence memory (Schaefer & Philippot, 2005); and (5) they are sometimes reported long after the event, a factor that has been shown to reduce the detail and vividness of memories (Talamini & Goree, 2012).

All of these factors have raised questions about the reliability of memories of near-death experiences. In contrast to these reasons to question the reliability of NDE memories, near-death experiencers themselves usually harbor no doubts at all. In fact, it is the norm for near-death experiencers to describe the NDE as “realer than real” or “more real than anything else I've ever experienced” (Greyson, 2014).

Considerable research has focused on differentiating memories of perceived events from memories of imagined events (French & Wilson, 2006). Johnson and colleagues developed the Memory Characteristics Questionnaire to assess the reality monitoring of autobiographical memories, which is the ability to differentiate memories of perceived versus imagined events (Johnson, Foley, Suengas, & Raye, 1988). Johnson et al. (1988) demonstrated that memories of real events contained more perceptual information such as color and sound, more contextual information such as recall of the surrounding time and place, and more meaningful supporting detail such as emotional information, than did memories of imagined events. Later studies corroborated that memories of perceived events are more likely than memories of imagined ones to have richer perceptual detail, more contextual detail (surrounding temporal and spatial information), less information about prior cognitive operations suggesting generation of the memory, and fewer elements that are bizarre or conflict with other knowledge (Johnson, 2006; Johnson et al., 1988; McGinnis & Roberts, 1996; Suengas & Johnson, 1988; Takahashi & Shimizu, 2007).

In an effort to explore the reality monitoring of memories of near-death experiences, two recent studies have examined the characteristics of NDE memories, compared to memories of perceived and imagined events, using a 15-item abridged version of the MCQ. Both studies concluded that memories of NDEs were more similar to memories of real experiences than to memories of imagined events. Thonnard et al. (2013) used the 15-item modified version of the MCQ to evaluate and compare memories among four groups: 8 coma survivors who reported near-death experiences; 6 coma survivors who reported coma-related experiences that did not include NDEs; 7 coma survivors who reported no memory of the coma; and 18 healthy volunteers. They found that memories of NDEs had more characteristics of memories of real events, such as clarity and self-referential and emotional information, than did memories of imagined events.

Palmieri et al. (2014) also used the 15-item modified version of the MCQ to compare the characteristics of NDE memories with memories of both real and imagined events in a sample of 10 near-death experiencers and 10 comparison participants without NDEs. They also attempted to enhance memories through hypnosis, and they recorded EEGs to evaluate associated neural markers of these memories. Like Thonnard et al. (2013), they reported that NDE memories were significantly different

from memories of imagined events and were similar to memories of real events in detail richness and in self-referential and emotional information. NDE memories were associated electrophysiologically with theta frequencies on the temporal region, which are suggestive of episodic memories of real events.

The aim of the present study was to evaluate further the phenomenological characteristics of memories of NDEs by comparing them with memories of real events that happened around the time of the NDE and with “memories” of imagined events from the same time period, that is, events that might have occurred but did not, such as fantasies or dreams from that period or events wished for, planned for, or feared, that never materialized. We used the full 38-item Memory Characteristics Questionnaire, which would permit analysis of component factors of the MCQ in addition to total scores. Our goal was to extend previous studies by [Thonnard et al. \(2013\)](#), and [Palmieri et al. \(2014\)](#), by using a much larger sample of near-death experiencers and by using the full MCQ scale rather than a shorter, modified scale. We also included in our analyses elements reported to influence autobiographical memory, such as emotional valence of the experience, age at time of event, years elapsed since the event, and medication use and cardiac arrest at the time of the event.

2. Materials and methods

2.1. Participants

Participants were identified from among 130 individuals who had spontaneously contacted the authors to share their accounts of their close brushes with death. Among those 130 individuals, 122 described experiences that met criteria for a near-death experience, scoring 7 or more points on the NDE Scale (see below), and were enrolled as the study group. The remaining 8 individuals described experiences that did not meet criteria for a near-death experience, and were therefore excluded from the study group.

The 122 participants in the study group included 88 women (72%) and 34 men (28%); there were 109 self-reported Caucasian participants (89%) and 13 (11%) of other or mixed ethnicity. Their mean age at the time of their close brush with death was 27.9 years ($SD = 10.9$), with a range of 4–56 years; and the mean years elapsed since that event was 34.2 years ($SD = 13.9$), with a range of 4–69 years.

