



Controlling death by defending ingroups – Mediation insights into terror management and control restoration



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HIGHLIGHTS

- Three studies show that control motivation underlies mortality salience (MS) effects.
- MS and control deprivation (CD) effects on ingroup defense were indistinguishable.
- Mediators of MS and CD effects were pattern perception and need for structure.
- A key function of MS-based ingroup defense may be control restoration.

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ABSTRACT

A large body of evidence supports the key tenet of terror management theory (TMT) that people manage death anxiety by defending cultural ingroups. However, surprisingly little is known about the motivational processes driving this effect. Given that mortality salience (MS) as well as control deprivation instigate ingroup defense, it is possible that MS effects on ingroup defense are fueled by the motivation to restore control that has been shattered by the inevitability of death. Study 1 revealed that control motivation – operationalized as illusory pattern perception – mediates MS and control deprivation effects on ingroup defense. Study 2 showed that thoughts about lacking control mediate MS and control deprivation effects on perceptions of randomness. Study 3 compared control motivation – operationalized as state need for structure – and death-thought accessibility (i.e., the main mediator candidate in TMT) in terms of mediation of MS and control deprivation effects on ingroup defense. Replicating the results of Study 1, control motivation mediated both MS and control deprivation effects, whereas death-thought accessibility failed to mediate any effects. Using different operationalizations of control motivation, these studies provide broad mediational evidence for the notion that MS-induced ingroup defense serves the function of compensating for the loss of control that is inherent in the inescapability of death.

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“It is possible to provide security against other afflictions, but as far as death is concerned, we men all live in a city without walls.”
Epicurus (n.d.)

According to the ancient Greek philosopher Epicurus, a particularly problematic aspect of death is the inexorableness of the ephemerality of being or, in other words, human defense- and helplessness in the face of death. Similar ideas have been brought forward by cultural

anthropologists and psychologists investigating how people cope with uncontrollable aspects of their lives, such as the inevitable transience of existence (Becker, 1973; Fritzsche, Jonas, & Fankhänel, 2008; Pyszczynski, Sullivan, & Greenberg, in press). This line of research has converged in demonstrating that mortality salience (MS) motivates people to engage in symbolic defenses against the existential fear of their ever-impending demise. Hundreds of studies have shown that people defend the worldviews of their cultural ingroups (e.g., through ingroup favoritism and outgroup discrimination) and strive for self-esteem (by meeting the ingroups' behavioral standards) after contemplating their mortality (Burke, Martens, & Faucher, 2010). Given that the identification with cultural ingroups is conceived as a multiply determined phenomenon that may serve a variety of needs, including the needs for control (Fritzsche et al., 2008) and self-preservation (Greenberg, Solomon, & Arndt, 2008), and these needs are eventually

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frustrated by death (Pyszczynski, Greenberg, Solomon, & Maxfield, 2006), the question arises which motivational processes underlie MS-induced ingroup defense. Focusing on the role of death's uncontrollability in the emergence of ingroup defense (Fritsche et al., 2008), the aim of the present research is to investigate whether MS effects on ingroup defense can be explained by the motivation to restore a sense of control that has been shattered by the unavoidability of mortality. This question is investigated using a mediational approach that should yield new insights into the motivational underpinnings of MS and control deprivation by examining whether MS and control deprivation effects on ingroup defense are distinguishable with respect to their mediating processes.

Ingroup defense as a mechanism for terror management

According to terror management theory (TMT), people defend and support their cultural ingroups (e.g., through ingroup bias; Greenberg et al., 1990) in order to symbolically transcend death by identifying with entities that will continue to exist long after the individual's personal death (Greenberg et al., 2008). TMT posits that the awareness of life's relentless evanescence entails a potential for paralyzing terror, which is held at bay by maintaining the ingroup's cultural worldview – because it provides people with a sense of order, meaning, and permanence – and behaving in accordance with the standards prescribed by this worldview, thereby obtaining self-esteem. Thus, TMT suggests that the *ultimate* function of ingroup defense is to soothe existential anxiety. However, TMT also proposes that people possess a basic motive for control (or *effectance*) (Pyszczynski, Greenberg, & Solomon, 1998; Pyszczynski et al., in press). It is argued that compensatory responses to MS – most prominently, the extensively investigated group-related type of cultural worldview defense, namely the defense of cultural ingroups (henceforth: *ingroup defense*) – can serve the *ultimate* function of protecting from existential terror by means of fulfilling the more *proximate* function of restoring a sense of control. Since reminding people of their uncontrollable demise is assumed to undermine the existential security that is afforded by a stable sense of personal control, thereby increasing the need to affirm this psychological resource, ingroup defense may be not only conceived as an *ultimate* strategy for terror management but also as a *proximate* mechanism for control restoration (Pyszczynski et al., 1998, in press). In other words, MS-induced efforts in control restoration may help the individual “to feel that he controls his life and his death” (Becker, 1973, p. 55). Notably, this perspective is consistent with control-related theorizing on the psychological function of ingroup defense (Fritsche, Jonas, & Kessler, 2011).

Ingroup defense as a mechanism for control restoration

Control theorists have long posited that the desire to perceive control (i.e., influence) over one's social environments and outcomes constitutes a primary and fundamental motivating force in human life (deCharms, 1983; Kelley, 1971; White, 1959). More recently, the compensatory control model proposed that this desire has its roots in a more basic and inclusive motivation to defend against perceptions of randomness and chaos in the environment (Kay, Whitson, Gaucher, & Galinsky, 2009). Put differently, this model traces people's control strivings to the need to perceive order or structure, thus preventing unsettling perceptions of randomness. Importantly, this reasoning implies that *personal* control (i.e., perceiving the self as in control) and *external* control (i.e., perceiving external systems, such as the cultural ingroup, as in control), are interchangeable means of preserving a desired level of perceived order (vs. randomness) in the environment (Shepherd, Kay, Landau, & Keefer, 2011). This perspective thus views the need for control, or *control motivation*, as functionally equivalent to the need for order or structure, because the critical issue is that the world *per se* is under control (i.e., orderly/nonrandom). In terms of order, it does not

matter under whose control the world is, be it the self or external systems. The term *perceived control* can thus be likened to the term *perceived order* as well.

According to this line of reasoning, experiences or reminders of low control (i.e., control deprivation) should lead to efforts in regaining a sense of control by maintaining psychological structures that are capable of lending order to one's environment (i.e., control restoration; Kay, Gaucher, McGregor, & Nash, 2010). Accordingly, threats to personal control have been reported to elicit motivated perceptions of order (i.e., illusory pattern perception) – operationalized as superstitious and conspiratorial thinking (Whitson & Galinsky, 2008). This perceptual compensatory control mechanism may represent the most elementary manifestation of control motivation (Kay et al., 2009).

On a higher-order level, people may regulate levels of perceived control by using social groups as sources of external control. It has been argued that a major psychological benefit of social ingroups is that they can provide the individual with a notion of *vicarious control* – the perception that the world is under control by powerful others (Rothbaum, Weisz, & Snyder, 1982). Accordingly, Fritsche et al. (2008) reasoned that ingroup defense following control deprivation can be understood as an attempt to regain control on the group-level (i.e., group-based control restoration). In line with this reasoning, low trait and state control has been found to increase various instances of ingroup defense, including ethnocentrism, prejudice toward outgroups, and ingroup bias (Agroskin & Jonas, 2010; Fritsche et al., 2008, Fritsche et al., 2013). This functional interpretation of ingroup defense as a compensatory control mechanism is consistent with TMT, which also suggests that people can maintain perceptions of control by clinging to their ingroups (Pyszczynski et al., in press). Thus, given that ingroup defense may fulfill the function of control restoration, control motivation (i.e., the need to restore control) could play a critical mediational role in MS effects on ingroup defense.

Control motivation and MS effects on ingroup defense

Theorizing on control (Fritsche et al., 2008) as well as TMT (Pyszczynski et al., in press) have recently converged in proposing that death represents the most intense instance of control deprivation. The inevitability of death may fundamentally frustrate the control motive, since neither the time nor the way of one's death is controllable or predictable (apart from suicide). Against this backdrop, it seems likely that the problem of death is accompanied by a deep-seated problem of control, which becomes virulent in the course of MS inductions, causing ingroup defense. Methodologically speaking, this approach suggests a mediational model, in which control deprivation is involved by MS inductions, subsequently leading to an increase in control motivation (i.e., the need to perceive order and prevent perceptions of randomness). This control motivation, in turn, should trigger efforts in control restoration, such as the defense of cultural ingroups that can lend order to one's environment.

Initial evidence for this control-related motivational process model of MS-based ingroup defense stems from several studies of Fritsche et al. (2008) who showed that ingroup defense occurs only following reminders of uncontrollable death (traditional MS) but not reminders of controllable death (i.e., suicide). Thus, the traditional MS induction (Rosenblatt, Greenberg, Solomon, Pyszczynski, & Lyon, 1989) may involve a loss of control, which should increase control motivation; the rise of control motivation, in turn, may finally result in the affirmation of sources of external control, such as cultural ingroups. This interpretation would be able to explain why ingroup defense did not arise after a kind of MS that is at least partly devoid of control deprivation – suicide salience – contrary to the classic control deprivation-immanent MS type. So, if MS in fact entails control deprivation, then MS and control deprivation effects on control-conferring outcomes, such as ingroup defense, should be of a similar nature. In other words, MS and control

deprivation should be functionally equivalent with regard to outcomes that are suitable for control restoration.¹

Comparing MS and control deprivation effects on control-conveying outcomes

There are a few studies that directly compared MS and control deprivation effects on control-providing outcomes. In line with our reasoning, *Burris and Rempel (2004)* found increased ingroup defense after both MS and control deprivation relative to a control condition. Moreover, MS augmented the affirmation of constructs specifically designed to convey symbolic immortality relative to control deprivation, whereas control deprivation uniquely increased the appeal of order-offering worldview aspects compared with MS and uncertainty (*Shepherd et al., 2011*).² Thus, in addition to demonstrating that control deprivation effects on order/control-providing outcomes are equal to (*Burris & Rempel, 2004*) or even stronger than MS effects (*Shepherd et al., 2011*), this research suggests that the need to restore a sense of control is conceptually and empirically distinct from the need to attain symbolic immortality. Notably, these findings are consistent with the TMT view that although concerns about death and lacking control are functionally interrelated in that both can lead to control-restorative compensatory responses due to the anxiety-soothing function of perceived control, these concerns are not wholly reducible to one another (*Pyszczynski et al., in press*). This implies that the need to regain a sense of order (i.e., control motivation) is likely to make a unique contribution to the emergence of MS/control deprivation-based ingroup defense.

