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Mark R. McDermott
University of East London

Kathryn Lafreniere
University of Windsor

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**The Multidimensional Mortality Awareness Measure & Model (MMAMM):
Development and validation of a new self-report questionnaire & psychological
framework.**

Oona Levasseur

and

Mark R. McDermott
School of Psychology
University of East London, London, England

and

Kathryn D. Lafreniere
Department of Psychology
University of Windsor, Ontario, Canada

Corresponding author:

Professor Mark R. McDermott
School of Psychology
University of East London
Water Lane
Stratford Campus
London
E15 4LZ

Tel: 0208-223-4474

Email: m.r.mcdermott@uel.ac.uk

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Abstract

For each of eight literature-identified conceptual dimensions of mortality awareness, questionnaire items were generated, producing 89 in all. 359 participants responded to these items and to questionnaires measuring health attitudes, risk-taking, rebelliousness and demographic variables. Multivariate correlational analyses investigated the underlying structure of the item pool and the construct validity as well as the reliability of the emergent empirically derived subscales. Five components, rather than eight, were identified. Given the item content of each, the associated mortality awareness subscales were labelled as: legacy, fearfulness, acceptance, disempowerment, and disengagement. Each attained an acceptable level of internal reliability. Relationships with other variables supported the construct validity of these empirically derived subscales and more generally of this five-factor model. In conclusion, this new multidimensional measure and model of mortality awareness extends our understanding of this important aspect of human existence and supports a more integrative and optimistic approach to mortality awareness than previously available.

**The Multidimensional Mortality Awareness Measure & Model (MMAMM):
Development and validation of a new self-report questionnaire & psychological
framework.**

According to the United Kingdom's Office of National Statistics (2012), in the order of 1743 people come to the end of their lives each day in the U.K. Arguably, thereby, death as the inevitable conclusion of life is a realisation that impinges upon experience in complex and multiple ways. Such *mortality (or death) awareness* (MA) has been highlighted recurrently in early philosophical writings (for example, those of Epicurus, 270BC, in Warren, 2004). The emergence of the Death Awareness Movement in the 20th century represented a more pressing need to understand the clinical symptoms of grief (Lindermann, 1967) and to help professionals engage with mortality constructively (Feifel, 1959; Kubler-Ross, 1969). However, Becker (1973) has argued that it is natural for humans to fear death and to avoid its reality through various forms of subterfuge. Yet it is apparent that mortality awareness can have both positive and negative meanings. The tragedy of 9/11, which involved 2996 deaths, illustrates well this duality: the increased anxiety generated amongst employees in the workplace was found to be associated with both higher rates of absenteeism and also with more meaning of life reflections and selfless behaviours, such as enrolling in the helping professions (Grant & Wade-Benzoni, 2009).

Measuring MA

Despite the complex form and meaning of mortality awareness, its recognition as a psychologically multifaceted and multifunctional construct is not readily evident in studies that have attempted to measure it. For example, Templer's (1970) 'The Fear of Death Scale' is a one-dimensional measure, while similarly Florian & Snowden's (1989) measure addresses several dimensions of death fright, but neither considers various positive functions

and outcomes that may be associated with MA. Although pro-social behaviours have been noted in ‘survivors’ (Cozzolino et al, 2004), death acceptance has received little attention, with the exception of the creation of two measures: Ray & Najman (1974) produced a brief, seven item measure of death acceptance, while Klug & Sinha (1987) produced a sixteen item measure composed of two subscales measuring death acceptance in relation to confrontation (the conscious contemplation of one’s death) and integration (the positive emotional assimilation of the consequences of death). In the former, the confrontation items are mainly about rejecting avoidance of death awareness rather than being about a positive notion of acceptance. Consequently, Wong (2008) has called for additional dimensional exploration in terms of positive acceptance versus problematic avoidance. Further, the Death Attitude Profile (Gesser et al, 1987) and its revised iteration (Wong, Reker & Gesser, 1994), while including acceptance and fear subscales as dimensions, links the former with religious belief (‘Death is a union with God and eternal bliss’), and so arguably its content is not representative of secular Western societies wherein religiosity has severely declined in frequency (Crockett & Voas, 2006).

More latterly, Wittkowski’s (2001) ‘Multidimensional orientation towards dying and death inventory (MODDI-F)’ holds out the promise of recognising the complexity of mortality awareness. However, its multidimensionality is restricted to focusing upon the relationships between accepting or fearing one’s own death and that of other people, so, despite its name, does not interrogate MA’s potentially more multifaceted nature. This relative paucity of multidimensional measurement is also echoed in studies which use a simple stimulus to cue MA to observe effects upon behaviours: the ‘Mortality salience manipulation’ (Rosenblatt et al, 1989) consists of two open-ended items asking respondents about the physical consequences of death and the emotions provoked by this thought. Thereby, the psychometrics of mortality awareness are in need of development.

Theorising MA

Despite the deficiencies evident in the MA measurement arena, various theories are available to explain its influence and their diversity only highlights the multifaceted nature of MA. Terror management theory, Generative theory and Posttraumatic growth theory all address very different facets of MA. The influential Terror Management Theory (TMT) as developed by Greenberg, Pyszczynski, Solomon, Rosenblatt, Veeder, Kirkland, & Lyon, (1990) states that human behaviour is mostly motivated by fearing death. TMT was inspired by Existentialism which highlights the need to look at the experience of dreading death (Solomon, 2005), arguing that MA is a quality unique to humankind and that cultural belief systems are necessary to buffer against associated anxiety (Becker, 1973). According to TMT, cultural worldviews that provide meaning, order, and coherence to existence, offer a set of standards that outline worth and grant symbolic immortality through religious or social institutions. Through such standards, people attain a sense of value and live on through their culture, which unlike them, may survive indefinitely, and thereby buffer death anxiety (Pyszczynski, Greenberg, & Solomon, 1999). These effects of mortality awareness help individuals to cluster with others who share their views, and to cultivate hostility towards out-group members who challenge them. However, the kinds of activities that are preferred as a mean of overcoming death anxiety vary across cultures. In a study comprised of five experiments by Ma-Kellams and Blascovitch (2012), in which participants were primed with death thoughts, it was found that Westerners showed a preference for identity-enhancing activities while East Asians opted for pleasurable ones. Heine, Harihara & Niiya (2002) attempted to apply TMT in Japan and discovered a preference for high status possessions and a defence of cultural values as means of addressing death anxiety.