Although all participants reported that, at the time of the event, they considered themselves close to death, in retrospect closeness to death during that event was described by 47 participants (39%) as involving loss of vital signs, by 30 (25%) as involving a serious injury or illness without loss of vital signs, and by 25 (21%) as not serious; 20 participants (16%) could not estimate proximity to death retrospectively. The experience during the close brush with death was described as predominantly pleasant by 107 participants (88%), as emotionally neutral by 5 (4%), and as unpleasant by 6 (5%); 4 participants (3%) could not describe the emotional tone of the experience.

With regard to factors that may substantially affect memory, 56 participants (46%) reported that they had some potentially psychoactive drug or medication the day of the event (including alcohol, prescribed medications, and recreational drugs), 43 (35%) reported they had not, and 23 (19%) could not recall; 9 participants (7%) reported they had had a documented cardiac arrest at the time of the event, 111 (91%) reported they had not, and 2 (2%) did not know.

2.2. Procedure

Participants were mailed or e-mailed a brief questionnaire about their demographic background and details of their close brush with death, and two standardized, self-rated questionnaires: the NDE Scale and three copies of the MCQ. Participants were asked to complete one copy of the MCQ with regard to their memories of the NDE, a second copy with regard to memories of some other event that actually happened around the time of the NDE and was recalled vividly as an important and possibly life-changing event, and the third copy with regard to some event that they had imagined around the time of the NDE but that never actually occurred, such as something they had fantasied, planned for, wished for, feared would happen, or dreamt about.

“Real” events around the time of the NDE chosen by participants most often involved deaths of family members; traumatic endings of relationships; natural disasters such as hurricanes, wildfires, or floods; major surgeries, illnesses, or hospitalizations; births of children; or events connected to the NDE, such as major milestones in their recovery from the precipitating accident. “Imagined” events chosen by participants most often involved anticipated weddings or divorces; natural disasters that did not materialize; anticipated job offers or promotions; or planned celebrations or reunions.

Participants completed these questionnaires at a time and place of their choosing and returned them by mail or e-mail. The study protocol was approved by the University of Virginia Institutional Review Board for Social and Behavioral Sciences.

2.3. Measures

2.3.1. Near-death experience

The NDE Scale ([Greyson, 1983](#)), a self-rated, 16-item, multiple-choice questionnaire, was used to assess near-death experiences. It has been shown to differentiate NDEs from other close brushes with death ([Greyson, 1990](#)); and to have high internal consistency (Cronbach's $\alpha = 0.88$), split-half reliability ($r = 0.84$, $p < 0.001$), and test-retest reliability over a short-term

period of 6 months ($r = 0.92$, $p < 0.001$; Greyson, 1983) and over a long-term period of 20 years ($r = 0.83$, $p < 0.001$; Greyson, 2007). A Rasch rating-scale analysis established that the NDE Scale yields a unidimensional measure, invariant across gender, age, intensity of experience, or time elapsed since the experience (Lange, Greyson, & Houran, 2004). Although the NDE Scale was developed as an ordinal scale without quantified anchor points, the fact that it satisfactorily fits the Rasch model suggests that, for all practical purposes, there do appear to be equal distances between the points of measurement that give the scale interval-level measurement properties (Wright & Masters, 1982). Latent semantic analysis of NDE narratives revealed a relation between linguistic content and NDE Scale scores, supporting the construct validity of the scale (Lange, Greyson, & Houran, 2015).

The 16 items on the NDE Scale explore cognitive changes during the experience, such as an altered sense of time; affective changes, such as intense feelings of peace; purportedly paranormal experiences, such as a sense of separation from the physical body; and purportedly transcendental experiences, such as an encounter with a mystical being or presence. Scores on the NDE Scale can range from 0 to 32; a score of 7, one standard deviation below the mean of 15, is generally used as a criterion for considering an experience to be a NDE (Greyson, 1983).

2.3.2. Memory characteristics questionnaire

The MCQ is 38-item Likert-type scale assessing a variety of memory characteristics such as visual detail, spatial and temporal information, memory clarity, and emotional intensity. The questionnaire was developed by Johnson et al. (1988) to assess the qualitative characteristics of perceived and imagined events. Items are rated using a 7-point scale, with 1 corresponding to vague and 7 to very clear memory.