Mediators of MS and control deprivation effects

One of the most promising approaches to testing the idea that MS-induced ingroup defense may be fueled by MS-induced control motivation may consist in the exploration of possible mediators of MS and control deprivation effects. Our control-related motivational process model suggests that both MS and control deprivation effects on ingroup defense should be mediated by processes reflecting control motivation. Up to now, not much research has been dedicated to the question of which variables may mediate MS and control deprivation effects. TMT views the accessibility of death-related thoughts as potentially underlying MS effects: “In the face of mortality awareness DTA [death-thought accessibility] mediates, or at least partially mediates, worldview and self-esteem defensiveness” (*Hayes, Schimmel, Arndt, & Faucher, 2010, p. 716*). Proponents of this hypothesis refer to a similar time course of death-thought accessibility and worldview defense, since levels of death-thought accessibility were found to run parallel to worldview defense levels following MS, requiring a delay and distraction to mount. Furthermore, threats to worldview and self-esteem have been shown to increase death-thought accessibility; worldview defense and self-esteem boosts, conversely, decreased death-thought accessibility (for an overview of death-thought accessibility research see *Hayes et al.*

¹ We would like to stress at this point that our approach has nothing to say about MS outcomes that are unsuitable for control restoration. Thus, the enormous amount of TMT literature on outcomes argued to reflect a desire for literal or symbolic death-transcendence (e.g., desire for offspring, *Fritzsche et al., 2007*; symbolic immortality, *Shepherd et al., 2011*), or other outcomes unrelated to control, is not proposed to be explainable with our approach (see also *Routledge & Vess, 2012*).

² It is noteworthy that this empirical distinguishability of control deprivation and uncertainty effects is complemented by a conceptual distinguishability. Whereas lacking control involves lacking influence over outcomes and environments (e.g., *Kay, Gaucher, Napier, Callan, & Laurin, 2008*), uncertainty has been primarily conceptualized as identity-related confusion (who am I, what should I do?; *Van den Bos, 2009*). Likewise, control deprivation can be distinguished from meaning deprivation, since meaninglessness has been conceived as a very basic epistemic process — violation of expected relations (*Proulx & Heine, 2010*). Note that controlling outcomes requires knowing relations in one's environment but is not identical to this purely epistemic phenomenon.

al., 2010). However, the specific time course of delayed death-thought accessibility increase after MS was not replicated by recent research (*Trafimow & Hughes, 2012*), suggesting that mediational studies should clarify whether death-thought accessibility really underlies MS effects on ingroup defense.

Yet, to our knowledge, there are only two published articles reporting statistical mediation tests with regard to MS effects, yielding heterogeneous results. *Fransen, Fennis, Pruyn, and Das (2008; Study 1)* found death-thought accessibility to mediate the increase in spending intentions after an explicit exposure to an insurance brand due to heightened death-thought accessibility in the exposure condition and a positive relationship between death-thought accessibility and spending intentions. Note, however, that heightened spending intentions are not clearly indicative of ingroup defense and do not constitute a typical outcome in the TMT literature (at least not as typical as ingroup defense). In contrast, *Das, Bushman, Bezemer, Kerkhof, and Vermeulen (2009)* failed to demonstrate mediation by death-thought accessibility. Although death-thought accessibility was augmented following MS, it moderated rather than mediated the effect of MS on ingroup defense. Thus, it is still unclear which processes underlie the emergence of ingroup defense after MS.

With respect to control deprivation effects, similarly few studies exploring potential mediators exist to date. *Fritzsche et al. (2008, Study 6)* found that a personal control deprivation effect on ingroup support was mediated by group-related control motivation (i.e., the need to feel strong through the ingroup). Furthermore, *Kay et al. (2008)* and *Kay, Shepherd, Blatz, Chua, and Galinsky (2010)* identified mediators reflecting concerns about order and structure for control deprivation effects on the belief in an order-providing God. Moreover, the motivation to perceive order (i.e., illusory pattern perception) was revealed to mediate control deprivation effects on increased preference for order-offering theories (*Rutjens, van Harreveld, van der Pligt, Kreemers, & Noordewier, 2013, Study 4*). Yet, both latter findings are not specifically related to ingroup defense, implying that mediational evidence on control deprivation effects on ingroup defense is very scarce. Summing up, it seems unclear a) which motivational processes underlie MS and control deprivation effects, and, crucially, b) whether these are the same or different mediators. Addressing this research gap, the present work comparatively explores mediators of MS and control deprivation effects on ingroup defense to shed light on their motivational and cognitive underpinnings.

The current research

Specifically, we aimed at testing whether both MS and control deprivation effects on ingroup defense are mediated by control motivation. Drawing on the compensatory control model, which views the need to perceive order and prevent perceptions of randomness as the primary motivation behind control deprivation effects (*Kay et al., 2009*), we operationalized control motivation as illusory pattern perception (Study 1) and state need for structure (Study 3). We also tested whether both MS and control deprivation effects might be moderated by self-esteem, since prior TMT research has determined that high self-esteem can buffer MS effects because it may provide symbolic death-transcendence (*Harmon-Jones et al., 1997*). Moreover, TMT posits that levels of self-esteem may reflect levels of perceived personal control (*Pyszczynski et al., in press*), which might thus buffer control deprivation effects, too.

To test this mediational model, we compared the effects of MS and control deprivation relative to another aversive condition on illusory pattern perception and ingroup defense in Study 1. Study 2 was designed to test whether perceptions of randomness emerge following MS and control deprivation, and whether this effect is mediated by thoughts about lacking control (or death). Finally, Study 3 included a death anxiety-specific mediator (death-thought accessibility) in addition to control motivation (state need for structure) in order to compare

the roles of these potential mediators in the emergence of ingroup defense. To our knowledge, these studies are the first to systematically explore and comparatively test mediators in threat compensation research. We employed diverse samples in terms of nationality (Germans and Austrians) and profession (soldiers and students) to test our mediational hypotheses.

Study 1

In Study 1, we tested the hypothesis that MS effects on ingroup defense are rooted in control motivation that is activated in consequence of the control loss inherent in death. This view would suggest control motivation to mediate both MS and control deprivation effects on ingroup defense. A new induction method modeled after Fritsche, Jonas, Niesta Kayser, and Koranyi (2010) was created, in which participants were confronted with short poems addressing the existential predicaments that are posed by death and lacking control. The outcomes were illusory pattern perception (mediator) and ingroup defense (criterion).

Moreover, we assessed the MS effects buffering role of self-esteem (Harmon-Jones et al., 1997), which could also apply to control deprivation effects, because self-esteem may represent a reflective gauge of personal control (Fritsche et al., 2008; Pyszczynski et al., in press), given the conceptual similarity and high positive associations between these constructs (Judge, Erez, Bono, & Thoresen, 2002). More specifically, the hydraulic hypothesis of the compensatory control model suggests that people want to maintain a preferred level of perceived order and structure in their environment, not that they want as much order as possible (Kay et al., 2010b). Therefore, high self-esteem (personal control) should function as a dispositional buffer against the need to restore perceptions of order following control deprivation. Moreover, self-esteem may moderate the relationship between illusory pattern perception and ingroup defense because illusory pattern perception may provide perceptual control (Galinsky, Whitson, Huang, & Rucker, 2012). Thus, persons with high self-esteem or personal control should not strive for additional external control (via ingroup defense), after they had been given the opportunity to affirm perceptual control (via illusory pattern perception). Persons with low self-esteem (i.e., low personal control), by contrast, may want to restore as much external control as possible after MS/control deprivation, thus affirming perceptual³ as well as group-based control. To sum up, we expected both MS and control deprivation to increase ingroup defense via the motivation to perceive order (illusory pattern perception), but only for persons with low self-esteem (see Fig. 1).

Method

Participants and design

116 students/soldiers from the University of the Federal Armed Forces Munich, Germany were recruited via a university mailing list. They took part in an online study about topics associated with psychology of literature and personality psychology. Their mean age was 23.6 years ($SD = 2.4$; range: 20–29), 24.3% of the participants were female. Participants were randomly assigned to conditions in a moderated mediational between-participants design (see Fig. 1).