The likely multidimensional nature of MA is suggested further by the multiple functions it serves, as illustrated by studies using a Terror Management framework that have found it to be associated with a wide variety of outcomes. For example, the priming of mortality awareness through use of situational cues (such as watching videos of accidents) has been found to be associated with a preference for authoritarian leaders (Cohen et al., 2004); for violent counter-terror measures (Landau et al., 2004); an increase in contributions to national rather than international charities (Jonas, Schimel, Greenberg, & Pyszczynski, 2002); more severe sentences for unlawful offenders who threatened one's worldviews (Arndt, Lieberman, Cook, & Solomon, 2005); and preference for demonstrations of corporeal strength between athletes who value strength (Peters, Greenberg, Williams, & Schneider, 2005).

Erikson's Generative Theory (1959, 1982) focuses on a different aspect of MA via its association with 'Generativity' – the need to create legacy, and how this varies across the lifespan. The theory proposes that as people progress through life, they endure eight developmental crises. The penultimate crisis in the middle of adulthood is associated with an understanding that life is ending and leads to either the development of 'generative' behaviours for the benefit of future generations, or to 'stagnation', with the cessation of being an active contributing member of society. Generative individuals are said to be able to teach successive generations while working towards a meaningful sense of life. The final crisis Erikson proposes results from increased awareness of mortality and from the tension between 'ego integrity' - a sense of meaning and coherence-, and 'despair' - associated with dreading mortality. Studies examining associations between age and Generativity (e.g. McAdams & de St. Aubin, 1993) have demonstrated that the development of generative impulses is associated with a need to produce a legacy for the world, with this desire acting as a buffer

against death fright through extension of one's role after death. The cultural variation observed in the types of activities with which people engage to address awareness of their mortality, as evidenced within the context of TMT coupled with the intrapsychic complexity of the lifespan perspective taken by Generative Theory on the development of MA strongly suggests that such awareness is a multifaceted phenomenon.

Within the realm of studies examining post-traumatic growth, individuals who have experienced near death experiences thereafter have been found to be more likely to experience self-improvement, for example embracing pro-social activities (Ring & Valarino, 1998). For those who have survived life-threatening illness, 30% to 90% report positive changes (Humphreys & Joseph, 2004) within relationships, sense of self, and in terms of a renewed appreciation of life (Joseph & Linley, 2005). As such, post-traumatic growth theorising places emphasis on the beneficial effects of heightened mortality awareness, rather than on its capacity to simply invoke dysphoric emotions.

Predicting multidimensional MA

Research has shown that religious faith can play a defensive role against the problematic effects of MA, with the possibility of an afterlife negating the idea of mortality (Norenzayan, Dar-Nimrod, Hansen & Proulx, 2007). However, Niemiec and colleagues (2010) have found that when mortality is cued, mindfulness can act as a coping strategy to mitigate defensiveness, whilst individuals with high self-control tend to engage with mortality anxiety more positively (Gailliot et al. 2006). The Terror Management Health Model (TMHM; Goldenberg & Arndt, 2008) suggests that more conscious thoughts of death are associated with a greater frequency of healthy behaviours to prevent premature demise. So it may be expected that health attitudes and behaviours should differentially predict scores

on multidimensional dimensions of MA. However, research on the relationship between the paradoxical health behaviour of smoking with MA indicates that when mortality-related messages are combined with a strong self-esteem/smoking association, smoking increases rather than decreases (Hansen, Winzeler & Topolinski, 2010), suggesting important moderating effects of third variables, such as self-esteem. One such variable is rebelliousness, the feeling of wanting to oppose a perceived requirement, which has been found to be associated with maladaptive health behaviours and attitudes (Klabbers et al 2009). Rebelliousness has been found to be of two forms: 'reactive' being aligned with a feeling of unfairness or frustration, and 'proactive' with oppositional behaviour engaged in for hedonistic reasons (Author, 1987). With proactive rebelliousness as a possible moderator of a relationship between health activity and MA, reactive rebelliousness may also be an independent predictor of MA, since as a proxy measure of psychological reactance as after Brehm (1966), scores on reactive rebelliousness may predict death denial, defensiveness and anxiety.

Moreover, risk-taking behaviours have been found to be associated with both mortality salience and with rebelliousness (Rosenbloom, 2003; Author, 2013). The nature of the relationship between risk taking and MA is unclear however, with one study finding risk-taking to be associated with low MA (Word, 1996), while other research suggests that risk-taking is associated with raised MA if the risk-taking activity heightens self-esteem (Taubman-Ben-Ari, Florian & Mikuliner, 1999). These conflicting results call for further research to clarify how risk taking and MA interrelate.

The demographic variables, age and gender, are also involved in the prediction of MA: Youth is associated with feelings of invulnerability and the optimism that healthy behaviours will prevent early death (Taubman-Ben-Ari & Findler, 2005), while as adults

become older, health issues make vulnerability and MA more salient. For women, giving birth is considered to trigger MA for the mother (Westbrook, 1978), whilst also newly acquired parental responsibilities may trigger this for fathers, depending upon traditional versus non-traditional role assignment within families (Nazroo, Edwards & Brown, 1997).