A principal components analysis of the MCQ yielded five composite factors that were similar for memories of perceived events and for memories of imagined events (Suengas & Johnson, 1988): (1) a Clarity factor, measuring clarity of memories, visual detail, vividness, event detail, comprehensibility of the order of events, and overall memory; (2) a Sensory factor, tapping sound, smell, and taste in the memories; (3) a Contextual factor, including memory for location of the recalled event, spatial arrangement of objects, and spatial arrangement of people; (4) a Thoughts and Feelings factor, measuring memory for thoughts and feelings during the recalled event and how much the event reveals about the individual; (5) and an Intensity of Feelings factor, tapping how intense feelings were both during the event and while remembering it. Scores on each of these five factors tend to be higher for memories of real events than for memories of imagined events.

2.4. Statistical analysis

Pearson correlation coefficients were used to assess the associations of MCQ scores with age at the time of the NDE and time elapsed since the NDE; analyses of variance were used to assess differences by emotional tone and closeness to death; and t tests were used to assess differences by gender, ethnicity, use of psychoactive drugs at the time of the event, and cardiac arrest at the time of the event. A Pearson correlation coefficient was used to assess the association of MCQ scores with the depth of the NDE as measured by raw score on the NDE Scale.

A repeated measures ANOVA was performed with a Greenhouse-Geisser correction to test for differences between MCQ scores related to memories of the NDEs, memories of real events around the time of the NDE, and memories of imagined events around the time of the NDE.

All data analyses were performed using SPSS 24 (IBM, Armonk, NY, USA).

3. Results

3.1. NDE Scale

The mean score on the NDE Scale for the 122 participants in the study group was 16.95 ($SD = 6.27$), with a range of 7–32. Cronbach's alpha for the 16-item scale in this study was 0.837.

3.1.1. NDE scale and potentially confounding variables

For the 122 participants in the study group, NDE Scale scores were not significantly associated with age at the time of the event ($r = 0.07$, $p = 0.435$) or with years elapsed since the event ($r = -0.18$, $p = 0.53$). In addition, NDE Scale scores in the study group did not differ significantly by gender ($t = 1.78$, $df = 120$, $p = 0.231$, $d = 0.202$), race ($t = -0.77$, $df = 120$, $p = 0.440$, $d = 0.226$), retrospectively-reported proximity to death ($F = 1.54$; $df = 2, 99$; $\eta^2 = 0.030$), or cardiac arrest ($t = 0.42$, $df = 118$, $d = 0.015$) or use of drugs or medications on the day of the event ($t = 0.58$, $df = 97$, $d = 0.012$).

However, NDE Scale scores among those who remembered near-death experiences did differ significantly by emotional tone of the experience, with a medium effect size ($F = 5.83$; $df = 2, 115$; $p = 0.004$, $\eta^2 = 0.092$). Those who described their experience as pleasant had a significantly higher mean NDE Scale score (17.64, $SD = 6.16$) than those who described their experience as emotionally neutral (13.60, $SD = 5.59$) or as unpleasant (9.67, $SD = 2.42$). Participants who described their experience as emotionally neutral or unpleasant had NDE Scale scores that did not differ significantly from each other.

3.2. Memory characteristics questionnaire

3.2.1. Memory characteristics questionnaire and potentially confounding variables

For the 122 participants in the study group, MCQ scores were not significantly associated with age at the time of the NDE ($r = 0.16$, $p = 0.077$) or with years elapsed since the NDE ($r = 0.09$, $p = 0.340$). In addition, MCQ scores did not differ significantly by gender ($t = 0.47$, $df = 120$, $p = 0.64$, $d = 0.09$), race ($t = 0.19$, $df = 120$, $p = 0.853$, $d = 0.06$), or cardiac arrest ($t = 0.42$, $df = 118$, $d = 0.15$) or use of drugs or medications on the day of the event ($t = 0.58$, $df = 97$, $d = 0.12$).

