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Which near-death experience features are associated with reduced fear of death?

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ABSTRACT

Death is a common existential concern, and fear of death is widespread at subclinical levels. Near-death experiences (NDEs) are profound mystical experiences that may occur close to death, and they are usually followed by dramatic reductions in fear of death. The content of these experiences varies in each case, but NDEs tend to have common features among individuals and across cultures. While many studies using different tools to measure fear of death and death anxiety have documented their reduction after NDEs, we do not know the influence of specific NDE features on this effect. This research presents statistical correlations between features of NDEs and post-experience death attitudes, both negative and positive. We found that encountering mystical beings and having a life review during one's NDE are the strongest predictors of reduced fear of death. Contrary to theoretical predictions, a sense of disembodiment is not associated with change in death attitudes. These findings can be used to design interventions aimed at reducing fear of death in vulnerable populations, including people at end-of-life. We also discuss these findings in the context of Terror Management Theory regarding death awareness as a motivator of human behaviour.

KEYWORDS

fear of death; death anxiety; near-death experiences; terror management theory; death attitudes

Introduction

Death attitudes and related theories

Death is one of the most prominent existential concerns of human beings. Humans have a biological instinct for survival, but are also cognitively aware of their own mortality, the latter being inevitable and unpredictable. According to Terror Management Theory (TMT), the conflict between one's instincts and the awareness of one's mortality can give rise to existential anxiety, which in turn serves as a powerful human motivator (Greenberg, 2012; Greenberg et al., 1986). The theory holds that, in order to mitigate death anxiety, people invest heavily in their cultural worldviews and strive for self-esteem provided by adhering to respective cultural norms, standards, and values. Cultural defences that could continue one's legacy and impact through one's children,

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achievements, or national identity are said to confer 'symbolic immortality'. Belief in an afterlife can also defend against death anxiety and is referred to as 'literal immortality'. TMT has received substantial empirical support of its hypotheses in hundreds of studies across many countries, looking at the impact of death-related cognition on human behaviour (Greenberg, 2012). The most common tool to test TMT's predictions has been the 'mortality salience' (MS) approach, where participants are asked to read or write about death, their own mortality, or a terminal illness; or to watch a video of an accident, whereas in a control condition participants read about a topic unrelated to death (Burke et al., 2010). According to the MS hypothesis, making mortality salient should strengthen individuals' beliefs in their cultural worldviews and their striving for self-esteem within these cultural structures, in order to defend against death anxiety. When people are thus made aware of death, even subconsciously, the salience of their mortality can influence perceptions and behaviours in a wide range of domains, including ingroup and outgroup relationships, prejudice, religion, morality, charity, creativity, romantic relationships, and financial decision-making (Greenberg et al., 1997; Solomon et al., 2004; Zaleskiewicz et al., 2013).

While TMT remains the most prominent theory of managing the existential terror of death (Greenberg, 2012), a newer and complementary theory focuses on a positive and growth-oriented perspective of death and mortality. According to Meaning Management Theory (MMT), proactively accepting death, rather than simply engaging in death denial, is necessary for an authentic and well-lived life (Wong, 2008; Wong & Tomer, 2011). Conversely, death anxiety can be transcended only by engaging in meaningful life pursuits. Both TMT and MMT predict that when made aware of mortality, individuals will become more focused on culture-supporting and self-esteem affirming activities, but for different reasons – minimising terror versus maximising meaning and death acceptance, respectively (Wong & Tomer, 2011).

Preceding and parallel to the development of these theories, a large research effort has focused on characterising and measuring various attitudes towards death. Initially, much of this work focused on negative attitudes such as death anxiety and fear of death. These related concepts encompass a wide range of attitudes, including fear of annihilation of the physical self, fear of the dying process, and fear of what may come after death. It was argued later that individuals can also have attitudes of acceptance towards death, including its inevitability, naturalness, and even desirability under certain circumstances (Gesser et al., 1988).

Death anxiety and fear of death are pervasive, both in terms of the array of everyday behaviours they influence and their prevalence in the general population, even at non-clinical levels. At the same time, interventions to reduce these anxieties produce only modest results (Dein, 2014; Grossman et al., 2018; LeMay & Wilson, 2008). Yet, certain spontaneous experiences occurring close to death ('near-death experiences', or NDEs) can lead to an almost complete elimination of the fear of death and may, conversely, promote feelings of acceptance towards death. Notably, merely coming close to death without experiencing an NDE does not, in itself, lead to such dramatic reductions in fear of death (Van Lommel et al., 2001). Consistent with TMT, NDEs protect against death anxiety through 'literal immortality', since they create or strengthen a conviction that there is life after death (Noyes et al., 2009). In this study, we examine fear of death and other death attitudes in the context of near-death experiences and their phenomenology.