The present study

The literature reviewed here strongly suggests the need for a multidimensional measure which encompasses all of the possible conceptual dimensions of MA. So, the first aim of the study reported here is to develop such a measure, a Multidimensional Mortality Awareness Measure (MMA-Measure). Specifically, it hypothesised that MA is comprised of eight separate conceptual dimensions: death related existential anxiety, death defensiveness, death hopelessness & passivity, death creativity and legacy, death philanthropy, death acceptance, death denial, and death continuity. Items are generated in relation to each of these and subjected to principal components analysis to determine if the conceptual dimensions are verifiable empirically. Secondly, the study explores whether relevant psychological and demographic variables can predict respondents' scores on the confirmed MA dimensions. Specifically, we examine the relative predictive utility for MA of variables which include: health attitudes, risk-taking, rebelliousness, age, gender, educational status, and proximity to life threatening illnesses, and witnessing someone die. Thereby, a cross-sectional, multivariate correlational design is used to develop the Multidimensional Mortality Awareness Measure (MMA-Measure) and to test its construct validity and reliability, with MMA-Measure subscales as dependent variables and risk-taking, health profile and rebelliousness subscales as independent variables. In this way, as well as broadening understanding of the place of MA within the context of other psychological variables, this study also examines the construct validity of the new measure.

Method

Participants

359 adult participants were recruited via online social media and at three campuses of a University located in the South-East of England. This convenience sample was comprised of 231 females (64%) and 128 males (36%). Their ages ranged from 18 to 80 years old ($M=32$, $SD=12.27$). 38% had achieved an undergraduate degree, and 23% a postgraduate qualification. 52% self-designated as current students, while 28% were in full-time employment, and 62% earning less than £15,000 per year. 54% of the respondents were single and 39% were married or co-habiting. 63% described their ethnicity as white, while 17% self-designated as Black African or Black Caribbean, and 9% as either South Asian, Indian or Pakistani. 46% described themselves as British citizens. 8% of participants reported having a disability. 21% indicated having experienced a life threatening illness; 58% reported having been close to someone with a life-threatening illness; and, 40% indicated they had seen someone die.

Materials

Four self-report questionnaires and items soliciting demographic information were presented to respondents in either hardcopy booklet form or online. Firstly, respondents completed the Domain-Specific Risk-Taking questionnaire ('DOSPERT'; Weber, Blais & Betz, 2002). This 40-item scale assesses risk-taking in relation to: financial decisions (separately for investing versus gambling); health/safety; recreation; ethical issues; and social decisions. Participants were asked to rate on a 5-point Likert scale the likelihood that they would engage in risky activities. An example of an item from this measure is as follows: 'Betting a day's income at the horse races' (financial decision subscale). Item scores are

summed for each 8-item subscale, with total scores ranging from 0 (low risk taking likelihood) to 40 (high risk taking likelihood). This measure has been shown by Weller and Tikir (2011) and Markiewicz and Weber (2013) to be valid and reliable.

Secondly, participants responded to 89 items in an author-generated questionnaire focusing on mortality awareness, the development of which is reported in the Results and referred to as the Multidimensional Mortality Awareness Measure (MMA-Measure). This pool of items consisted of eight conceptual subscales as follows:

(1) 'Death Existential Anxiety' item content focused upon anxiety linked to the impossibility of escaping the end of one's life and a feeling of malaise. An exemplar item is: 'I think of death as a negative thing.'

(2) 'Death Defensiveness' item content focused upon avoidance of the awareness of death and the triggering of defensive behaviours that result in feeling death related anxiety. An exemplar item is: 'When thoughts of death enter my mind, I think about something else straight away.'

(3) 'Death Hopelessness/Passivity' item content focused upon the realisation of personal insignificance in the face of death awareness and the inability to be invulnerable to death. An exemplar item is: 'Thinking about death makes me feel that everything is pointless.'

(4) 'Death Creativity & Legacy' item content is about the need to create a legacy in order to live beyond death. An exemplar item is: 'I would like to be famous so that many people will remember me after my life has ended.'

(5) 'Death Philanthropy' item content focused upon the need to give to others in order to attain a feeling of significance as an antidote to death anxiety. An exemplar item is: 'When I give to others, I feel more alive.'

(6) 'Death Acceptance' item content reflected the confrontation & integration of the emotional as well as the physical reality of death, an example item being: 'I would not be scared of planning my funeral in advance.'

(7) 'Death Denial' item content reflected the refusal to acknowledge the idea of death and a possible feeling of immortality, an example item being: 'I think of death as something that is far away & that will not happen to me.'

(8) 'Death and Continuity' item content is about the notion that death can be ameliorated by the trans-generational transfer of biological genes and of memes in the form of family, memories, values and spirituality, an example item being: 'I often think of ways by which I can extend the length of my life.'