Procedure and materials

Manipulation. The online questionnaire opened with instructions followed by some sociodemographic questions. Then, participants

received the manipulation which was newly created using the interpretation of poems as a method of induction. We used three short German poems that were very similar in terms of length and form to induce feelings and thoughts associated with death/lack of control/winter. Winter was used as an aversive control topic akin to the dental pain condition frequently used in TMT research (e.g., Jonas, Greenberg, & Frey, 2003). Participants were asked to read the poem carefully and relate to it emotionally, as MS effects mainly appear when information is processed by the emotion-related experiential system (Simon et al., 1997). After that, participants were asked what the poet might have intended to express; they were also asked to give their own interpretation of the poem. Then, they were asked to provide their associations with the poem, especially images, sounds, smells, and moods. Finally, three bogus interpretations of the poem by other students paraphrasing its content were presented and the participants were asked to indicate to what extent they concurred with these interpretations on a 10-point scale (from 1 = not at all to 10 = totally).⁴ Using these tasks a deep and thorough processing of the poem in a rather emotional way was ensured. The poems' lengths ranged from 14 to 24 words. The poems are presented in Appendix A in an English translation (please note that the unique linguistic quality of the original German-language poems could not be conserved in the literal English translation).⁵

As a filler questionnaire, we next included the 20-item Positive and Negative Affect Schedule (Krohne, Egloff, Kohlmann, & Tausch, 1996; Watson, Clark, & Tellegen, 1988).⁶

Illusory pattern perception (mediator). Next, the illusory pattern perception measure was presented. It was embedded in a randomized block containing two further trait questionnaires, which should ensure a sufficiently long delay between manipulation and dependent variable (ingroup defense), as a meta-analysis suggested that the specificity of MS effects may be based on the length of delay between threat induction and subsequent defense (Martens, Burke, Schimmel, & Faucher, 2011). Drawing on the work of Whitson and Galinsky (2008), we created ten scenarios, each of which comprised at least two potentially interrelated events. Seeing connections between these events would be evidence for conspiratorial or superstitious thinking, hence illusory pattern perception. There were four conspiracy- and six superstition-related scenarios; one conspiracy- and one superstition-related scenario are given in Appendix B in an English translation. Participants had to answer three questions about the interrelatedness of the events for each scenario. These questions were: "How unequivocal is the relationship between the outcome of the story and the preceding events?", "How unequivocally does the outcome develop from the storyline?", "In terms of the resulting

⁴ A score of the participants' agreement with the interpretations was obtained by forming a composite scale of the ratings of the interpretations. The agreement with the interpretations did not vary as a function of the manipulation, $F(2,113) = 2.79$, $p = .07$. Moreover, treating this variable as a covariate in separate analyses did not change the results reported below in a substantial way. Therefore, we will not mention this variable further.

⁵ A pilot study demonstrated the validity of this manipulation using a procedure that will be portrayed in full detail within the framework of Study 2 where the same method was utilized in the context of another but similar manipulation. Most importantly, thoughts of low control were more pronounced in the MS and control deprivation conditions than in the winter condition and mediated MS and control deprivation effects on perceptions of randomness, whereby death cognition, despite being most pronounced in the MS condition, was not related to randomness perceptions (Agroskin & Jonas, 2011).

⁶ Whereas positive affectivity (ten items; $\alpha = .82$) was not affected by the manipulation, $F(2,108) = 1.22$, $p = .30$, negative affectivity (ten items; $\alpha = .87$) was, $F(2,108) = 7.63$, $p = .001$. Negative affectivity was higher in the control deprivation condition ($M = 1.71$, $SD = 0.81$) than in the winter salience condition ($M = 1.24$, $SD = 0.29$), $p = .01$. Negative affectivity in the MS condition ($M = 1.43$, $SD = 0.44$) did not differ from both other conditions ($ps > .10$), thus replicating prior TMT research. Treating this variable as a covariate in separate analyses did not change the results reported below in a substantial way. Therefore, we will not mention this variable further.

³ However, note that illusory pattern perception may not provide a strong sense of control, as control-deprived people were found to strive for additional control by preferring order-offering theories, after having got the opportunity to engage in illusory pattern perception (Rutjens et al., 2013, Study 4). It may thus be that illusory pattern perception primarily reflects control motivation (not restoration), but also provides a slight sense of order (Galinsky et al., 2012), which, however, does not suffice as control restoration after a profound loss of control.

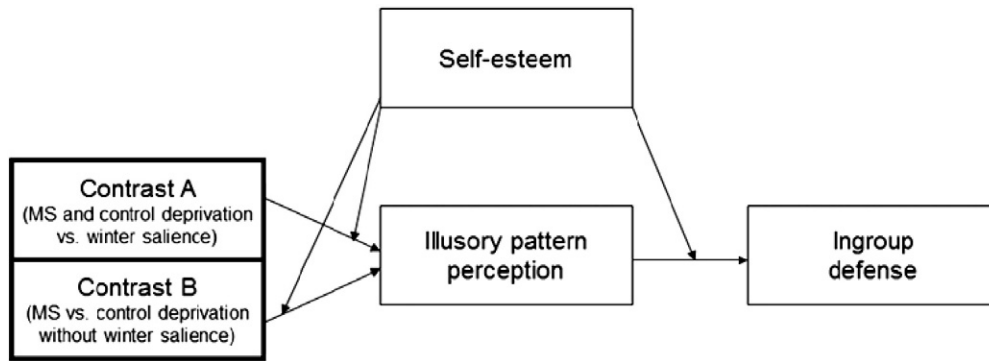


Fig. 1. Moderated mediation-related design of Study 1. Boxes in bold type represent pairs of contrasts (one critical and one orthogonal contrast) pertaining to the threat induction. Note: MS = mortality salience.

outcome, how much room for interpretation does the story allow?⁷ Answering the first two questions with high values (on a 6-point scale where 1 = not at all and 6 = highly) and the last one with a low value (1 = little, 6 = much) would indicate illusory pattern perception, since it would imply the “identification of a coherent and meaningful interrelationship among a set of random or unrelated stimuli” (Whitson & Galinsky, 2008, p. 115). Negative, positive, and neutral outcomes from the perspective of the protagonist were alternated. Overall, the illusory pattern perception measure consisted of 30 items ($\alpha = .91$).

Ingroup defense. The ingroup defense measure followed the mediator block. It was conceptualized as derogation of leftist demonstrators attacking the German Federal Armed Forces to which all participants belonged. Two leaflets from these leftist groups were presented, each of which sharply criticized the Federal Armed Forces with statements like “Dismiss the Federal Armed Forces! Reader against militarization” and “Detection of the enemy” in connection with the image of a soldier. In addition, two pictures of leftist demonstrators were shown. Participants were asked to indicate to what extent they thought that the originators of these leaflets/posters should be publicly pilloried (item 1), expelled from Germany (item 2), and deserve the worst (item 3) on a 10-point scale (from 1 = not at all to 10 = totally). Overall, this measure contained twelve items ($\alpha = .95$).

Moreover, each leaflet and picture was accompanied by 15 adjectives – eight positive ones (e.g., “intelligent”) and seven negative ones (e.g., “evil”). Participants had to indicate to what extent the adjectives described the demonstrators on the same 10-point scale. The positive adjectives were recoded and a composite of all adjectives was formed (60 items; $\alpha = .95$). As both outgroup derogation measures were significantly correlated, $r = .51$, $p < .001$, they were aggregated to form a broad measure of ingroup defense.

Self-esteem. Finally, a single-item measure of global self-esteem (“I have high self-esteem”) was presented (Robins, Hendin, & Trzesniewski, 2001). A 10-point scale (from 1 = not at all to 10 = totally) was used. We decided to present this measure after the manipulation to make it impossible for the participants to boost their self-esteem by choosing high values, since this could have buffered MS effects on ingroup defense (Harmon-Jones et al., 1997). Instead, self-esteem was measured at the end of the questionnaire (i.e., after the dependent variable). Crucially, self-esteem was not affected by the manipulation ($F = 0.02$, $p = .98$), suggesting that this measure reflects participants’ self-esteem in the sense of an enduring trait rather than a manipulation-biased state. All

items within the respective instruments were presented in randomized order. After data collection, respondents were thanked and debriefed.

Results and discussion

The intercorrelations and descriptive data of the study variables are depicted in Table 1. To test our key hypothesis that both MS and control deprivation lead to illusory pattern perception for participants with low self-esteem, and that illusory pattern perception mediates MS and control deprivation effects on ingroup defense, we performed moderated mediation analyses (Preacher, Rucker, & Hayes, 2007; Model 5) using Mplus 6.12 (Muthén & Muthén, 2010). Thus, we expected critical Contrast A (+.333 = MS, +.333 = control deprivation, −.667 = winter salience), in which MS and control deprivation were compared to winter salience, to exert a positive effect on ingroup defense via illusory pattern perception, but only for persons with low self-esteem. On the contrary, orthogonal Contrast B (+.5 = MS, −.5 = control deprivation, 0 = winter), in which MS and control deprivation were directly compared, should not attain significance, neither as main effect nor as interaction with self-esteem (cf. Cohen, Cohen, West, & Aiken, 2003; Rosenthal & Rosnow, 2008).

First, we conducted hierarchical moderated regression analyses to investigate the interaction between the manipulation and self-esteem on the mediator illusory pattern perception, including Contrast A, self-esteem, and Contrast B in Step 1. In Step 2, the interaction terms of both contrasts with self-esteem were entered. In Step 1, no significant effects occurred ($ps > .14$). Step 2 revealed a significant increase of the explained variance in illusory pattern perception due to the inclusion of the interaction terms, $\Delta R^2 = .06$, $F(2,110) = 3.52$, $p < .05$. Subsequent analyses disclosed a significant interaction of Contrast A and self-esteem on illusory pattern perception, $b = -.18$, $SE = .08$, $\beta = -.24$, $t(110) = -2.39$, $p < .05$, such that persons with low self-esteem ($SD = -1$) exhibited higher illusory pattern

Table 1
Means, standard deviations, and intercorrelations for variables in Study 1.

Variable	1	2	3	4	5
1. Self-esteem	–				
2. Illusory pattern perception	.07	–			
3. Ingroup defense	−.10	.17	–		
4. Dummy 1: MS vs. winter	.02	.06	.03	–	
5. Dummy 2: Control deprivation vs. winter	.01	.20*	.11	−.36**	–
<i>M</i>	7.58	2.81	4.99	0.25	0.43
<i>SD</i>	2.10	0.80	1.60	0.28	0.45

Note. $N = 83$ –116 for all correlations. Dummy 1: MS = 1, control deprivation = 0, winter salience = 0. Dummy 2: MS = 0, control deprivation = 1, winter salience = 0. All relationships between the dummy variables and the other variables are represented by standardized regression coefficients, whereby Dummy 1 and Dummy 2 were simultaneously entered as predictors. * $p = .057$, ** $p < .001$.