Near-death experiences

Near-death experiences are profound subjective experiences reported by some individuals who have been close to death, including being 'clinically dead' and subsequently resuscitated (Holden, Greyson et al., 2009). These experiences feature common phenomenological aspects, including ineffable peace and joy (affective features), a sensation of being outside of one's body (paranormal features), a sense of time distortion and sudden understanding (cognitive features), and encounters with deceased relatives or religious figures (transcendental features) (Greyson, 1983a; Moody, 1975; Zingrone & Alvarado, 2009).

The phenomenon was first introduced to the English-speaking public under the term 'near-death experience' by Moody (1975), but such accounts of the phenomenon can be traced back to antiquity, and have been reported in the medical and research literature as early as the 19th century (Holden, Greyson et al., 2009). In the intervening decades since the publication of Moody's popular book, NDEs have gathered considerable attention in both popular media through books and movies and in academic research (Holden, Greyson et al., 2009; Sleutjes et al., 2014). Such interest is warranted because, despite challenges in estimating the prevalence and incidence of NDEs, these experiences are not rare. Prospective studies using a standardised tool to ascertain the presence of an NDE show that approximately 17% of critically ill patients report NDEs (Zingrone & Alvarado, 2009), while the lifetime prevalence of NDEs in the US population is about 5% (Gallup & Proctor, 1982). The cohort of people who experience and subsequently report NDEs is diverse with respect to age, sex, race, education, socio-economic status, and religious affiliation (Holden, Long et al., 2009; Moody, 1975).

NDEs are often accompanied by a robust pattern of aftereffects, including deep and long-lasting transformations in the experiencer's values, spirituality, relationships, and outlook on life (Greyson, 1983b; Noyes et al., 2009; Van Lommel et al., 2001). Specifically, the most common aftereffects include increases in sense of purpose, appreciation of life, self-esteem, compassion for others, desire to serve others, focus on spirituality, as well as decreased interest in material gain or status and (sometimes almost complete) loss of fear of death (Noyes et al., 2009).

Near-death experiences and reduced fear of death

In his original collection of NDEs, Moody (1975) described the decrease or loss of fear of death and death anxiety as one of the most salient aftereffects of NDEs, occurring in almost every NDE case he encountered. Subsequent studies where participants were explicitly asked about fear of death post-NDE, found that between 80% and 100% of near-death experiencers (NDErs) reported decreased fear of death, much higher percentages than in comparison groups. Ring (1980) reported that 80% of NDErs interviewed experienced a decrease or loss of fear of death, compared to 29% of individuals who had come close to death without having an NDE. In a study of patients with life-threatening cardiac arrest, Sabom (1982) found that 82% of NDErs reported decreased fear of death, compared to only 2% of non-experiencers (non-NDErs). In a study of 50 Australian NDErs, Sutherland (1990) found that 100% of participants had no fear of death post-NDE compared to only 20% of the same group before their NDE.

Research using psychometric self-report scales on death attitudes has further characterised this effect. In a six-month follow-up study, Sabom (1982) administered the Death Anxiety Scale (Templer, 1970) and Death Concern Scale (Dickstein, 1972), showing that NDErs had lower anxiety and concern about death than non-NDErs. Using the Death Threat Index (Krieger et al., 1974), a measure of the discrepancy between the concepts of oneself and one's death, Greyson (1992) reported that NDErs experienced lower death threat compared to non-NDErs after a brush with death, and the degree of death threat was inversely associated with scores on the NDE Scale, which can be thought of as an indicator or the 'depth' or 'intensity' of the NDE.

Furthermore, the decrease in fear of death persists (and even intensifies) over time. In a prospective study of NDEs in cardiac arrest patients in the Netherlands, van Lommel and colleagues reported that at 2- and 8-year follow-up post cardiac arrest, NDErs' fear of death decreased across time (van Lommel et al., 2001). Additionally, at each time point, fear of death was lower in NDErs than in a comparison group of cardiac arrest patients who did not experience an NDE and were matched by age, sex, and time since cardiac arrest.

Although far fewer in number, studies have shown that NDEs affect death acceptance, in addition to fear of death. Using the Death Attitudes Profile (Gesser et al., 1988) with cardiac care patients, Greyson (2003) reported that NDErs exhibited higher approach acceptance than matched non-NDErs, indicating that they were more likely to view death as a passage to a pleasant afterlife. A recent study using a revised version of this death attitudes scale corroborated this finding (Bianco et al., 2019).