Thereafter, participants answered seven author-generated items about their prior experience of death. This short Death Experience Questionnaire (DEQ) was added in order to solicit respondent's prior direct contact with witnessing someone dying, being close to death, or being terminally ill. An example from these items is: '*Have you ever been emotionally close to someone who has had a life threatening illness? (Yes/No) and 'If 'Yes' to the previous question, how emotionally close were you to that person during their illness? (Not close at all 1, 2, 3, 4, 5, 6, 7 Extremely close).*'

Next participants completed the Social Reactivity Scale (Author, 1987). This eighteen-item self-report questionnaire is comprised of two subscales, one measuring proactive rebelliousness, a sensation seeking and hedonistic form of oppositional behaviour, and reactive rebelliousness, a form which arises in response to an interpersonal disappointment or affront. Each subscale contains seven items, with four additionally included as fillers to counter the occurrence of socially desirable response sets. Items are scored on a 3-point Likert scale with 0 = not rebellious, 1 = not sure, and 2 = rebellious. An example item from

the proactive rebelliousness subscale is: ‘When you are told that you are breaking a rule (for example, ‘No Smoking’) is your first reaction: (0) stop breaking the rule any further; (2) go ahead and still break the rule; (1) not sure.’ An example item from the reactive scale is: ‘You have been treated badly by someone. Do you: (2) try to get back at the person; (0) hope that things will improve; (1) not sure.’ Total scores on each subscale range from 0 to 14. The questionnaire has been shown to be valid and reliable in various studies (Klabbers et al, 2009; Author, 2013; Author, 2014).

Then, participants responded to the Health-Promotion Lifestyle Profile II (Walker, Sechrist & Pender, 1995) which is a 52-item measure composed of six subscales: (1) spiritual growth, (2) interpersonal relations, (3) nutrition, (4) physical activity, (5) health responsibility, and (6) stress management. Participants are asked to rate on a 4-point Likert scale (1=Never, 2=Sometimes, 3=Often, 4=Routinely) the frequency with which they engage in behaviours as specified. To illustrate, an example item from the health responsibility scale is: ‘Report any unusual signs or symptoms to a physician or other health professional.’ Adequate validity and reliability information has been reported by Tajik and colleagues (2010) in their health survey in the community research and by Callaghan (2005) in a study on healthy behaviours, self-efficacy, self-care, and basic conditioning factors in older adults. Lastly, participants responded to items soliciting demographic information (age, sex, highest level of educational attainment, occupation, partnership status, ethnicity, income, disability, and nationality).

Procedure

Participants were recruited in a three month period during the summer of 2013 via either SurveyGizmo (N=256, 71%) or hardcopy questionnaire booklets (N=103; 29%) on the

three campuses of the University. Potential participants were presented with an information letter and consent form and told that the duration of the study would be approximately thirty minutes. The information letter indicated the purpose of the study and assured participants of confidentiality and anonymity. Participants were informed they could withdraw from the study at any point without consequence. The researcher's email address was provided for further enquiries. The protocol for the research project was approved by the University's School of Psychology Research Ethics Board. Hard copy completed consent forms and questionnaires were kept in separate folders in a secure location.

Results

Missing items scores in the raw data were replaced by median values for each variable. The percentage of missing values across variables ranged from .2 to .6 of one percent. Thereafter, analysis of MMA-Measure items was carried out, and further correlational analyses conducted to investigate reliability and construct validity.

Mortality Awareness Item Analysis

Initially, a scree analysis, as after Cattell (1966), was carried out to investigate the number of components underlying the 89 mortality awareness items in the item pool. Examination of the scree plot showed a maximum of seven 'jumps' down to the beginning of the scree, indicating the existence of up to seven empirically derived dimensions within the correlation matrix. Subsequently, three Principal Component Analyses (PCA), using varimax rotation, were carried out, each specifying 5, 6 or 7 factors to be extracted. The five-factor solution was the most conceptually coherent and interpretable, with patterns of item loadings on factors six and seven in the other two PCAs being largely uninterpretable and conceptually non-discrete. Items loading > 0.4 exclusively on one factor were regarded as indicative of that component. Items that loaded > 0.4 on two factors or more were disregarded. The results of the five-factor PCA accounted for 36% of the variance in the correlation matrix.

Coefficients of internal reliability were computed for each of the five empirically derived subscales, resulting in Alpha coefficients ranging from 0.59 to .87. By this process, a 36-item questionnaire measuring five-dimensions of mortality awareness was produced: the Multidimensional Mortality Awareness Measure (MMA-Measure). Table 1 shows the loadings of the 36 items on each of the five factors. These five components are labelled and described hereafter in accordance with the item content within each. For each empirically derived subscale, the item with the most substantive loading is given as an exemplar.

- (1) Mortality Legacy (10 items from a pool of 31, $\alpha = .87$, explained variance 15%): content of items loading exclusively onto this factor relate to the need to create a legacy to live on beyond death, the lead item being *'I want to be remembered for doing great things for the world when I am no longer alive'*.
- (2) Mortality Fearfulness (10 items from a pool of 16, $\alpha = .86$, explained variance 9%): content of items loading exclusively onto this factor encompass the anxiety attached to the impossibility of escaping the end of one's life, the lead item being *'When I think about death I feel nervous'*.
- (3) Mortality Acceptance (5 items from a pool of 7, $\alpha = .78$, explained variance 5%): content of items in this component relate to the integration of the emotional and physical reality of death, the lead item being *'I am aware that death is part of life'*.
- (4) Mortality Disempowerment (6 items from a pool of 7, $\alpha = .73$, explained variance 4%): the content of items in this component represent the realisation of personal insignificance and of vulnerability in the face of death awareness, the lead item being *'Thinking about death makes me feel that everything is pointless.'*
- (5) Mortality Disengagement (5 items from a pool of 7, $\alpha = .59$, explained variance 4%): the content of items loading exclusively on this factor are about the refusal to acknowledge death and a feeling of immortality, the lead item being: *'I only think of the present moment and do not worry about my own death.'*

Table 1: The 36-items MMA-Measure with Item Loadings for N factors=5 model, varimax rotation.