However, MCQ scores did differ significantly by retrospectively-reported proximity to death with a medium effect size ($F = 3.46$; $df = 2, 99$; $p = 0.035$, $\eta^2 = 0.07$). Those who reported they had lost vital signs had a significantly higher mean MCQ score (5.75, $SD = 0.56$) than those who reported they had a serious illness or injury without loss of vital signs (5.38, $SD = 0.65$) or their condition was not serious in retrospect (5.58, $SD = 0.60$). Participants who reported their conditions were serious but without loss of vital signs or not serious had MCQ scores that did not differ significantly from each other.

MCQ scores also differed significantly by emotional tone of the experience, with a medium effect size ($F = 5.73$; $df = 2, 115$; $p = 0.004$, $\eta^2 = 0.09$). Those who described their experience as pleasant had a significantly higher mean MCQ score (215.09, $SD = 22.86$) than those who described their experience as emotionally neutral (201.02, $SD = 13.85$) or as unpleasant (185.25, $SD = 20.51$). Participants who described their experience as emotionally neutral or unpleasant had MCQ scores that did not differ significantly from each other.

Cronbach's alpha for the 38-item scale in this study was 0.885.

3.2.2. Memory characteristics Questionnaire scores for memories of NDEs

The mean score on the MCQ and its five component factors for the 122 participants with regard to memories of the NDE are shown in [Table 1](#). The correlation between depth of NDE, as measured by the NDE Scale, and MCQ scores was 0.42 ($p < 0.001$) for the total MCQ, 0.25 for Clarity ($p = 0.006$), 0.40 ($p < 0.001$) for Sensory, 0.13 ($p = 0.152$) for Context, 0.19 ($p = 0.040$) for Thoughts and Feelings, and 0.33 ($p < 0.001$) for Intensity of Feelings. Thus, NDE depth was significantly associated with higher scores on the MCQ and on each of its component factors except for Context. The effect sizes were medium for correlations of NDE Scale scores with the total MCQ and Intensity of Feelings, and small for the remaining factors.

3.2.3. Comparison of memories of NDEs, real events, and imagined events

The mean score on the MCQ and its five component factors for the 122 participants with regard to memories of a real event around the time of the NDE, and for an imagined event around the same time period, are shown in [Table 1](#). A repeated measures ANOVA with a Greenhouse–Geisser correction determined that mean MCQ scores differed significantly between memories of the NDE, memories of a real event around the time of the NDE, and memories of an imagined event around the time of the NDE, with a large effect size ($F = 113.67$, $df = 1.95$, $p < 0.001$, $\eta^2 = 0.486$). Pairwise comparisons revealed that MCQ scores related to memories of NDEs were higher than MCQ scores related to memories of real events around the same time, to a statistically significant degree ($p < 0.001$); and that MCQ scores for memories of real events around the time of the NDE were likewise higher than MCQ scores for memories of imagined events from the same time, also to a statistically significant degree ($p < 0.001$).

As shown in [Table 1](#), this pattern of MCQ scores being higher for memories of NDEs than for memories of real events around the same time, which in turn were higher than for memories of imagined events, was replicated for four of the five component factors: Clarity, Contextual, Thoughts and Feelings, and Intensity of Feelings, each of which was statistically significant with a large effect size. For scores on the Sensory factor, there were no significant differences between memories of NDEs, memories of real events, or memories of imagined events.

3.3. Participants excluded from the study group

As noted in [Section 2.1](#) above, among the 130 participants who volunteered for this study were 8 individuals whose reported experiences did not meet criteria for an NDE. Among these 8 individuals, the mean score on the NDE Scale was 4.50 ($SD = 2.07$), with a range of 0–6.

Table 1
MCQ scores and type of event recalled ($N = 122$).

| MCQ variable | NDE | Real event | Imagined event | F (df) | <i>p</i> | η^2 |
|------------------------------|----------------|----------------|----------------|---------------|----------|----------|
| MCQ total score | 212.15 ± 23.87 | 175.96 ± 43.72 | 146.50 ± 49.03 | 113.67 (1.95) | <0.001 | 0.486 |
| Clarity factor | 38.52 ± 4.58 | 29.88 ± 10.14 | 25.45 ± 11.17 | 83.54 (1.91) | <0.001 | 0.410 |
| Sensory factor | 8.04 ± 4.08 | 8.13 ± 4.88 | 7.10 ± 4.79 | 2.55 (1.96) | 0.081 | 0.021 |
| Contextual factor | 18.80 ± 2.87 | 15.42 ± 5.33 | 12.10 ± 5.67 | 73.36 (1.94) | <0.001 | 0.379 |
| Thoughts and Feelings factor | 19.07 ± 2.61 | 15.79 ± 4.55 | 13.02 ± 5.51 | 76.72 (1.94) | <0.001 | 0.390 |
| Intensity of Feelings factor | 11.57 ± 2.52 | 9.40 ± 3.22 | 8.31 ± 6.96 | 19.37 (1.37) | <0.001 | 0.140 |

MCQ = Memory Characteristics Questionnaire.