In addition to documenting the association between NDEs and reductions in fear of death and death anxiety, researchers have proposed reasonable mediators of this relationship, such as a strengthened belief in life after death (Moody, 1975; Ring, 1984). Research unrelated to NDEs supports the association between belief in an afterlife and reduced death anxiety, as well as increased death acceptance (Harding et al., 2005). Change in belief about life after death is not an essential feature of the NDE itself, but rather one of its most commonly documented aftereffects. However, individual features of the experience itself may influence post-NDE death attitudes, as higher scores on the NDE Scale, indicating NDEs richer in typical features and with stronger intensity, are associated with less death threat (Greyson, 1992) and with diminished fear of death (Bianco et al., 2019). To date, empirical studies have not examined these specific associations, but some authors have made theoretical predictions.

Tassell-Matamua and Lindsay (2016) proposed four NDE features that may facilitate the reduction of fear of death after an NDE by promoting a new model of reality. They hypothesised that 'disembodiment' or having an out-of-body experience (OBE) during the NDE might reduce fear of death by providing evidence that some aspect of consciousness may be disconnected from the physical body and thus may survive physical death. Strong positive emotions during the NDE may reduce fear of death by creating an association between closeness to death and strong positive affect. Furthermore, encountering a bright light during the NDE may facilitate the effect by creating a sense of connection with divinity, which is the most common phenomenological manifestation of the bright light and extends across multiple cultural worldviews. Finally, encountering spiritual beings (including religious figures or spirits of deceased relatives) may facilitate fear of death reduction by providing some evidence that the NDE may be verifiable and

that there may be continued existence after death. Tassell-Matamua and Lindsay (2016) argued that a nuanced understanding of precisely what it is about the experience that facilitates the prominent reduction of fear of death after NDEs could have implications for clinical psychology and end-of-life care. For example, such insights might be used to design more effective therapeutic interventions to reduce fear of death, and provide comfort to terminally ill patients and grieving individuals.

Overview of the present study

Despite the abundance of research showing a steep decrease in fear of death after NDEs, it is unclear if any specific aspects of the experience may promote this powerful effect. The goal of this study was to address this gap and to expand our understanding of NDE aftereffects related to attitudes towards death, by focusing on three specific aims. First, we aimed to replicate findings using various self-report measures, in the largest-to-date sample of NDErs in a study of death attitudes. Second, we aimed to test empirically theoretical predictions by Tassell-Matamua and Lindsay (2016) about specific NDE features that influence the loss of fear of death in NDErs. Third, we aimed to explore associations between NDEs (and their specific features) and death-related attitudes beyond fear and anxiety, including positive ones.

We used the NDE Scale (Greyson, 1983a) to identify NDEs and quantify specific NDE features. We used the Death Attitude Profile–Revised (Wong et al., 1994) and Death Anxiety Scale (Templer, 1970) to assess a range of death-related attitudes. We hypothesised that distinct NDE features may associate differentially with distinct death-related attitudes.

Methods

Participants

Participants were 422 individuals who had previously contacted the authors to share their accounts of their experiences when they had come close to death, after learning of our research. These reports were spontaneous and unsolicited, and no effort was made to recruit participants for this study. After receiving their narratives about their NDEs, we invited them to complete research questionnaires, upon obtaining informed consent to participate in research. The conditions leading to the close brush with death included surgery or childbirth complications (36.1%; including cardiac surgery and caesarian sections), illness (28.1%; including cardiac illness), accidents (15.5%; including vehicular accidents or drownings), and other causes (20.3%; including suicide attempts, intentional wounding by others, and allergic reactions). Information on the condition leading to the NDE was missing for 20.6% of our sample participants. Of the 422 participants who contacted us to report experiences related to their close brush with death, retrospective analysis of their responses indicated that only 384 (91%) reported experiences that qualified as NDEs (NDErs), determined by scoring at least 7 on the NDE Scale. The remaining 38 participants (non-NDErs) were excluded from most analyses in this paper except for direct comparisons of death attitudes between NDErs and non-NDErs.

Our sample of 422 participants who contacted us as noted above consisted of 289 women (68.5%) and 133 men (31.5%). The sample included 354 Caucasians (84%), 31 participants of other ethnicity (7%), and 37 individuals (9%) of unknown ethnicity. The mean age at the time of the close brush with death was 31.3 years \pm 14.8, and the mean time elapsed between the close brush with death and the first contact to report the event was 19.4 years \pm 14.6. Demographic variables by NDE status are presented in the Results section. Not all participants in our sample completed all the scales. Numbers of respondents are noted below for each instrument.

Procedure

Participants were mailed or emailed a brief questionnaire about demographics and details of their close brush with death, as well as three standardised self-report questionnaires: the NDE Scale (Greyson, 1983a), the Death Attitudes Profile – Revised (Wong et al., 1994), and the Death Anxiety Scale (Templer, 1970). Participants completed these questionnaires at a time and place of their choosing and returned them by mail or email. The study protocol was approved by the University of Virginia’s Institutional Review Board for Social and Behavioral Sciences.