	1	2	3	4	5
Mortality Legacy					
5 I want to be remembered for doing great things for the world when I am no longer alive	0.68	0.14	0.11	-0.04	-0.02
10 I would like to create something that will outlive me	0.66	0.02	0.03	-0.09	-0.10
11 I want to do things in an original way so I am valued and feel further away from death	0.65	0.22	-0.004	0.07	0.13
16 When I think about the fact that we are only on earth for a short period of time, I feel that I want to create something to leave behind	0.64	0.08	0.04	-0.12	-0.15
21 I want to be remembered after my death for my charity work	0.63	0.06	-0.08	0.16	0.03
23 I would like to name a charity after my name so it lives on after my death	0.62	0.06	-0.20	0.07	0.02
30 By giving time and energy to others unselfishly, I feel stronger than the forces that will end my days	0.62	-0.04	0.11	0.10	-0.008
6 My values are very important to me because this is all that will be remembered from me when I will be dead	0.60	0.16	0.03	0.1	0.05
32 A record of my life (photo film, diaries) after I am no more is important for me so that I am remembered	0.59	0.28	0.02	0.1	0.09
12 Leaving behind my thoughts and beliefs in writing to others is a good way of beating death	0.58	0.09	-0.07	0.21	0.20
Mortality Fearfulness					
29 When I think about death I feel nervous	0.15	0.69	-0.21	-0.03	-0.10
14 I am scared of dying before I am old	0.12	0.64	-0.16	-0.16	0.01
24 I think of death as a negative thing	-0.01	0.63	-0.15	0.02	0.18
27 Thinking about death paralyses me	0.11	0.60	-0.37	0.25	0.003
2 I have seen someone that almost died and it made me realise that I am very scared of dying	0.24	0.59	-0.23	0.15	-0.02
31 I feel afraid when I think of the time flying rapidly by	0.23	0.58	-0.08	0.13	-0.12
22 The idea of death makes me feel powerless	0.2	0.57	-0.06	0.27	0.00
17 I fear the death of my close relatives	0.14	0.57	0.14	0.10	-0.01
33 When thoughts of death enter my mind, I think about something else straight away	0.15	0.54	-0.19	-0.06	0.35
1 It makes me angry when I think about my own death	0.18	0.54	-0.39	0.22	-0.005
Mortality Acceptance					
3 I am aware that death is part of life	0.07	-0.14	0.68	-0.08	-0.13
35 I accept that I cannot live forever	-0.04	-0.01	0.65	-0.01	-0.06
20 I do not let the fear of dying rule my life	0.12	-0.21	0.58	-0.15	0.12
25 I accept that there is a cycle of life from birth to death	0.16	-0.06	0.57	-0.16	0.05
7 We will all die at some point	0.03	-0.004	0.55	-0.05	-0.08
Mortality Disempowerment					
33 Thinking about death makes me feel that everything is pointless	0.07	0.23	-0.22	0.59	-0.05
9 If I had an untreatable illness I would not fight it as we are helpless anyway	-0.03	-0.07	0.02	0.58	0.05
13 Nothing matters to me because we all die in the end	0.06	0.01	-0.21	0.57	0.02
15 Life is futile	0.06	0.22	-0.19	0.47	0.04
19 Death makes me feel hopeless	0.06	0.39	-0.24	0.46	-0.06
27 When I think about death, it makes me feel that human race is insignificant	0.15	0.27	-0.03	0.46	-0.02
Mortality Disengagement					
8 I only think of the present moment and do not worry about my own death	0.1	-0.20	0.11	-0.07	0.63
36 Death thoughts are an unnecessary waste of energy	-0.07	0.22	0.04	0.00	0.57
26 I never think about what might happen after death	-0.17	0.1	-0.03	0.16	0.50
18 I sometimes forget that I will die	0.08	0.09	0.04	-0.06	0.50
4 I think of death as something that is far away and that will not happen to me	0.02	0.19	-0.16	0.11	0.41

Descriptive Statistics

For the MMA-Measure, mean scores on the five subscales ranged from 2.61(SD=1.14) on M-Disempowerment, 3.64 (SD=1.09) on M-Fearfulness, 3.67 (SD=1.15) on M-Disengagement, 4.08 (SD=1.22) on M-Legacy, to 6.16 (SD=0.94) on M-Acceptance. On the six risk-taking subscales of the DOSPERT, mean scores varied from 1.86 (Gambling) to 2.86 (Recreational), with standard deviations ranging from 0.53 to 0.66. On SRS, means were 4.34 (SD=3.27) for proactive rebelliousness, and 3.79 (SD=2.95) for reactive rebelliousness. For the health attitude subscales scales (HPLP-II), mean scores ranged from 2.15 (s.d= 0.55) for health responsibility to 2.89 (SD=0.48) for healthy stress management.

The Demographics of MA

No significant differences between male and female respondents were found on the five MMA-Measure subscale scores using independent t-tests. However, respondents who self-designated as having a disability (M=6.63, s.d=0.59, N=28) reported greater M-Acceptance than those who had not (M=6.12, SD=0.96, N=331) [$t(40)=-4.24$, $p=0.001$ (with 95% CI -.77 to -.27) and $d=0.64$].

MMA-Measure subscale scores did not differ on ANOVA tests for partner status or for occupational status. However, despite low cell sizes, some differences on subscales by ethnicity were observed: on M-Legacy [$F(8,350)=2.96$, $p=0.003$], M- Fearfulness [$F(8,350)=2.75$, $p=0.006$], M-Disempowerment [$F(8,350)= 3.63$, $p=0.001$] and M-Disengagement [$F(8, 350)2.87$, $p=0.004$], with notably those self-designating as Black African scoring the lowest on M-Acceptance and the highest on M-Fearfulness.