NDE = near-death experience.

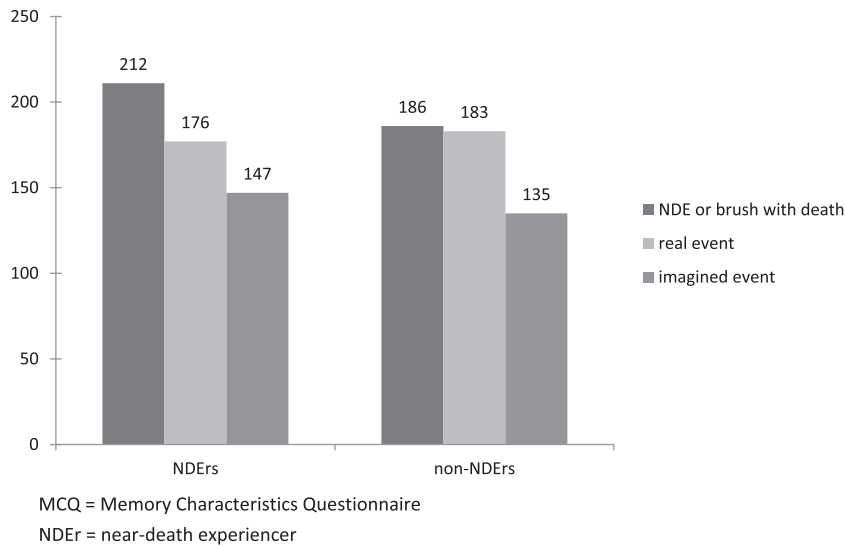


Fig. 1. Total MCQ scores for NDErs and non-NDErs, by type of event remembered.

We did not perform statistical analyses of the differences between MCQ scores of the 122 participants who described NDEs with MCQ scores of the 8 participants who did not, because of the difference in sample sizes. However, it is instructive to examine MCQ scores of the non-NDErs with regard to their close brush with death and with regard to the other real and imagined events from the same time period.

The mean score on the MCQ for the 8 participants who were excluded from the study group because they did not report NDEs was 185.77 ($SD = 48.24$) for memories of their close brush with death, 183.49 ($SD = 33.79$) for memories of a real event that occurred around that same time, and 135.85 ($SD = 68.08$) for memories of an imagined event around that same time. We did not perform statistical analysis of the MCQ scores of this group because its small size limited its statistical power. However, as noted in Fig. 1, in contrast to the findings for participants who reported NDEs, it is clear that the non-NDErs' memories of their close brush with death were comparable to their memories of other real events around the same time, whereas memories of imagined events from the same time period were much less vivid and detailed.

4. Discussion

The aim of the present study was to evaluate the phenomenological characteristics of memories of NDEs by comparing them with memories of a real event and an imagined event around the same time of the NDE. The data from this study suggest that memories of NDEs are not comparable to memories of imagined events. Memories of NDEs were rated higher on the MCQ than memories of real events, which in turn were rated higher than memories of imagined events.

Our observation that MCQ scores are higher for memories of a real event than memories of an imagined event are consistent with previous studies by Johnson et al. (1988) and with what would be expected in comparing memories of real and imagined events. The fact that MCQ scores were even higher for NDEs suggests that they are recalled as even “more real” than real events, which is in line with how NDErs describe them. Our findings are consistent with those of Thonnard et al. (2013) and Palmieri et al. (2014), both of whom concluded that recollections of NDEs were suggestive of memories of real experiences rather false memories of imagined experiences.