Measures

NDE scale

The NDE Scale is a self-rated, 16-item, multiple-choice questionnaire developed to assess the phenomenology of NDEs (Greyson, 1983a). The scale has been shown to differentiate NDEs from other close brushes with death (Greyson, 1990), and to have high internal consistency (Chronbach’s $\alpha = 0.88$), split-half reliability ($r = 0.84$, $p < 0.001$), and test-retest reliability over both short-term (6 months, $r = 0.92$, $p < 0.001$; Greyson, 1983a) and long-term periods (20 years, $r = 0.83$, $p < 0.001$; Greyson, 2007). Internal consistency in this sample was also good, with a Chronbach’s α of 0.84.

The 16 items on the NDE Scale reflect different phenomenological aspects of the NDE, including cognitive changes during the experience, such as an altered sense of time; affective changes, such as intense feelings of peace and joy; purportedly paranormal experiences, such as a sense of separation from the physical body; and transcendental experiences, such as an apparent encounter with a mystical being or presence. Total scores on the NDE Scale range from 0 to 32, a higher score indicating a ‘deeper’ experience. The scale also produces a dichotomous categorisation, where a score of at least 7 (one standard deviation below the mean of 15 in the validation sample; Greyson, 1983a) is used as a criterion for considering a close brush with death to be an NDE.

Death attitudes

The Death Attitude Profile–Revised (DAP-R) is a 32-item self-report scale that measures a broad range of death-related attitudes (Wong et al., 1994). Unlike other death-related questionnaires such as the Death Anxiety Scale (Templer, 1970) that measure predominantly negative attitudes towards death, the DAP-R measures, additionally, positive and neutral aspects. The questionnaire contains five theoretically-motivated components, which were also derived via factor analysis in a large community-based

age-stratified sample. The five components measure attitudes towards (1) Fear of Death (7 items) – negative thoughts and feelings about death or dying; (2) Death Avoidance (5 items) – avoidance of thoughts about death; (3) Neutral Acceptance (5 items) – acceptance of death as a natural part of life that is neither to be welcomed nor feared; (4) Approach Acceptance (10 items) – acceptance of death as a gateway to a desirable afterlife; and (5) Escape Acceptance (5 items) – acceptance of death as an escape from a painful physical existence. Individual items are scored on a Likert scale from 1 ('strongly disagree') to 7 ('strongly agree'), with a neutral mid-point of 4 ('undecided'). The five subscale scores are calculated by summing responses for individual items and dividing by the number of items in each subscale. Thus, a higher subscale score indicates stronger endorsement of the respective death attitude.

In the validation sample, the DAP-R was shown to have decent to excellent internal consistency (Cronbach's α s ranging from 0.65 to 0.97 for different subscales), good test-retest reliability at 4 weeks (r s ranging from 0.61 to 0.95), and good construct validity (as evidenced by convergent and divergent associations with other instruments measuring death-related concepts; Wong et al., 1994). In the current sample, four of the subscales had satisfactory internal consistency (Cronbach's α s ranging from 0.81 to 0.94; average α was 0.87), but the Neutral Acceptance subscale only achieved an α of 0.56. In a large study of hospital and hospice nurses, Clements and Rooda (1999,2000) replicated four of the five original DAP-R factors, with reasonable internal consistency, but found that the original Neutral Acceptance subscale split across two additional dimensions. Given the poor internal consistency of the Neutral Acceptance subscale in our sample, as well as the inconsistent structure of this subscale, we chose to exclude it from the analyses for this project. The DAP-R was completed by 198 of the NDErs in our sample and by 18 non-NDErs, between 2011 and 2017.

Death anxiety

The Death Anxiety Scale (DAS) is the earliest validated and most popular self-report tool developed to measure death attitudes (Templer, 1970). The DAS consists of 15 true-false statements that address negative attitudes towards death, dying, serious illness, and time perspectives on life and death. The total score is calculated as a sum of the statements marked as 'true' (after reverse-scoring six of the items), such that higher scores indicate higher death anxiety. The DAS has reasonable internal consistency (Kuder-Richardson 20 coefficient = 0.76), good test-retest reliability at 3 weeks ($r = 0.83$), and has demonstrated convergent validity via positive correlations with anxiety measures (Templer, 1970). Internal consistency in the present sample was adequate (Kuder-Richardson 20 coefficient = 0.66). The DAS was developed initially to measure a unitary construct of death anxiety, but subsequent research has shown a multifactorial structure with often inconsistent factor interpretations (Lonetto et al., 1979; Martin, 1983; Warren & Chopra, 1979). Despite this and other weaknesses (Durlak, 1982; Neimeyer et al., 2003), the DAS has been used extensively in various research settings, primarily because of its brevity. As measured by the DAS, older adults typically show lower levels of death anxiety than young adults (Stevens et al., 1980), and, across cultures, women show higher levels of death anxiety than men (Lester et al., 2007).