⁷ A few filler items, such as “Have you or someone you know ever experienced something like this?”, were included to distract the participants from the focal questions. Studies 2 and 3 also included some distractive items to counteract the centrality of the focal measures.

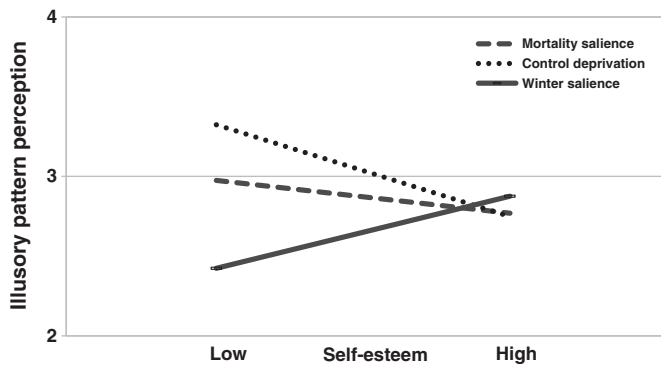


Fig. 2. The effects of mortality salience, control deprivation, and winter salience on illusory pattern perception in Study 1. Plotted values reflect predicted illusory pattern perception values at one standard deviation below and above the self-esteem mean. Scale ranges from 1–6.

perception after having been exposed to MS/control deprivation than persons confronted with winter, $b = .62$, $SE = .22$, $\beta = .39$, $t(110) = -0.71$, $p = .48$. Moreover, similar to the non-significant main effect of Contrast B, the interaction between Contrast B and self-esteem was not significant either, $b = .08$, $SE = .12$, $\beta = .08$, $t(110) = 0.67$, $p = .50$ (see Fig. 2). Thus, our predictions concerning the mediator model were corroborated.

Then, we analyzed the dependent variable model, testing our hypothesis that illusory pattern perception is positively associated with ingroup defense but again only for persons with low self-esteem. As with the mediator model, we included the same terms as predictors, this time additionally entering illusory pattern perception and its interaction with self-esteem. Moderation analyses determined a significant interaction between illusory pattern perception and self-esteem, $b = -.28$, $SE = .11$, $\beta = -.29$, $t(108) = -2.57$, $p = .01$, such that a positive effect of illusory pattern perception on ingroup defense occurred for individuals with low self-esteem ($SD = -1$), $b = 0.99$, $SE = .32$, $\beta = .50$, $t(108) = 3.08$, $p < .01$, but not high self-esteem ($SD = 1$), $b = -.18$, $SE = .29$, $\beta = -.09$, $t(108) = -0.62$, $p = .54$ (see Fig. 3). No other reliable effects occurred in both steps ($ps > .05$).⁸ Our predictions were therefore supported.

Next, we performed moderated mediation analyses to investigate the mediating role of illusory pattern perception. As per bootstrapping procedure (5000 bootstrap samples), it was found that illusory pattern perception significantly mediated the effect of Contrast A on ingroup defense when self-esteem was low (indirect effect (b) = .61, 95% bias-corrected confidence interval [BC CI] of .16 to 1.33) but not when self-esteem was high (indirect effect = .03, 95% BC CI of $-.10$ to .38).⁹ We also checked reverse mediation, entering ingroup defense as mediator and illusory pattern perception as criterion, without finding any significant indirect effects. Thus our key hypothesis was corroborated: MS/control deprivation increased

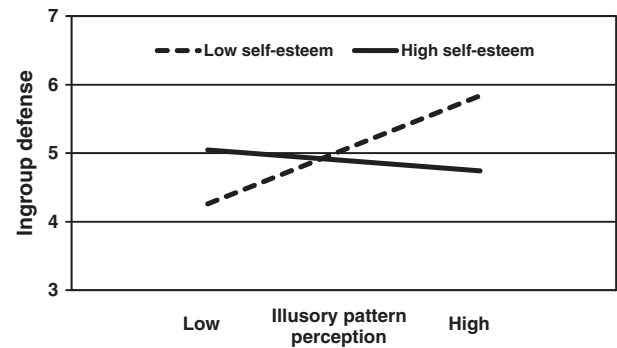


Fig. 3. The effects of illusory pattern perception and self-esteem on ingroup defense. Plotted values reflect predicted ingroup defense values at one standard deviation below and above the illusory pattern perception mean. Scale ranges from 1–10.

ingroup defense via illusory pattern perception for persons with low self-esteem. Contrast B exerted no significant indirect effects on ingroup defense (regardless of the self-esteem level), indicating that MS and control deprivation exerted statistically indistinguishable effects on ingroup defense through illusory pattern perception.

Study 1 provides evidence for the notion that death-reminded as well as control-deprived people engage in a motivated search for (external) order when lacking self-esteem (i.e., personal control). This most elementary instance of control motivation (Kay et al., 2009) brought them to subsequently defend their ingroup, since this may allow for a control restoration on the group-level (Fritzsche et al., 2008). Therefore, the assumption that MS effects on ingroup defense are rooted in control motivation, which is activated by death reminders that entail a loss of control, is consistent with our results. These findings may be especially important because they not only demonstrate that MS and control deprivation operate similarly after quite a long delay but also show that illusory pattern perception mediates their effects on ingroup defense, thus pointing to a common underlying mechanism – the motivated search for order (i.e., control motivation). Hence, Study 1 provided the first mediational evidence for the idea that terror management may be sometimes functionally equivalent to control restoration (Pyszczynski et al., in press).

However, one could argue that our threat manipulation was not pure enough to ensure that the change in the dependent variables was only due to different intensities of control deprivation and the resultant control motivation. Although the poems used were matched in length, style, and content as far as possible, some differences in content remained. Each poem addressed the problems people face due to the threats of death, lack of control, and winter but these problems were not identical. Yet, this issue has been addressed in a pilot study (see footnote 5) and is fully resolved in Studies 2 and 3 where other inductions were employed.

Study 2

In Study 2, an important missing link of Study 1 was addressed: Although the MS/control deprivation-induced control motivation (search for order through illusory pattern perception) and group-based control restoration (ingroup defense) indirectly suggested that a loss of control must have occurred, which probably necessitated control restoration in the first place, this reduction of perceived control has not been explicitly demonstrated. Therefore, Study 2 tested whether perceptions of randomness are similarly augmented by MS and control deprivation. We operationalized reduced perceived control as increased perceptions of randomness in line with the compensatory control model, which states that the primary motivation behind control deprivation effects is the need to perceive order and prevent perceptions of

⁸ The interaction between Contrast A and self-esteem on ingroup defense attained significance in the dependent variable model (i.e., direct effect of the interaction), $b = .47$, $SE = .21$, $\beta = .31$, $t(108) = 2.22$, $p < .05$. However, this effect disappeared when using bias-corrected bootstrap estimates (b) (5000 draws; 95% confidence interval of $-.01$ to .96), contrary to all other effects, which remained significant when using bootstrap estimates. As the simple slopes were also non-significant ($ps > .06$), we do not discuss this effect further.

⁹ These analyses were recomputed using dummy variables instead of the contrasts. The indirect effect of control deprivation on ingroup defense was significant for persons with low self-esteem (indirect effect = .81, 95% BC CI of .15 to 1.71), but not high self-esteem (indirect effect = .02, 95% BC CI of $-.15$ to .42). The indirect effect of MS was marginally significant for persons with low self-esteem (indirect effect = .42, 90% BC CI of .03 to .99), but not high self-esteem (indirect effect = .03, 90% BC CI of $-.07$ to .37).

randomness (Kay et al., 2009). Since illusory pattern perception is conceived as a motivated search for order (i.e., control) (Kay et al., 2009), we considered it important to test whether MS and control deprivation are similarly capable of evoking concerns about order by engendering perceptions of randomness.

In addition, Study 2 was designed to confront a possible meaning-related criticism of Study 1. Proulx and Heine (2010) argued that MS and control deprivation could be viewed as instances of meaning deprivation, and illusory pattern perception constitutes efforts in meaning maintenance. We therefore compared the effects of MS and control deprivation with another aversive condition that was supposed to deprive participants of meaning. Specifically, we induced boredom salience because boredom has been shown to create a sense of meaninglessness (Van Tilburg & Igou, 2012), as well as ingroup defense via augmenting the need for meaning (Van Tilburg & Igou, 2011).

Participants had to read a poem about death, lack of control, or boredom. Then, they had to indicate to what extent they perceived the poems as meaningful. In addition, items pertaining to the impressiveness of the poems were given to ensure that all poems were perceived as equally impressive, since variation in this variable may have confounded our findings as well. Next, participants were asked to indicate how far they were inclined to think about certain topics due to the poems. We expected that death thoughts would prevail among the individuals in the death condition relative to both other conditions. Furthermore, low control cognition was predicted to be particularly high in the control deprivation as well as MS condition, as our approach states that death deprives people of control in a global and fundamental sense. Finally, thoughts of boredom were hypothesized to predominate in the boredom condition relative to the other conditions. In addition to the death, lack of control, and boredom topics, several further subjects were presented to control for variation regarding the propensities for dwelling on certain other topics that might have been made salient to differing extents by the poems. Lastly, a measure of randomness perceptions (Krampen, 1991) was applied to test the notion that people perceive their lives as more randomly determined (i.e., less controllable) after MS and control deprivation than boredom salience. This decrease in perceived control should be mediated by thoughts about lacking control.

Method

Participants and design

Eight participants who failed to respond to the randomness perceptions measure, and six outliers of more than 3 SDs above the average processing duration of the online questionnaire were excluded due to suspicion that they were taking breaks or doing other activities during completion of the questionnaire, leaving a final sample of 73 participants, who studied at the University of Salzburg, Austria. Their mean age was 25.3 years ($SD = 7.0$; range: 19–56), 89.0% female. They were invited via a university mailing list to take part in an online study about personality psychology and psychology of literature, and were randomly assigned to conditions in a one-factor (MS vs. control deprivation vs. boredom salience) between-participants design with threat thoughts as mediators and perceptions of randomness as dependent variable.