As for relationships of age and highest level of educational attainment with scores on MMA-Measure subscales, two findings are notable statistically: Increasing M-Acceptance

with age [$r(357)=.15$, $p=0.003$]; and, decreasing M-Fearfulness with higher level of education [$r(357)=-.14$, $p=0.008$] and increasing age [$r(357)=-.15$, $p=0.004$].

Comparing people who reported having had a life threatening illness and those who had not, significant differences were observed on three of the MMA-Measure subscales: M-Fearfulness and M- Disempowerment scores were less for individuals who had experienced threatening illnesses ($M=3.32$, $SD=1.07$ and $M=2.35$, $SD=1.11$) than for those who had not ($M=3.72$, $SD=1.08$ and $M=2.68$, $SD=1.13$) [$t(357)=2.88$, $p=0.004$, 95% CI 0.13 to 0.67 and $d=0.89$; and $t(357)=2.26$, $p=0.025$, 95%CI 0.04 to 0.62, and $d=0.94$].

Opposite effects were found for M-Acceptance, with the group that experienced a threatening illness ($M=6.38$, $SD=0.89$) scoring more than the ones who had not [$(M=6.10$, $SD=0.95)$; $t(357)=-2.34$, $p=0.02$, 95%CI -0.52 to -0.05, $d=0.30$]; and the group who had been close to someone having a life threatening illness ($M=6.25$, $SD=0.87$) scoring higher than the one who had not ($M=6.03$, $SD=1.02$), [$t(357)= -2.13$, $p=0.034$, 95%CI -0.33 to 0.13, $d=0.23$]. However, having seen someone die was not found to be related to MMA-Measure subscales scores.

It also emerged that the closer one was (on a scale from 1 to 7) to someone who had a threatening illness was associated high fearfulness scores ($r(138)=0.24$, $p=0.002$). From people that had been close to dying ($N=75$), the closer to death they reported to have come, the less fearful ($r(73)=-.28$, $p=0.008$) and the less disengaged ($r(73)=0.26$, $p=0.01$) but also the more acceptant of mortality they were ($r(73)= 0.26$, $p=0.01$).

MMA-Measure construct validity & predictive utility

Bivariate correlational analyses.

For M-Legacy, higher scores were associated with increasing proactive rebelliousness [$r(357)=0.09$, $p=0.046$], ethical risk taking [$r(357)=0.12$, $p=0.01$], a propensity to engage in

gambling and financial investment related risks [$r(357)=0.10$, $p=0.03$; $r(357)=0.15$, $p=0.002$], recreational risk taking [$r(357)=0.11$, $p=0.02$], greater health responsibility [$r(357)=0.27$, $p=0.001$], physical activity [$r(357)=0.13$, $p=0.007$], greater concern for better nutrition [$r(357)=0.16$, $p=0.002$], healthy spiritual growth [$r(357)=0.25$, $p=0.001$], and healthy stress management [$r(357)=0.22$, $p=0.001$].

For M-Fearfulness, higher scores were associated with less reactive rebelliousness [$r(357)=-0.09$, $p=0.46$], with higher proactive rebelliousness [$r(357)=0.09$, $p=0.04$], and greater health responsibility [$r(357)=0.13$, $p=0.008$].

For M-Acceptance, scores on this subscale were negatively correlated with proactive rebelliousness [$r(357)=-0.09$, $p=0.04$] and with financial gambling [$r(357)=-0.10$, $p=0.03$], but positively associated with healthy spiritual growth [$r(357)=0.19$, $p=0.001$], likeliness to engage in healthy relationships [$r(357)=0.24$, $p=0.001$], and healthy stress management [$r(357)=0.12$, $p=0.02$].

For M-Disempowerment, scores were positively correlated with proactive rebelliousness [$r(357)=0.21$, $p=0.001$], reactive rebelliousness [$r(357)=0.2$, $p=0.001$], ethical risk taking [$r(357)=0.1$, $p=0.032$], financial gambling [$r(357)=0.1$, $p=0.03$] and health responsibility [$r(357)=0.12$, $p=0.013$] but negatively associated with healthy spiritual growth [$r(357)=-0.269$, $p=0.001$].

Finally, for M-Disengagement, scores were positively correlated with proactive rebelliousness [$r(357)=0.12$, $p=0.01$], financial gambling [$r(357)=0.12$, $p=0.009$] and investment risk taking [$r(357)=0.09$, $p=0.05$], recreational risk taking [$r(357)=0.16$, $p=0.001$] and health and safety risk taking [$r(357)=0.14$, $p=0.005$].

Multivariate correlational analyses.

After an analysis for multicollinearity, multiple regressions were computed for each of the subscales. Independent variables that had been significantly correlated with each subscale in the bivariate analysis were incorporated as predictors. Death experience questions, disability status and ethnicity were not incorporated, however, because of low cell sizes.

For M-Legacy, of the eleven criterion predictors included in the regression (none of which were demographic variables), two were statistically significant, explaining 10.9% of the variance ($R^2=0.109$, $F(11,347)=5$, $p=0.001$): specifically, scores on Health Responsibility and Health Spiritual Growth significantly predicted M-Legacy ($\beta =0.197$, $p=0.004$; $\beta =0.138$, $p=0.038$).

M-Fearfulness was tested in a two-step manner so that effects of the demographic variables could be differentiated from those the psychological variables. In the first step, one demographic variable, age, was found to be inversely predictive of M-Fearfulness, with an explained variance of 2.7% ($R^2=0.027$, $F(2,356)=6.00$, $p=0.003$; $\beta =-0.119$, $p=0.03$), older respondents reporting less mortality fearfulness. In step 2, two predictors, education and health responsibility, jointly explained 4.4% of the variance ($R^2=0.044$, $F(4,354)=5.09$, $p=0.001$), with higher educational attainment predicting lower M-fearfulness ($\beta =-0.11$, $p=0.05$) and higher health responsibility scores predicting greater M-Fearfulness ($\beta =0.13$, $p=0.01$).