Here we adhered to the original true-false response scale (some later studies have used a graded Likert scale) and single dimension score. The DAS was completed by 349 NDErs in our sample and by 36 non-NDErs, between the years of 1981 and 2017.

For simplicity, we refer to the combined five subscales of the DAP-R and the total DAS as 'death attitudes' or 'death attitude variables' in the remainder of the paper.

Statistical analysis

Categorical variables were summarised as counts and percentages within group. Differences in categorical variables between participants who did and did not have NDEs during the close brush with death were assessed using χ^2 tests. Continuous variables were summarised as means, medians, and standard deviations. Differences in continuous variables by NDE status were assessed using the non-parametric Mann-Whitney U test, as the sample size within the non-NDE group was much smaller than the NDE group.

We examined associations between the 16 individual NDE features and death attitudes using bivariate correlations. We applied a stricter level of statistical significance to each set of analyses between the 16 NDE features and individual death attitudes. Specifically, in order to ensure that the overall likelihood of false positives within each set did not exceed 5%, we used Bonferroni-corrected p -values of 0.003.

Spearman's rank correlation coefficients were used to assess the associations of the 16 NDE features (ranked on an ordinal scale) with death attitudes, as well as for other analyses with highly skewed variables. Pearson's correlation coefficients were used for all other bivariate correlation analyses. Partial Spearman's rank correlation coefficients were used to assess the associations between NDE features and death attitudes, while controlling for the effect of other variables.

In uncorrected analyses, a p -value was taken as significant if ≤ 0.05 . All statistical analyses were conducted using SAS 9 (SAS Institute, Cary, NC).

Results

Demographics and death attitudes by presence of NDE during the close brush with death

Of the 422 participants in this study, 384 (91%) reported experiences that retrospectively qualified as NDEs by scoring 7 or higher on the NDE Scale, whereas 38 (9%) reported experiences that did not. [Table 1](#) presents demographic and death attitude variables for the two groups separately, as well as a statistical between-group comparison. There were no significant group differences in sex, ethnicity, and age at the close brush with death, but NDErs reported the experience sooner after the event than non-NDErs did. Despite decreased power for comparisons of death attitudes due to a small sample size in the non-NDE group, NDErs showed significantly lower Fear of Death and greater Approach Acceptance compared to non-NDErs. In addition, NDErs exhibited, on average, significantly lower Fear of Death and lower Death Avoidance than control groups of all ages in the original DAP-R validation sample ($ps < 0.0001$; Wong et al., 1994), as well as higher Approach Acceptance than control groups between ages 18–59 ($ps < 0.0001$).

Table 1. Demographic characteristics and death attitudes by NDE status.

Variable	NDErs N = 384		Non-NDErs N = 38		Comparison	
	N*	Mean/Median ± SD, or percent	N*	Mean/Median ± SD, or percent	Test statistic	p
Sex (Female)	384	69%	38	63%	$\chi^2_{(1)} = 0.55$	0.459
Ethnicity (Caucasian)	350	91%	35	100%	$\chi^2_{(1)} = 3.37$	0.066
Age at near-death event	384	30.9/29 ± 14.3	38	35.8/33 ± 18.9	U = 9127	0.129
Years elapsed since event	384	18.9/16 ± 14.2	38	25.1/22 ± 17.1	U = 9637	0.026
Fear of Death	198	1.9/1.7 ± 1.0	18	2.4/2.4 ± 1.0	U = 2568	0.016
Death Avoidance	198	2.1/2.0 ± 1.2	18	2.4/2.1 ± 1.1	U = 2330	0.273
Approach Acceptance	198	5.5/5.8 ± 1.3	18	4.4/4.9 ± 1.6	U = 1260	0.007
Escape Acceptance	198	4.5/4.4 ± 1.5	18	4.6/4.4 ± 1.1	U = 2004	0.841
Death Anxiety	349	4.4/4 ± 2.7	36	4.9/5 ± 2.5	U = 7725	0.219

* = Sample size available for analysis

Death attitudes and NDE features

To characterise the relationship between NDE phenomenology and death attitudes, we examined associations with individual NDE features (Table 2). Fear of Death correlated negatively with the life review and with encountering a mystical being. Approach Acceptance was positively correlated with experiencing joy, seeing a bright light, encountering mystical beings, and encountering beings identifiable as deceased persons. Experiencing a bright light showed the only significant correlation with Escape Acceptance. Two features were significantly negatively correlated with Death Anxiety: experiencing a sense of cosmic unity and encountering a mystical being. Experiencing joy during the NDE was negatively associated with both Fear of Death and Death Anxiety, but these correlations did not meet our stringent significance threshold. In addition, no NDE features were significantly associated with Death Avoidance after applying the stricter significance threshold.