This pattern held for the full-scale MCQ and for four of the five component factors identified by Johnson et al. (1988) in their original study. All the MCQ factors were significantly higher for the NDE memories, with the exception of the Sensory factor, which includes questions about memories of sounds, smells, and tastes in the event. This exception is perhaps attributable to the frequent claims by NDErs that they were not in their physical bodies at the time of the event, and that their experience did not take place in our familiar physical environment, rendering sensory details less relevant.

As noted in Section 1 above, many people claim that their near-death experiences were “more real” to them than their usual waking experiences. Among participants in this study, for example, a woman who gave birth under trichloroethylene anesthesia at age 23 said, “Never, ever, did I think it might have been a dream. I knew that it was true and real, more real than any other thing I’ve ever known”. A woman who had a pulmonary embolism after a Caesarean delivery at age 31 said, “My death experience is more real to me than life”. A woman who gave birth prematurely under nitrous oxide anesthesia at age 27 said, “It was more real than real: absolute reality”. A 29-year-old woman said, “There was no sense of doubt whatsoever. Everything had a sense of being ‘more real’ than anything that would normally be experienced in the physical world as we know it”. A man who rolled his car over at the age of 21 said, “I have no doubt that this experience was real. It was vastly more real than anything we experience here”. A woman who attempted suicide at the age of 31 said, “This was more real

than anything on Earth. By comparison, my life in my body had been a dream". And a woman who, at the age of 25, bled out during a surgical procedure when the surgeon accidentally cut an artery, noted: "What happens during an NDE happens in the realm of truth, in the true reality, and what happens here on Earth is just a dream".

Dell'Olio (2010) noted that "there is a sense of phenomenological certainty to the experience" (p. 117). A survey of 613 NDErs found that 96% felt their NDE was "definitely real," while none described it as "definitely unreal" (Long & Perry, 2010, p. 52). Perry (2011) noted that "There is clearly something about NDEs that both convinces people they are real and makes them distinguishable from experiences generally regarded as unreal. ... Actually, their claim goes even further. ... Many NDErs say that what they experienced was *more* real than this world" (p. 476). Perry (2011) speculated that this hyperreal quality of NDEs may be related to the logical coherence of NDE narratives, unlike the illogical and sometimes bizarre disconnections in dreams; the intensification of mental activity, including expanded awareness, thought, feeling, sensation, and perception; the power of the NDE to overwhelm the experiencer; the objective verification of unexpected details perceived in the NDE; the sense of being in direct contact with an external reality, unfiltered by the senses; and the enduring transformative effect of the experience.

Although the literature on recall of positive versus negative memories has been contradictory and confounded by associations of positive memories with less elapsed time since the event (Waters, Bohanek, Marin, & Fivush, 2013) and with greater tendency to relive and rehearse the memories (Destun & Kuiper, 1999), recall of positive memories has generally yielded higher MCQ ratings than has recall of negative memories for sensory, temporal, and contextual elements (Destun & Kuiper, 1999; D'Argembeau, Comblain, & Van der Linden, 2003; Schaefer & Philippot, 2005). Both NDE Scale scores and MCQ scores in this study were higher among those who reported an emotionally pleasant near-death experience than among those who reported neutral or negative NDE, raising the question of the contribution of positive affect during a close brush with death to the association between NDE depth and MCQ scores. Among near-death experiencers, the correlation coefficient between NDE Scale and MCQ scores was 0.42; the partial correlation between NDE Scale and MCQ scores, keeping emotional valence of the recalled event constant, was 0.355 ($p < 0.001$), still a large effect size, suggesting that positive affect alone was not a significant factor in the association between NDE depth and MCQ scores.

It has been shown that people vary in their ability to mentally re-experience past events ("mental time travel ability"), an aptitude sometimes measured by a modified version of the MCQ (Smith-Spark, Bartimus, & Wilcock, 2017). Furthermore, some anomalous memories, specifically memories purportedly of past lives, may signify an overinclusive cognitive style associated with creative ability, in that people who reported past life memories had high scores on creativity measures and low scores on measures of latent inhibition, indicating overinclusive cognition (Meyersburg, Carson, Mathis, & McNally, 2014). To the degree that memories of NDEs can be considered another type of anomalous memory, it would be interesting to know whether memories of NDEs were also associated with overinclusive cognition. We think it unlikely that either unusual mental time travel ability or an overinclusive cognitive style accounts for the high MCQ scores for memories of NDEs, because experiencers' MCQ scores for memories of other real and imagined events were comparable to those of non-experiencers. Nevertheless, to assess this possibility, it may be fruitful for future research on the aftermath of NDEs to include measures of creative ability and latent inhibition.