M-Acceptance was tested also in a two-step process. A small percentage of (2.1%) of the variance was explained in step 1 ($R^2=0.02$, $F(2,356)=8.71$, $p=0.003$), in which age acted as a predictor for high scores ($\beta =0.15$, $p=0.003$). In the second step the psychological variables accounted for 7.5% of the variance ($R^2=0.08$, $F(5,353)=6.79$, $p=0.001$), with increased age predicting higher scores ($\beta =0.16$, $p=0.003$), as well as likelihood of engaging in healthy relationships ($\beta =0.24$, $p=0.001$).

For M-Disempowerment, three predictors accounted for 7.5% of the variance ($R^2=0.075$, $F(8,350)=10.47$, $p=0.009$): two indicated positive associations, proactive rebelliousness ($\beta =0.15$, $p=0.005$) and health responsibility ($\beta =0.28$, $p=0.001$); and one indicated a negative predictive relationship, specifically spiritual growth ($\beta =-0.46$, $p=0.001$).

The prediction of M-Disengagement was tested in relation to proactive rebelliousness, financial (gambling and investment), recreational and health & safety risk-taking subscales. However none of these variables were observed to have independent predictive utility.

Discussion

In summary, the results of the present study indicate that the eight dimensions of a literature-led conceptual scheme of mortality awareness (MA) were not confirmable but rather that a five-component model with associated discrete questionnaire subscales was tenable, composed specifically of the following dimensions of MA: (1) Mortality Legacy, (2) Mortality Fearfulness, (3) Mortality Acceptance, (4) Mortality Disempowerment, and (5) Mortality Disengagement. Hereafter, the meaning of these five components will be specified, after which we will consider their reliability and relationships with other variables included in the study.

The subscales

The five-factor solution accounts for 36% of the total variance in the originating item correlation matrix. With varimax rotation maximising unique variance accounted for by each factor and a sample size of $N=359$ producing a ratio of 4:1 respondents to items, thereby exceeding the 3:1 ratio for sample sizes above 250 as recommended by Cattell (1978), the five factor solution arguably is stable and replicable, notwithstanding that additional factors might be extractable in other samples.

Five out of the ten items composing the M-Legacy subscale were derived from the Death Creativity & Legacy conceptual subscale, with items from the Death Continuity and Death Philanthropy conceptual subscales also appearing. The item composition of the ML subscale, thereby, is in line with Erikson's claim (1959) that creativity and philanthropy result from a need for legacy. The M-Legacy subscale items then, are about what remains from individuals after death, including values, philanthropic activities, art, and social constructs, with legacy having been defined as '*something handed down by a predecessor*' (Thompson, 1995, p776).

The M-Fearfulness empirical subscale is comprised of ten items, seven of which were derived from the precursor Death Existential Anxiety conceptual subscale. The three remaining items came from the Death Hopelessness/Passivity and Death Denial subscales, as derived from the TMT framework. Thereby, M-Fearfulness as measured here is simply about the fear humans experience when facing or thinking about their own or other's death (Becker, 1973).

The M-Acceptance subscale is composed of five items, four items from the precursor Death Acceptance conceptual subscale and one from Death Continuity. The content of these items is about the ability to cope effectively with mortality through philosophical acceptance of it. This form of mortality awareness is a counterpoint to the fearfulness and anxiety that is central to the account offered by TMT and thereby extends the modelling and measurement of mortality awareness.

M-Disempowerment is entirely composed of items from the precursor Death Passivity/Hopelessness conceptual subscale and therefore has retained its initial definition as previously articulated here: '*the realisation of personal insignificance in the face of death awareness and the inability to be invulnerable to death.*' As after Becker (1973), it represents

the lost ability to buffer and reduce the existential impact of MA when one can no longer fulfil the necessary psychological needs for happiness and acceptance.

Finally, the last subscale, M-Disengagement is comprised of five items, all being derived from the precursor Death Denial conceptual subscale. High scores on this subscale indicate in respondents a detachment from death awareness, containing within that disconnectedness the notion that engagement with MA is unproductive and of death as a distal event not relevant to current activity.

Validity & reliability

The internal reliability of four of the five MMA-Measure subscales are designable as 'good', according to criteria as after Cronbach (1951), with Alpha coefficients of internal consistency ranging from .73 to .87. Cronbach's Alpha for the M-Disengagement subscale at .59 lies just on the border of 'acceptable' reliability. Thereby, the five groups of items in the MMA-Measure are internally consistent, demonstrating that the questions in each subscale are operationalising related aspects of the same construct.

The proposition that the five subscales assess the constructs which they purport to and so have good validity, is supported by the independent multivariate relationships with scores on the questionnaires assessing risk-taking, rebelliousness, and health attitudes and behaviours. M-Legacy, for example, was found to be independently predicted by health responsibility and by spiritual growth, suggesting that those who have an appreciation of handing down an aspect of their lives to succeeding generations as a way of overcoming death, also are more likely to take responsibility for their health and place value on their internal development over the lifespan. Such a relationship was also found for M-Fearfulness. Additionally, however, as might be expected, with higher education and increasing age, respondents reported less M-Fearfulness, and consistent with this finding for

age, older participants reported greater M-Acceptance. The relationship with educational attainment supports the results of Silles' study (2009), which found a causal link between the two. The results for age support Erickson's developmental theory of Generativity (1959, 1982), which suggests that nurturing behaviours and mortality acceptance mitigate death fear and that legacy-orientated instincts are expressed during the second half of life. Interestingly, those who reported an increased likelihood of participating in healthy relationships - the ability to communicate and create intimacy with others, as after Walker, Sechrist, & Pender, (1987) - were also respondents who tended to score higher on M-Acceptance. This indicates that the successful integration into a world view of death inevitability is associated with psychological benefits, as also suggested by the work of Klug & Sinha (1987). Notably, improved relationships can be a significant outcome for survivors of mortality-related trauma, which can produce shifts in goals and values (Lykins et al, 2007), thereby enabling posttraumatic growth.