Sensitivity analyses

We conducted sensitivity analyses to evaluate potentially confounding variables including age at occurrence of the NDE, age at filling out the questionnaires, time elapsed between the NDE and filling out the questionnaires, and sex.

First, we examined whether the results could be explained by differences in age at NDE. Age at NDE was not individually associated with any death attitude variables (median p -value: 0.88; range: 0.66–0.93). Second, we examined the effect of age at filling out the questionnaires and their association with NDE components. Similarly to age at NDE, age at filling out the questionnaires was not significantly associated with any DAP-R death attitudes (median p -value: 0.67; range: 0.13–0.94). However, older participants showed lower death anxiety than younger participants ($r = -0.18$; $p = 0.0007$), but the associations between NDE features and death anxiety remained mostly unaffected when taking age into account. Specifically, when controlling for age, the presence of mystical beings and a sense of cosmic unity in one's NDE were still associated with lower death anxiety. In addition, the presence of peace also emerged as a significant feature under the stricter threshold ($\rho = -0.171$, $p = 0.001$), such that NDErs who experienced a sense of peace had lower death anxiety. All other features remained non-significant. Third, we examined the



Table 2. Correlations between NDE features and death attitude variables in the sample of NDErs.

NDE features	Death attitudes				Statistics	Fear of Death N = 198	Death Avoidance N = 198	Approach Acceptance N = 198	Escape Acceptance N = 198	Death Anxiety N = 349
	Time distortion	Thought acceleration	Life review	Sudden understanding						
Cognitive Component					<i>rho</i>	-0.168	-0.176	0.032	-0.030	-0.005
					<i>p</i>	0.018	0.013	0.645	0.679	0.921
					<i>rho</i>	-0.166	-0.115	0.163	0.043	0.003
					<i>p</i>	0.019	0.105	0.022	0.549	0.955
Affective Component					<i>rho</i>	-0.216	-0.084	0.183	-0.002	0.025
					<i>p</i>	0.002	0.237	0.010	0.974	0.646
					<i>rho</i>	-0.178	-0.034	0.143	0.080	-0.055
					<i>p</i>	0.012	0.638	0.044	0.263	0.301
Paranormal Component					<i>rho</i>	-0.115	-0.022	0.152	-0.010	0.157
					<i>p</i>	0.105	0.756	0.032	0.882	0.003 [†]
					<i>rho</i>	-0.148	-0.086	0.292	0.130	-0.123
					<i>p</i>	0.037	0.226	<.0001	0.067	0.022
Transcendental Component					<i>rho</i>	-0.154	-0.112	0.139	0.002	-0.161
					<i>p</i>	0.031	0.115	0.050	0.979	0.003
					<i>rho</i>	-0.143	-0.047	0.288	0.262	-0.144
					<i>p</i>	0.045	0.507	<.0001	0.0002	0.007
Other realm					<i>rho</i>	-0.163	-0.068	0.170	-0.025	-0.070
					<i>p</i>	0.022	0.340	0.016	0.721	0.191
					<i>rho</i>	0.021	0.024	-0.020	-0.074	-0.014
					<i>p</i>	0.772	0.739	0.776	0.301	0.789
Spirits (H)					<i>rho</i>	-0.096	-0.021	0.091	-0.008	0.009
					<i>p</i>	0.180	0.769	0.202	0.915	0.861
					<i>rho</i>	-0.044	-0.061	0.054	0.030	-0.062
					<i>p</i>	0.538	0.389	0.447	0.675	0.245
Border					<i>rho</i>	-0.144	-0.139	0.187	0.135	-0.130
					<i>p</i>	0.042	0.050	0.008	0.057	0.015
					<i>rho</i>	-0.248	-0.143	0.248	0.145	-0.191
					<i>p</i>	0.0004	0.044	0.0004	0.041	0.0003
Death					<i>rho</i>	-0.175	-0.040	0.267	0.137	-0.040
					<i>p</i>	0.014	0.579	0.0001	0.053	0.456
					<i>rho</i>	-0.077	0.042	0.018	0.012	0.033
					<i>p</i>	0.279	0.556	0.805	0.866	0.544

(H) denotes NDE feature hypothesised to be associated with reduced fear of death (Tassell-Matamua & Lindsay, 2016). P-values in **bold** are statistically significant after adjusting for multiple testing. [†] This p-value was slightly above our stricter threshold of 0.003.

effect of time elapsed between the NDE and filling out the questionnaires on our main results. Time elapsed was not significantly associated with any death attitude variables in bivariate correlations (median p -value: 0.16; range: 0.06–0.73). Fourth, we explored sex as a potential confound of our results, as prior research has shown some differences between men and women on specific death attitudes (Wong et al., 1994). Contrary to evidence from the general population, sex was not associated with any death attitudes (median p -value for sex: 0.65; range: 0.17–0.88). Overall, our main results were robust to controlling for potential confounding variables.