4.1. Limitations of this study

Our confidence in and interpretation of the findings of this study must be tempered by certain weaknesses inherent in any retrospective study. The self-selection of participants and the reliance on retrospective self-reports of experiences may have limited the generalizability of these findings.

Because our sample of participants who had come close to death was self-selected, we do not know whether (or how) they may differ from other survivors of close brushes with death who chose not to participate in the study. It is conceivable that survivors of near-death events who have clearer, more vivid, and more realistic memories may be more willing to participate in research than those who do not. However, we think that unlikely, as participants within the study sample had a wide range of scores on the MCQ.

Another correlate of the self-selection of our participants was that they had an interest in exploring their close brushes with death. It is possible that such participants may have guessed our hypothesis that memories of NDEs might differ from memories of other events, and that the demand characteristics of the study may have influenced their effort in recalling events or in their responses on the MCQ.

The large majority of Caucasians in our sample limits our interpretation of the implications of these data for other ethnic groups; the small number of non-Caucasians precluded statistical analysis of the influence of different ethnicities on MCQ scores. Because near-death experiencers from different cultural backgrounds may differ in their response to traumatic events, it would be helpful to extend this research to include samples beyond the predominantly Caucasian population in the current study.

We asked participants to select for their comparison "real event" some important and possibly life-changing event that they could recall vividly and that happened around the time of the NDE. However, we did not attempt to assess the emotional valence or existential impact of those comparison events, nor of any other factors that may bear on recall other than elapsed time since the event. Thus, even though the comparison real events that they chose included consequential events like deaths, births, and natural disasters, it is possible that they differed from NDEs in some dimensions that rendered them less memorable than NDEs.

The cross-sectional design of the study does not permit conclusions regarding the long-term stability of characteristics of NDE memories. We relied on one-time sampling of retrospective reports of experiences, which may theoretically be vulnerable to memory decay, distortion, or fabrication. However, a prior study of the consistency of NDE Scale scores over a period of decades suggested that passage of time did not materially influence memories of the experience (Greyson, 2007).

This study suggests that memories of an NDE during a close brush with death are typical of memories of events that actually happened, rather than memories of imagined events. This conclusion does not bear on the objective reality of NDEs, but suggests simply that they are recalled as real experiences and not as experiences that arise in the imagination. Holden surveyed all systematic studies of near-death experiences from 1975 to 2005, and found 107 NDEs in which perception of the physical surroundings during unconsciousness was reported (Holden, 2009). Of those 107 cases, 8% contained some inaccuracy and 92% were completely accurate, including 34% where the accuracy was corroborated by independent, objective sources (Holden, 2009). It would be interesting to compare the characteristics of memories of NDEs with and without such external corroboration.

This study assumed that NDEs are unitary phenomena, and indeed a Rasch rating-scale analysis of the NDE Scale lends statistical support to that unidimensional approach (Lange et al., 2004), as does a recent computational linguistics analysis of NDE narratives (Lange et al., 2015). However, it is conceivable that memories of different types of NDEs might have different characteristics. In order to explore the possibility of effects of different types of NDEs, further research could profitably be directed at elucidating the particular NDE features that may be associated with different memory characteristics. It may also be helpful to distinguish between types of NDE with differing phenomenological features or those occurring under differing circumstances. In addition, further research is needed to ascertain whether (and how) memory characteristics may vary longitudinally and what individual and situational variables in the near-death event may predict characteristics of later memories of the event.

4.2. Conclusion

The findings of this study suggest that memories of NDEs are more similar to memories of real events than to memories of imagined events, and in fact are more vivid and detailed than are memories of other real events from the same time period. NDEs may offer insight into the psychological defenses against, and responses to, life-threatening crises, and may also have implications for how memories for extremely intense experiences are encoded and processed. The relatively high incidence and clear phenomenology of NDEs calls for further research into the mechanisms of memories following traumatic experiences.

Disclosure statement

The authors have no actual or potential financial, personal, or other conflicts of interest to declare that could influence, or be perceived to influence, this work.

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