Procedure and materials

Manipulation. The online questionnaire opened with instructions followed by some sociodemographic questions. Then, participants received the manipulation, which consisted of three conditions. The control deprivation condition was equal to the one used in Study 1. The other two conditions – MS and boredom salience – were newly developed and exactly tailored to the control deprivation condition regarding the poems' content except that the words "global lack of control" (*Ohnmacht* in German) were replaced by the words "death" in the death condition and "boredom" in the boredom condition. So, by

creating new poems that were completely equal to the control deprivation poem in terms of content (except for one crucial word realizing the manipulation) we aimed at ruling out alternative explanations that could have been possible due to different issues mentioned in the poems of Study 1. Following the reading of the poem, participants were asked to what extent they felt the poems were impressive and moving (three items; $\alpha = .68$).¹⁰ Furthermore, participants had to indicate how far they perceived the poems as meaningless (six items; $\alpha = .85$).¹¹

Threat-related thoughts (mediators). Then, participants were asked to indicate to what extent they were inclined to think about certain topics because of the poems. These topics were selected in pre-tests in the following way. Three independent raters unaware of our hypotheses categorized 83 participants' interpretations of the poems, which had been generated in a separate study using a different participant sample. The interpretations were categorized into topics that were mentioned in the interpretations (e.g., death, lack of control). The categories formed by the absolute majority of raters (two out of three) served as the basis for the threat-related thoughts measure. These were *death*, *global lack of control*, and *boredom*. Thus, only the main themes of the poems were mentioned, suggesting that our content-matching strategy was successful. Additionally, five filler items were included in the list of threat-related thoughts: *bus*, *desk*, *book*, *pear*, and *bag*. Moreover, the topics *helplessness*, *winter*, *warmth*, *love*, *light*, and *spring* were included in this list, since they were selected in the pilot study pertaining to Study 1 (see footnote 5), and both studies were run in the same session. Thoughts of lacking control and helplessness were aggregated for the analyses reported below, since they were highly correlated, $r = .52$, $p < .001$. All items mentioned after the manipulation also acted as a delay, which is necessary for MS and control deprivation effects to appear (Fritsche et al., 2008).

Perceptions of randomness. Finally, we gauged perceptions of randomness using the subscale "chance control orientation" of the questionnaire *Fragebogen zu Kontroll- und Kompetenüberzeugungen* [questionnaire on locus of control and competence] (Krampen, 1991). This measure reflects the greatest possible lack of control in that many life events are thought to be contingent on chance, thus being beyond personal and external control, since randomness implies fundamental disorder and uncontrollability. The scale contained eight items (e.g., "A lot of what happens in my life depends on chance", "Fortuitous events determine a large part of my life", "It is a matter of pure chance if other people conform to my wishes"; $\alpha = .72$). After concluding data collection, respondents were thanked and debriefed. All items were presented in randomized order and answered on a 10-point scale.

Results and discussion

The intercorrelations and descriptive data of the study variables are depicted in Table 2. Both threat-related poems (MS and control deprivation) significantly increased thoughts about both death and lacking control relative to the boredom poem. However, whereas thoughts of death were higher in the MS condition than in the control deprivation condition (as indicated by the positive effect of Contrast B; see Fig. 4), thoughts of low control were equal following MS and

¹⁰ All poems were perceived as equally moving and impressive, $F(2, 70) = 0.78$, $p = .46$, as indicated by an omnibus ANOVA.

¹¹ As expected, the boredom-related poem ($M = 4.51$, $SD = 2.27$) was perceived as significantly more meaningless than the other poems ($M = 3.42$, $SD = 1.34$), which exhibited equal meaninglessness levels (Contrast A: $F(1, 71) = 6.46$, $p = .01$, $\eta_p^2 = .08$; Contrast B: $F(2, 70) = 0.33$, $p = .57$, $\eta_p^2 = .005$). However, entering this variable as a covariate in separate analyses did not change the results reported below in a substantial way. Therefore, we will not mention this variable further.

Table 2
Means, standard deviations, and intercorrelations for variables in study 2.

Variable	1	2	3	4	5	6
1. Thoughts of death	–					
2. Thoughts of low control	.34**	–				
3. Thoughts of boredom	–.56***	–.22†	–			
4. Perceptions of randomness	.19	.32**	–.10	–		
5. Dummy 1: MS vs. boredom	.83***	.24*	–.86***	.22†	–	
6. Dummy 2: Control deprivation vs. boredom	.25**	.43***	–.74***	.19	–.40***	–
<i>M</i>	5.47	7.59	5.22	4.62	0.29	0.29
<i>SD</i>	3.67	2.43	3.88	1.26	0.46	0.46

Note. $N = 73$ for all correlations. Dummy 1: MS = 1, control deprivation = 0, winter salience = 0. Dummy 2: MS = 0, control deprivation = 1, boredom salience = 0. All relationships between the dummy variables and the other variables are represented by standardized regression coefficients, whereby Dummy 1 and Dummy 2 were simultaneously entered as predictors. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

control deprivation (as indicated by the non-significant effect of Contrast B; see Fig. 4). Accordingly, thoughts of death were positively linked to thoughts of low control. Yet, solely contemplating low control was predictive of randomness perceptions. Thus, the poems affected participants' cognitions in line with our expectations.

We performed multiple mediation analyses to test our key prediction that thoughts of low control uniquely mediate MS/control deprivation effects on perceptions of randomness using Mplus 6.12 (Muthén & Muthén, 2010). We included critical Contrast A (+.333, +.333, –.667) and orthogonal Contrast B (+.5, –.5, 0) as predictors, thoughts of low control, death, and boredom as mediators and randomness perceptions as dependent variable. Multiple mediation analyses were performed following suggestions of Preacher and Hayes (2008). The results are depicted in Fig. 4. Significance tests of the indirect effects can be found in Table 3. Whereas the total effect of Contrast A (MS and control deprivation vs. boredom) on randomness perceptions was significant, the direct effect was not. Contrast B (MS vs. control deprivation) exerted no significant effects (neither total nor direct and indirect) on the dependent variable. As predicted, MS/control deprivation increased perceptions of randomness uniquely through thoughts of low control, suggesting that people tend to perceive their lives as more randomly determined (i.e., less controllable) specifically due to low control cognition after MS and control deprivation.¹²

Thus, an important missing link of Study 1 was filled by finding evidence for a global loss of control in response to the threat induction. This decrease in perceived control manifested as perceptions of randomness that are likely to underlie the compensatory control processes, which occurred in Study 1 in the form of illusory pattern perception and ingroup defense.¹³ The unique mediating role of thoughts about lacking control is particularly noteworthy because it suggests that the motivational process connecting MS and control deprivation to compensatory order-offering responses, such as ingroup defense, may be represented by control motivation. Critically, MS and control deprivation effects were statistically indistinguishable concerning thoughts of low control and randomness perceptions but different with regard to dwelling on death. This suggests that although MS produces more death-related thinking than control deprivation, MS-provoked contemplations of low control may play a particularly important role in terror management by instigating randomness perceptions, illusory pattern perception, and ingroup defense. However, TMT posits that not explicit but rather implicit death cognition (i.e., death-thought accessibility) as measured by word-stem completing tasks underlies MS effects (Hayes

et al., 2010). As our threat thoughts measure was explicit, we included a death-thought accessibility measure in Study 3.

Study 3

Study 3 was designed to test whether the mediational role of control motivation in MS effects on ingroup defense may be reducible to underlying workings of implicit death cognition. TMT views the accessibility of death-related thoughts as a critical cognitive determinant of compensatory responses to MS, positing that “in the face of mortality awareness DTA [death-thought accessibility] mediates, or at least partially mediates, worldview and self-esteem defensiveness” (Hayes et al., 2010, p. 716). Accordingly, we considered it important to examine if heightened levels of control motivation are a mere epiphenomenon or byproduct of increased death-thought accessibility, which might act as the more fundamental determinant of MS-induced ingroup defense. By including death-thought accessibility in addition to control motivation as a potential mediator, we aimed at disentangling death-specific from control-related processes in the emergence of threat-based ingroup defense. As a measure of control motivation, we used state need for structure (or order), which may be a promising candidate of mediating control deprivation effects on ingroup defense, since it has been shown to rise after control deprivation similar to illusory pattern perception (Whitson & Galinsky, 2008). Notably, need for structure has also been assumed to rise after MS (Dechesne & Kruglanski, 2004; Richter & Kruglanski, 2004). It was moreover demonstrated that persons with high trait need for structure react with particular aversion to anything ambiguous and confusing, such as behaviorally inconsistent targets and modern art (Landau, Greenberg, Solomon, Martens, & Pyszczynski, 2006; Landau et al., 2004). Thus, the hypothesized mediating role of state need for structure may parallelize the moderating role of trait need for structure. Summing up, two distinct routes from MS and control deprivation to ingroup defense are tested: One route links both MS and control deprivation to ingroup defense via control motivation (state need for structure), whereas the other route is represented by implicit death cognition, which should be solely subject to MS (not control deprivation). Put differently, we expected a MS-based increase in death-thought accessibility in addition to a MS/control deprivation-induced increase in control motivation. According to TMT, death-thought accessibility should mediate MS effects on ingroup defense either in addition to (i.e., partial mediation) or, as the more fundamental process, instead of control motivation (i.e., total mediation) (Hayes et al., 2010).