Discussion

We examined associations between various death attitudes and specific NDE features and NDE aftereffects in a large sample of NDErs. In addition, we compared death attitudes between NDErs and non-NDErs. Consistent with previous research, NDErs reported significantly lower fear of death and higher approach acceptance than non-NDErs (Bianco et al., 2019). In addition, NDErs in our study reported significantly lower fear of death and lower death avoidance than control groups of all ages, and higher approach acceptance than young and middle-aged control groups (Wong et al., 1994). Cumulatively, these findings suggest that an NDE serves as a powerful ‘intervention’ that reduces negative thoughts about death and dying, or avoidance thereof, and increases beliefs that death is a passage to a happy afterlife.

As one of the main goals of this study, we tested theoretical predictions about specific NDE features that may be related to reduced fear of death in NDErs. Many NDE features hypothesised by Tassell-Matamua and Lindsay (2016) to be related to reduced fear of death after an NDE were associated with various death attitudes, although not necessarily with fear of death. As a direct measure of fear of death in our sample, we used the Fear of Death subscale of the DAP-R. Additionally, we used the DAS as a related measure of death anxiety, which we were able to collect in a larger subsample of participants. Notably, these two scales are positively correlated ($r = 0.61$, $p < .001$ in DAP-R validation sample; Wong et al., 1994), although the correlation was much more modest in our sample ($r = 0.38$, $p < .0001$).

Tassell-Matamua and Lindsay predicted that strong positive emotions experienced during the NDE will be associated with reduced fear of death. Experiencing joy during the NDE was associated with both lower fear of death and lower death anxiety. However, neither of these correlations met our stricter significance threshold; therefore, we cannot be sufficiently confident that these are real findings and not false positives. Consistent with the theoretical predictions, experiencing a feeling of peace was associated with lower death anxiety. Tassell-Matamua and Lindsay also predicted that experiencing a bright light or encountering a being of light, another affective NDE feature, would facilitate reduced fear of death after the NDE. Experience of the light was negatively correlated with death anxiety in our sample, but this association again did not meet our stricter significance criterion. Our data partially supported the prediction that encountering spiritual beings (including religious figures, spirits of deceased relatives, or spirit guides) will influence the decrease in fear of death among NDErs. The NDE scale we used to quantify NDE features treats encountering mystical beings (defined as a being, presence or voice of a ‘mystical or other-worldly origin’) and spirits (defined as deceased

relatives and religious figures) as separate features (Greyson, 1983a). In our sample, the former, but not the latter, was associated with both lower fear of death and lower death anxiety.

Contrary to Tassell-Matamua and Lindsay's predictions and our expectations, having an OBE during the NDE was not associated with fear of death or any of the other death attitude variables. In our sample, these correlations were effectively close to zero, not merely non-significant. This finding is surprising because experiencing yourself outside of your body may provide the most direct evidence that your 'consciousness' can exist independently of your physical body and thus reduce fear of death. In addition, a study on OBEs as a separate phenomenon occurring without an imminent threat of death and lacking other typical NDE features has reported that 67% of experiencers had decreased or completely eliminated fear of death after the OBE (Osiris, 1979). A different study directly comparing OBEs and NDEs, which both included the element of disembodiment, reported that experiencers in both groups had similar reductions in fear of death (Tiberi, 1993). Furthermore, the author reported that positive emotions during the experiences (such as joy, serenity, and peace) were directly associated with positive aftereffects like decreased fear of death in both groups. This is consistent with findings from our study that positive emotions specifically are associated with lower fear of death after an NDE.

Notably, the life review was associated with fear of death, as its second strongest predictor, but was not included in Tassell-Matamua and Lindsay's (2016) predictions. The life review occurs in 20% to 30% of NDEs and includes a rapid review of one's past life events and an understanding or direct experience of how these various events impacted the experiencer or those around them (Zingrone & Alvarado, 2009). In our study, NDErs who experienced a life review showed lower fear of death after the NDE than those whose experience did not include a life review. This finding accords with reports that a life review in a personal or counselling setting may mitigate fears about death, especially in the elderly or those facing terminal illness or impending death (Haber, 2006).

In addition to their association with fear of death or death anxiety, some of the NDE features mentioned by Tassell-Matamua and Lindsay (2016) were associated with other death attitudes in our study. Specifically, experiencing a bright light or feelings of joy, as well as encountering mystical beings or spirits of deceased relatives during the NDE were all independently associated with higher approach acceptance. Based on this and prior studies (Bianco et al., 2019; Greyson, 2003), NDEs in general, and some specific NDE features in particular, promote the belief that death is a gateway to a desirable afterlife. The bright light and encounters with nonmaterial beings are usually experienced as loving and welcoming (Moody, 1975). Thus, NDEs may stimulate death acceptance by creating a psychological association between death and strong positive affect – a pathway hypothesised to explain the loss of fear of death in NDEs (Tassell-Matamua & Lindsay, 2016).