Conversely, as might also be expected, the association of M-Disempowerment with proactive rebelliousness, the readiness to engage in sensation-seeking and sometimes risky forms of oppositional behaviour, suggests that a sense of personal insignificance and invulnerability in the face of death is not an adaptive way of relating to mortality, a proposition further corroborated by the negative relationship with spiritual growth. The association between proactive rebelliousness and mortality disempowerment suggests that reminders of MA may disempower individuals, encouraging negativism to restore power and freedom, as consistent with the theory of psychological reactance (Brehm, 1966), which proposes that if behaviour change messages are threatening to personal agency, individuals will endorse adverse behaviours to re-establish their feelings of liberty. Interestingly, however, those who felt such disempowerment, nevertheless still retained a sense of

responsibility for their health behaviour choices. This indicates that mortality awareness more generally, whether of the legacy, fearfulness or disempowerment type, cues health accountability, and so supports the TMHT notion that conscious reminders of mortality may lead to healthier behaviours (Goldenberg & Arndt, 2008).

Though no single predictor emerged in regression analysis for mortality disengagement, bivariate correlations produced a consistent pattern of associations with recreational, financial and health-related risk-taking, and proactive rebelliousness, all being positively correlated. This suggests that mortality disengagement is a maladaptive, short-term strategy which suppresses awareness of negative distal outcomes, thereby heightening the present-moment arousal produced by risky activities.

As well as age and education being related to aspects of mortality awareness as operationalised by the MMA-Measure, analysis of differences between the four major ethnic groups contained within the sample found that participants who self-designated as Black Africans were less acceptant of their mortality than other respondents (including those who self-designated as Black Caribbean). This result is consistent with the ethnological finding that Africans tend to engage in claims of immortality and cultural representations that deny death (Adams, 1992) but might be explicable post hoc in a variety of other ways, as to be explored by future research.

The multidimensional approach to MA adopted here illustrates that the same psychosocial event connoting possible loss can have diametrically opposed effects on different aspects of MA. Specifically, whilst we found an association between having had or witnessing a life threatening illness with higher levels of mortality fear and disempowerment,

for others such an event was associated with greater mortality acceptance and legacy, implying that those who cope with death fright effectively can progress positively. Such a nuanced understanding of the effects of life-threatening events is not available via less complex approaches to MA and is a tangible benefit of the MMAMM. It constitutes an important step on from other scales which measure fewer dimensions or which align mortality with religiosity, as does, for example, Wong et al's (1994) revised Death Attitude Profile.

Significance, utility & future directions

Future research is needed to further our knowledge of the psychometric properties of the MMA-Measure in order to more fully establish the place of the five MA components within the broader nomological network of other psychological constructs (Cronbach & Meehl, 1955), for example in relation to the Big Five personality variables (Costa & McCrae, 1992). Test-retest reliability could be established during the course of a longitudinal study which would also be able to discriminate between cause and effect processes involved in the genesis of mortality awareness and its developmental consequences over the lifespan. Such a study might also contain qualitative elements in multi-method exploration of different experiences and understandings of mortality awareness in everyday life amongst people of varying demography, including age, nationality, culture, ethnicity, gender, socioeconomic status and educational attainment. Such a study might seek to explore MA as both as a learned dispositional trait and as a state, given the experience of MA on a daily basis may be both a moment-to-moment one and also a more general readiness to interpret the world through the lenses of mortality.

The MMA-Measure & Model may have utility in a variety of applied and research settings. As an assessment tool, the MMA-Measure could be used as a baseline indicator in therapeutic settings to explore protective factors in and around issues pertaining to suicidal ideation and mortality. For example, establishing a client's orientation on both M- Legacy and M-Disempowerment may provide therapeutic options which would not be apparent simply by examining one to the exclusion of the other: reconstructing cognitions and behaviours associated with M-Disempowerment and constructing an adaptive cognitive schemata associated with M-Legacy may well be a viable way of moderating suicidal ideation, given the success of CBT with such reported by March et al, (2007) and Stanley et al (2009). Similarly, given the link between M-Disempowerment and rebelliousness and of the latter with various forms of substance abuse (Author, 2013), for individuals suffering from the constraints of addiction, the cuing of M-Legacy and M-Acceptance may produce a sense of empowerment and self-efficacy which enables recovery. Other settings in which the MMA-Measure & Model would be usefully deployed and elaborated include those inhabited by combat veterans, military personnel, emergency service workers, medical personnel in acute care contexts (nurses, emergency room medics), and carers for the elderly and terminally ill, given mortality awareness is a core existential preoccupation (Yalom, 2008).

In summary, the significance of the research reported here has been the production of a new multidimensional measure and model of mortality awareness which extends our understanding of this pervasive aspect of the human condition and enables further empirical exploration of this insufficiently studied psychological phenomenon. The positive and negative orientations toward mortality within the five component scheme testify, as suggested by Lykins et al (2007), to a reconciliation of TMT and PTG frameworks: facets of mortality awareness can both disable or enable. The MMA-Measure & Model, as a challenge to

previous research focused primarily on death fright, supports a more optimistic approach to the structure and functions of mortality awareness.

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