Moreover, in replication of Study 1, MS and control deprivation effects on control motivation should be moderated by self-esteem, contrary to the MS effect on death-thought accessibility, since MS usually exerts main effects on implicit death cognition (Hayes et al., 2010). Furthermore, we made use of another operationalization of ingroup defense, including four different measures of ingroup bias, to expand our approach. Specifically, we used two general measures of ingroup favoritism – ethnocentrism and anti-immigration attitudes – and two measures of outgroup derogation that were more concrete, as they featured concrete outgroups, namely Muslims. Finally, in order to enhance the comparability of our findings with past TMT and compensatory control research, we used the classic manipulations of MS (Rosenblatt et al., 1989) and control deprivation (Whitson & Galinsky, 2008).

Method

Participants and design

The sample mainly consisted of Austrian and German college students, recruited via university mailing lists.¹⁴ To preserve high

¹² These analyses were recomputed using dummy variables instead of the contrasts. Both control deprivation and MS uniquely increased perceptions of randomness through thoughts of low control relative to boredom salience (MS: indirect effect = .17, 95% BC CI of .004 to .47; control deprivation: indirect effect = .30, 95% BC CI of .01 to .68). No other indirect effects attained significance.

¹³ In a further study, we found evidence for the hypothesized link between perceptions of randomness and illusory pattern perception (Agroskin & Jonas, 2013).

¹⁴ Participants' nationality did not affect the results reported below, and thus is not mentioned further. The sample included three Muslims who were dropped from all analyses that included Muslims-related measures.

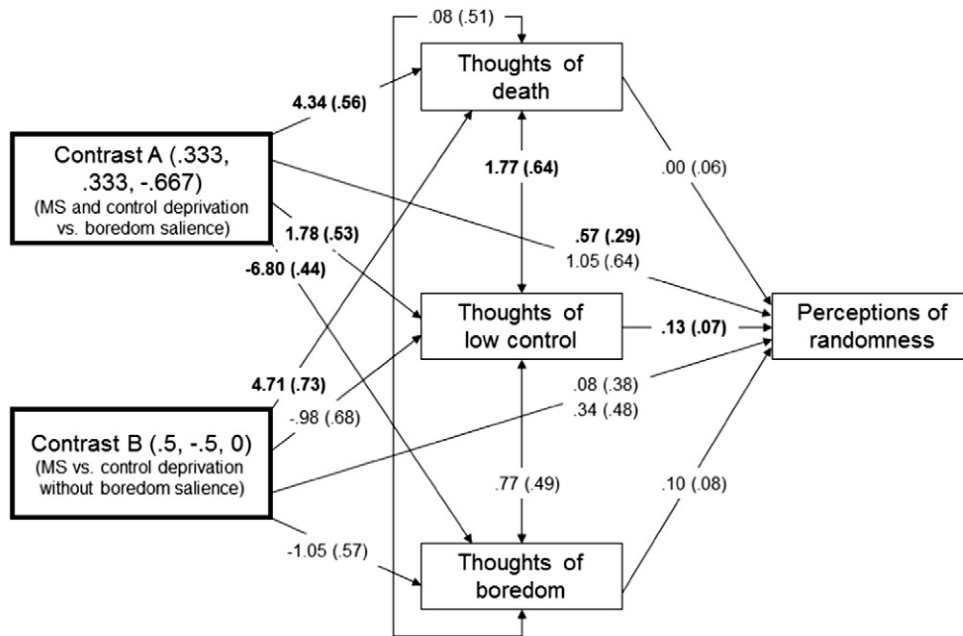


Fig. 4. The effects of the threat induction (coded as Contrast A and Contrast B) on perceptions of randomness through threat-related thoughts. Boxes in bold type represent pairs of contrasts (one critical and one orthogonal contrast) pertaining to the threat induction. Unstandardized regression coefficients (*b*) and standard errors (*SE*; in brackets) are indicated. The total effects of Contrast A and B on perceptions of randomness are noted above the direct effects. Significant effects are highlighted in bold type ($p < .05$). Note: MS = mortality salience.

data quality, only non-psychology students who followed instructions and were unlikely to have been distracted by other people or other activities (e.g., writing emails, chatting) during the completion of the online questionnaire were included in the sample, which contained 144 participants. The mean age was 23.9 years ($SD = 5.3$; range: 17–55), 65.3% of the participants were female. They participated in a study about societal questions and personality psychology. They were randomly assigned to conditions in a moderated multiple mediational between-participants design.

Procedure and materials

Self-esteem. The online questionnaire opened with instructions. Then, half the participants received the threat induction; these participants were given some personality measures (Heatherton & Polivy, 1991; Robins et al., 2001, among others) in the end of the study. The other half of the participants was given the personality items first and then the manipulation. We complemented the single-item measure of self-esteem (Robins et al., 2001) used in Study 1 with the six most

reliable items from the State Self-Esteem Scale (SSES) of Heatherton and Polivy (1991). Specifically, we used the two items with the highest factor loadings per subscale as reported by Heatherton and Polivy (1991). That is, we used two items from the Performance subscale (e.g., “I feel as smart as others”), two from the Social subscale (e.g., “I feel concerned about the impression I am making”; recoded), and two from the Appearance subscale (e.g., “I feel satisfied with the way my body looks right now”) (six items; $\alpha = .74$). Both self-esteem measures were highly correlated, $r = .68$, $p < .001$, suggesting that they could be aggregated to a composite measure to reliably reflect levels of global self-esteem beyond situational fluctuations.¹⁵ A six-point scale was used for these items as for all others reported below.

Manipulation. To facilitate comparability of our findings with prior research, the classic MS manipulation was used (e.g., Rosenblatt et al., 1989). It consists of two open-ended questions about what will physically happen to the individual when dying and after having died, as well as which emotions the thought about one’s own death triggers.

Control deprivation was induced by means of two open-ended questions as well. The first question asked participants to recall and describe a negative situation over which they had no control, although they had tried to control it. The second question asked about participants’ physical experience in the situation and about their thoughts and feelings.

The aversive control condition was matched to the control deprivation condition by asking participants about a negative situation over which they had control. All formulations in these two conditions were held equal as far as possible. Note that this is the classic way to manipulate control in compensatory control research, and this manipulation has been validated by several researchers investigating compensatory control processes (Kay et al., 2008; Rutjens et al., 2013; Whitson & Galinsky, 2008).

As a filler questionnaire, we next included a German version of the 20-item Positive and Negative Affect Schedule (Krohne et al., 1996; Watson et al., 1988). In line with prior TMT research, the manipulation

Table 3
Indirect effects in Study 2.

	Contrast A (.333, .333, -.667)		Contrast B (.5, -.5, 0)			
	Bootstrap results for indirect effects					
	Indirect effect	95% BC CI		Indirect effect	95% BC CI	
	Lower	Upper		Lower	Upper	
Mediators						
Total indirect effect	-.48	-1.87	.90	-.26	-.90	.38
Thoughts of death	-.02	-.52	.49	-.02	-.54	.54
Thoughts of low control	.24	.02	.56	-.13	-.46	.003
Thoughts of boredom	-.70	-1.94	.57	-.11	-.46	.05

Magnitude and confidence intervals of the unstandardized multiple mediation effects of the threat induction (coded as Contrast A – MS and control deprivation vs. boredom salience – and Contrast B – MS vs. control deprivation without boredom salience) on perceptions of randomness with threat-related thoughts as mediators. Note: Boldface type highlights a significant effect as determined by the 95% bias corrected confidence interval (95% BC CI) and 10,000 bootstrap samples.

¹⁵ Levels of self-esteem were not affected by presentation order, $F(1,142) = 0.01$, $p = .92$. Neither did the manipulation affect self-esteem for those participants who were given the self-esteem measure after the manipulation, $F(2,71) = 0.33$, $p = .72$.

did not influence affectivity ($F_s < 1.37$, $p_s > .25$). Then, a randomized block followed consisting of death-thought accessibility, state need for structure, and another questionnaire, which should ensure a sufficiently long delay between the manipulation and the dependent variable, ingroup defense (Martens et al., 2011).

Need for structure. The personal need for structure scale was used (Machunsky & Meiser, 2006; Neuberg & Newsom, 1993). This measure consists of twelve items ($\alpha = .86$) and gauges the need to perceive structure and order by assessing how far persons are inclined to structure the world into a simplified, more controllable form. Example items are “I enjoy having a clear and structured mode of life” and “It upsets me to go into a situation without knowing what I can expect from it”. The items were slightly modified to tap into state levels of the need for structure.

Death-thought accessibility. Death-thought accessibility was gauged with a word-stem completion task used before by Jonas and Fischer (2006). It was composed of 24 different word fragments to be completed by the participants. For six of these word fragments, either a death-related word such as grave, corpse, and coffin or a neutral word could be inserted. The other word fragments functioned as filler items. The death-thought accessibility scale was computed by adding the word fragments that were completed with death-related words; its possible range was zero to five.¹⁶ Participants were instructed to complete the word fragments with the first word that came to their mind, working as quickly as possible, to prevent them from substituting death words with other, more pleasant words. One further scale followed the mediator block to provide a delay between death-thought accessibility and the subsequent ingroup defense measures. Since gauging death-thought accessibility can prompt conscious death cognition *per se*, a delay was required to allow for a renewed post-suppression increase of death-thought accessibility outside of focal awareness, which is necessary for MS effects to occur (Hayes et al., 2010). After that, ingroup defense was measured.

Ingroup defense. Ingroup defense was assessed in a very broad manner by including four measures for different aspects of ingroup bias. Specifically, we included six items gauging general ethnocentrism, whereby ethnocentrism was conceptualized as ethnic group self-centeredness, with four intergroup expressions of ingroup preference, superiority, purity, and exploitativeness, and two intragroup expressions of group cohesion and devotion (Bizumic, Duckitt, Popadic, Dru, & Krauss, 2009). Each ethnocentrism facet was measured by one item (six items; $\alpha = .78$). Example items are “We, as a cultural group, should be more integrated and cohesive, even if it reduces our individual freedoms” (group cohesion) and “No matter what happens, I will always support my cultural or ethnic group and never let it down” (devotion). This short form of Bizumic et al.’s (2009) ethnocentrism scale has been previously used by Agroskin and Jonas (2010) and was found to be positively associated with trait measures of perceived low control in the political and economic domains, need for closure, avoidance of empathy, right-wing authoritarianism, and anti-immigration attitudes.