Naturally occurring NDEs are uniquely relevant to TMT, but the TMT literature has not directly addressed this connection, to our knowledge. Additionally, there are inconsistencies between TMT's predictions and what we know of NDE aftereffects. NDEs occur in circumstances of a real and serious threat to life, thus offering a real-life MS intervention. In comparison, interventions used to induce MS in TMT research are abstract and artificial. Some examples include having participants read or write about death, their own mortality, or a terminal illness; or watching a video of an accident, compared to a control topic

(Burke et al., 2010). After an MS induction, people become more materialistic and greedier (Vail et al., 2012), whereas most NDErs become significantly less concerned with material possessions and pursuits (Noyes et al., 2009). The dual-process model of terror management, an extension of TMT, posits that there are distinct defensive systems depending on whether death-related thought is conscious or unconscious (Pyszczynski et al., 1999). Unconscious thoughts of death, such as the ones elicited by an MS intervention, especially under the common condition of delay in examining the MS effect, require 'distal' defences like adhering to one's cultural norms and increasing one's self-esteem and life meaning within this cultural context. Conversely, conscious thoughts of death may activate 'proximal' defences like denying or reducing one's vulnerability to death or life-threatening illness or discounting death as only a problem of the distant future. Under this model, NDEs may elicit conscious thoughts of death since NDE memories are very real, prominent, and vivid (Moore & Greyson, 2017). Yet, many NDErs do not fear death, long for the place they experienced when close to death, and even view death as gateway towards a desirable afterlife.

One of the few papers to address the connection between TMT and NDEs has indeed suggested that MS may be different from mortality awareness that occurs in an NDE. Cozzolino et al. (2004) implemented a direct comparison of MS and a 'death reflection' manipulation which mimics NDE aspects, including reflecting on one's death and reviewing one's life. Individuals with an extrinsic value orientation (e.g. the pursuit of wealth and possessions) became greedier after MS, but, conversely, became less greedy after death reflection. Vail et al. (2012) argue that direct encounters with death could increase the magnitude of existential threat to a level that requires completely revising one's death anxiety buffers (e.g. one's worldviews and source of meaning in life), rather than relying on one's existing terror management system. Consistent with this interpretation, NDEs and their prosocial and growth-oriented aftereffects align with a more positive trajectory of managing one's death anxiety, compared to the sometimes negative effects elicited by MS (Vail et al., 2012). Independently of the work of Vail and co-authors, such a perspective has been presented in MMT – a more recent theory focusing on the growth that occurs when people live with acceptance of death, rather than simply engage in defences against death anxiety (Wong, 2008; Wong & Tomer, 2011). NDEs have specifically been mentioned as a source of support of MMT precisely because of the above-mentioned challenges to TMT (Wong, 2008). Among those challenges, there is no evidence that NDEs, as a powerful MS intervention, produce any defences against death anxiety and, on the contrary, NDErs show higher death acceptance.

Limitations

As in any NDE research, we cannot randomly assign individuals to experience an NDE or, alternatively, a close brush with death without an NDE. Therefore, the relationships between death attitudes and NDE status are correlational only and we cannot infer causality. Similarly, since we cannot predict NDE occurrences, we do not have pre-post measures of death attitudes to conclude confidently that it is the NDE that changes them. Research into the demographic and other characteristics of NDErs shows that NDEs are 'equal opportunity' experiences and the baseline levels of various death attitudes may thus reasonably be expected to approximate population estimates. Average levels of

several death attitudes we measured in NDErs after their experience were significantly different from averages in control samples, thus increasing our confidence that the NDE itself contributes to changes in death attitudes. Additionally, the cross-sectional associations with specific NDE features – the main focal point of this study – should reasonably hold, regardless of overall levels of death attitudes.

Conclusions and future directions

Near-death experiences are associated with a profound and lasting reduction in fear of death. In this study, we investigated which features of an NDE may promote this effect. Our findings supplement existing knowledge on interventions that may reduce fear of death in both clinical and non-clinical populations (Blomstrom et al., 2020; Menzies & Menzies, 2020). Future research should explore the feasibility and effectiveness of guided programmes (including virtual reality, VR), imagery or meditations to reduce fear of death by simulating specific NDE features. Additionally, this research should evaluate whether such changes persist over time, as they do for NDErs. Interventions using VR to simulate OBE and NDE states show cautious promise of reducing fear of death and achieving other typical NDE aftereffects (Barberia et al., 2018; Bourdin et al., 2017). While humanity is still grappling with the global COVID-19 pandemic and its psychological impact, including increased death anxiety (Menzies & Menzies, 2020), improving interventions aimed at reducing death anxiety is ever important.

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