Furthermore, four items gauging anti-immigration attitudes were included ($\alpha = .83$). These items reflect generalized antagonism toward immigration. Example items are “The economy of my home country should be protected from mass immigration” and “I think the government of my home country should make the immigration of foreigners more difficult”.

In addition to these measures of ingroup defense and favoritism, two measures of outgroup derogation were included. In contrast to the rather

abstract ingroup defenses, the outgroup derogation measures referred to a concrete outgroup, namely Muslims. In one case the Muslims featured an Islamist (i.e., radical Muslim) worldview, that is, a worldview that was incompatible with the worldview of the participants. In the other case, the Muslims exhibited a pro-democratic worldview, that is, a compatible worldview. This variation in worldview compatibility was implemented to test whether even outgroup members with compatible worldviews might be derogated after MS and control deprivation, which would be evidence for an especially narrow-minded form of ingroup bias (i.e., pure xenophobia). Specifically, in the case of the Islamists, a picture of radical Muslim demonstrators holding posters with statements like “Islam will conquer Europe”, “Islam will dominate the world”, and “Shariah the true solution” was presented. After a brief explanation of the context of the demonstration and central notions like “Shariah” that some participants may have been unfamiliar with, participants answered eleven items ($\alpha = .86$) reflecting derogation of the demonstrators, such as “They deserve the worst” and “I like them” (recoded).

In the case of the pro-democratic Muslims, a picture of Iranian Muslim demonstrators holding a poster with the statement “We want democracy” was presented. After a brief explanation of the context of the demonstration, participants were asked to answer the same items as with the Islamists except for one unsuitable item (ten items; $\alpha = .76$). All four ingroup bias measures were aggregated for the subsequent statistical analyses, since we assumed them to be expressions of the same underlying construct – ingroup defense. This was justified as suggested by their high interrelations ($\alpha = .79$). Then, sociodemographic data was collected. After completing data collection, respondents were thanked and debriefed.

Results and discussion

The interrelations and descriptive data are depicted in Table 4. Most notably, need for structure predicted ingroup defense, contrary to death-thought accessibility, suggesting that need for structure may be more likely to mediate moderated threat effects on ingroup defense. Moreover, the negative relationship between self-esteem and need for structure indicates that high self-esteem (i.e., *personal* control; Judge et al., 2002; Pyszczynski et al., *in press*) can buffer against the need for external control. This is consistent with the hydraulic hypothesis of the compensatory control model (Kay et al., 2010b).

The hypothesized model was tested in two steps corresponding to two different ways of coding the manipulation variable. With respect to need for structure the same two contrasts (Contrast A and B) used in the previous studies were utilized, since we wanted to test again whether MS and lacking control differ from having control (Contrast A) and from each other (Contrast B). We expected Contrast A to exert a positive effect on need for structure under conditions of low but not high self-esteem. In contrast, Contrast B should not attain significance because

Table 4
Means, standard deviations, and intercorrelations for variables in Study 3.

Variable	1	2	3	4	5	6
1. Self-esteem	–					
2. Need for structure	–.30**	–				
3. Death-thought accessibility	–.13	.12	–			
4. Ingroup defense	–.09	.36**	.09	–		
5. Dummy 1: MS vs. control	.03	–.03	.22*	.08	–	
6. Dummy 2: Control deprivation vs. control	–.03	.03	.02	.08	–.63**	–
<i>M</i>	3.98	3.69	0.52	2.77	0.44	0.33
<i>SD</i>	0.90	0.96	0.84	0.73	0.50	0.47

Note. $N = 141$ – 144 for all correlations. Dummy 1: MS = 1, control deprivation = 0, control condition = 0. Dummy 2: MS = 0, control deprivation = 1, control condition = 0. All relationships between the dummy variables and the other variables are represented by standardized regression coefficients, whereby Dummy 1 and Dummy 2 were simultaneously entered as predictors. * $p < .05$, ** $p < .001$.

¹⁶ One death word ‘Grab’ (‘grave’ in English) had to be omitted because we had inadvertently used a similar word fragment ‘Graul’ (‘grey’ in English) as an example in the instruction to the task, thereby biasing participants’ completions of the death word.

need for structure was not expected to be specific to death (contrary to death-thought accessibility).

With regard to death-thought accessibility, two new contrasts were formed because we were interested in the extent to which MS diverged from lacking control and having control (critical Contrast C: $+ .667 = MS$, $-.333 =$ control deprivation, $-.333 =$ control condition). In addition, we tested whether death-thought accessibility was only influenced by MS, comparing lacking control and having control without MS (orthogonal Contrast D: $+ .5 =$ control deprivation, $-.5 =$ control condition, $0 = MS$). We predicted Contrast C to exert a positive effect on death-thought accessibility. In addition, Contrast D should not attain significance, as death-thought accessibility should be uniquely engendered by MS, suggesting equal death-thought accessibility levels across both other conditions.

Since the mediators need for structure and death-thought accessibility featured different predictors, the model had to be computed twice, one time with Contrast C and D predicting both mediators, and a second time with Contrast A and B (as well as their interactions with self-esteem), doing the same. The dependent variable ingroup defense was modeled as a latent variable, constituted by the four ingroup bias measures, functioning as manifest indicators. The direct effects of the independent variables were set to zero, since there were no reliable direct effects in Studies 1 and 2. To test this model (Fig. 5), we performed moderated multiple mediation analyses using Mplus 6.12 (Muthén & Muthén, 2010).¹⁷ A very good data fit – as indicated by a non-significant Chi-Square Test as well as a low Root Mean Square Error Of Approximation (RMSEA) and a high Comparative Fit Index (CFI) – was obtained, $\chi^2(35) = 32.45$, $p = .59$, RMSEA = 0.000 (90% CI of 0.000 to 0.054), CFI = 1.000. This indicates that our theoretical model was highly consistent with the data.

First, the interaction of the threat induction and self-esteem on need for structure is addressed. In Step 1, only a negative link between self-esteem and need for structure emerged, $b = -.37$, $SE = .08$, $\beta = -.35$, $t(138) = -4.44$, $p < .001$ (all other $ps > .22$). A marginal change in explained variance due to the inclusion of the interaction terms was observable in Step 2, $\Delta R^2 = .03$, $F(2, 136) = 2.36$, $p < .10$ (one-tailed testing due to replication of Study 1 would yield a significant effect, $p < .05$). Consistent with our predictions, Contrast A affected need for structure as a function of self-esteem, $b = -.48$, $SE = .22$, $\beta = -.19$, $t(136) = -2.20$, $p < .05$, such that MS and lacking control increased need for structure relative to having control under conditions of low self-esteem ($SD = 1$), $b = .46$, $SE = .27$, $\beta = .20$, $t(136) = 1.73$, $p < .05$ (one-tailed due to replication),¹⁸ but not high self-esteem ($SD = 1$), $b = -.41$, $SE = .26$, $\beta = -.18$, $t(136) = -1.57$, $p = .12$ (Fig. 6). MS and control deprivation exerted statistically indistinguishable effects on need for structure as indicated by a non-significant interaction between Contrast B and self-esteem, $b = -.03$, $SE = .18$, $\beta = -.01$, $t(136) = -0.14$, $p = .89$. Hence, our hypotheses for need for structure were corroborated.

Next, we investigated the threat-based emergence of death-thought accessibility by testing whether it may be uniquely increased by MS. Indeed, a significant effect of Contrast C appeared, $b = .35$, $SE = .14$, $\beta = .21$, $t(138) = 2.58$, $p = .01$, suggesting that death-thought accessibility was higher after MS than after lacking/having control. Contrast D, conversely, did not predict death-thought accessibility, $b = .04$,

$SE = .18$, $\beta = .02$, $t(138) = 0.20$, $p = .84$, indicating that death-thought accessibility is in fact to be seen as a unique reaction to death awareness. No other effects attained significance including the interactions with self-esteem ($ps > .12$). Thus, our predictions regarding death-thought accessibility were supported as well.

Then, we tested whether ingroup defense was predicted by need for structure and death-thought accessibility. Need for structure was positively related to ingroup defense, $b = .38$, $SE = .09$, $\beta = .32$, $t(136) = 4.18$, $p < .001$. Death-thought accessibility, by contrast, did not affect ingroup defense, $b = .08$, $SE = .11$, $\beta = .05$, $t(136) = 0.71$, $p = .48$. These results support the notion that control motivation uniquely contributes to threat-based ingroup defense.¹⁹

Finally, we tested our mediational hypotheses. Specifically, we examined the indirect effects of the manipulation on ingroup defense, expecting MS and control deprivation (Contrast A) to amplify ingroup defense via the need for structure under conditions of low self-esteem. All indirect effects were computed using 95% bias corrected bootstrap confidence intervals (95% BC CI) and 10,000 bootstrap samples. As hypothesized, Contrast A significantly increased ingroup defense under conditions of low self-esteem (indirect effect = $.18$, 95% BC CI of $.014$ to $.46$), contrary to high self-esteem (indirect effect = $-.16$, 95% BC CI of $-.44$ to $.05$). No significant indirect effects of Contrast B on ingroup defense (irrespective of self-esteem levels) were found.²⁰ Thus, MS and control deprivation equally elicited ingroup defense via the need for structure under conditions of low self-esteem.²¹

Study 3 provides a valuable contribution to our control-related process model of MS effects on ingroup defense by replicating the findings from Study 1 with another threat manipulation (we used the traditional manipulations of MS and control deprivation), another mediator reflecting control motivation (need for structure/order), and another measure of ingroup defense (four different measures of ingroup bias). Most importantly, Study 3 also included the main mediator candidate in TMT – death-thought accessibility – which did not predict any ingroup defense measures, contrary to need for structure, which predicted all of them (see footnote 19). It is important to note, though, that death-thought accessibility was uniquely augmented by MS after a filler task in line with previous research (Hayes et al., 2010). Consequently, death-thought accessibility's failure to mediate MS effects on ingroup defense cannot be attributed to an inapt induction of MS. It therefore seems indicated to conclude that MS effects on control-conveying outcomes are uniquely driven by control motivation. It is worthy of note, furthermore, that the very broad assessment and latent modeling of ingroup defense, viewed in conjunction with the excellent model fit, speaks to the generalizability of our findings, because this means that solely the common variance of the four ingroup bias measures was predicted by need for structure. In contrast, the measures' unique variances were irrelevant, thus ruling out methodological artifacts. Overall, Study 3 complements the first

¹⁷ Two variables were entered as covariates to rule out possible confounds: The presentation order of the moderator self-esteem (before the manipulation vs. after the dependent variable) and age, which was associated with the presentation order, $r = -.15$, $p < .10$ (especially in the control deprivation condition, $r = -.29$, $p < .05$; relationships in both other conditions non-significant, $rs < -.13$, $ps > .49$), such that participants who received the self-esteem measure prior to the manipulation were marginally younger than those who received the self-esteem measure in the end of the study. Moreover, age was marginally related to self-esteem in the control condition, $r = -.33$, $p < .10$, but in no other condition, $rs < .16$, $ps > .28$. One participant did not respond to the age question and had to be excluded. However, the results were not substantially different without including the covariates.

¹⁸ Analyzing this simple slope at $SD = -1.5$ yielded a significant effect using a two-tailed test, $b = .68$, $SE = .35$, $\beta = .29$, $t(136) = 1.95$, $p = .05$.

¹⁹ We performed many additional analyses to check whether death-thought accessibility might somehow affect ingroup defense. Specifically, we explored the effects of death-thought accessibility on each ingroup bias measure separately, without finding any significant effects ($\beta s \leq .10$, $ps > .20$). Need for structure, by contrast, affected each measure ($\beta s \geq .23$, $ps < .01$). We also examined whether death-thought accessibility effects on ingroup defense may be moderated by the manipulation (e.g., appearing only in the MS condition) and self-esteem. No significant effects appeared among the two- and three-way interactions between these variables.

²⁰ These analyses were recomputed using dummy variables instead of the contrasts. The effect of control deprivation on ingroup defense was significantly mediated by need for structure for persons with low self-esteem ($SD = -1$; indirect effect = $.19$, 95% BC CI of $.002$ to $.52$) but not high self-esteem ($SD = 1$; indirect effect = $-.14$, 95% BC CI of $-.44$ to $.11$). Likewise, the effect of MS was significantly mediated by need for structure for persons with low self-esteem ($SD = -1.25$; indirect effect = $.21$, 95% BC CI of $.003$ to $.53$) but not high self-esteem ($SD = 1.25$; indirect effect = $-.22$, 95% BC CI of $-.58$ to $.03$).

²¹ In addition to controlling for the presentation order of the moderator, we performed subgroup analyses that did not reveal substantial differences between the respective conditions. Thus, this variable did not affect our results.

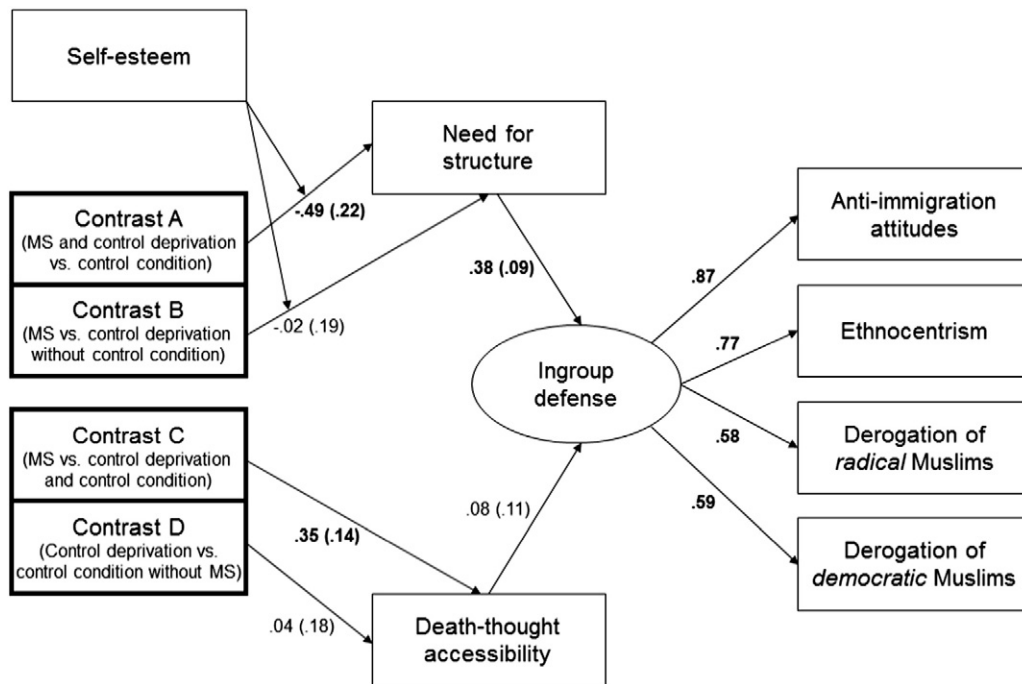


Fig. 5. Model tested in Study 3 ($N = 141$). Boxes in bold type represent pairs of contrasts (one critical and one orthogonal contrast, respectively) pertaining to the manipulation. Manifest variables are rectangular, whereas the latent variable is spherical. Path coefficients are described by unstandardized regression coefficients (b) and standard errors (SE ; in brackets). Factor loadings are standardized regression coefficients (β). Significant effects are highlighted in bold type ($p < .05$). Note: MS = mortality salience.

two studies by showing that the mediating role of control motivation cannot be reduced to underlying workings of implicit death cognition.

General discussion

The results of three studies shed light on the motivational underpinnings of MS and control deprivation effects on ingroup defense. In Study 1, illusory pattern perception (i.e., the motivated search for order/control) mediated the effects of MS and control deprivation on ingroup defense (i.e., group-based control restoration). Study 3 replicated this mediation using another measure of control motivation – state need for structure. This motivational process may be precisely reflective of the need to perceive order and prevent perceptions of randomness, which is the primary motivation behind control deprivation effects according to the compensatory control model (Kay et al., 2009). Importantly, need for structure fulfilled its mediational function notwithstanding the inclusion of death-thought accessibility, which is the key mediator candidate in TMT (Hayes et al., 2010). Study 2 offered evidence

for the increase in perceived randomness following MS and control deprivation, thereby suggesting that ingroup defense may serve the need to thwart perceptions of randomness. Crucially, the effects of MS and control deprivation were statistically indistinguishable with respect to all control-relevant measures (illusory pattern perception, need for structure, ingroup defense, explicit thoughts of low control, perceptions of randomness), but not the death-specific measures (explicit and implicit thoughts of death); the latter ones were uniquely strongly affected by MS. Moreover, the indirect effects of both MS and control deprivation on ingroup defense were qualified by levels of self-esteem, only occurring for persons with low self-esteem. Overall, this research provides the first comparative and, crucially, mediational examination of MS and control deprivation effects on ingroup defense.

Implications for terror management theory

According to TMT, the need for control (i.e., the need to perceive order and prevent perceptions of randomness; Kay et al., 2009) constitutes a basic human motivation (Pyszczynski et al., in press). Furthermore, death is thought to deprive people of control (this is demonstrated by our findings in Study 2). Mortality reminders should therefore increase the need for control (this is shown by our findings in Studies 1 and 3). Finally, ingroup defense is ascribed the function of coping with control threats by not only control theorizing (Fritsche et al., 2011) but also TMT (Pyszczynski et al., in press). Thus, our key finding that control motivation plays an equally decisive and unique role in driving both MS and control deprivation effects on ingroup defense seems to be in line with TMT. However, from the perspective of TMT, people's control strivings serve the more fundamental, ultimate psychological function of protecting from existential terror (Pyszczynski et al., 1998). This reasoning suggests that MS effects may be fueled by different processes located on different levels of motivational proximity to the goal of terror management. In other words, the motivation to restore control may serve a more proximate function of compensating for the lack of control that is inherent in mortality following MS, whereby these compensatory control processes may not be ends in themselves, but means of attaining the ultimate goal – managing existential angst. Efforts in control

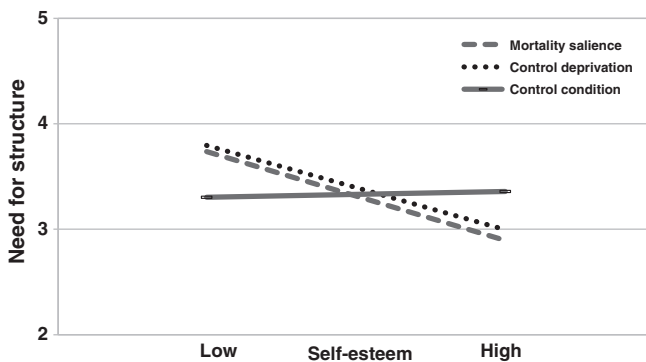


Fig. 6. The effects of mortality salience, control deprivation, and the control condition on need for structure in Study 3. Plotted values reflect predicted need for structure values at one standard deviation below and above the self-esteem mean. Scale ranges from 1–6.

restoration, such as ingroup defense, may thus chiefly fulfill the function of helping the individual “to feel that he controls his life and his death” (Becker, 1973, p. 55). Whether this distinction between *proximate* and *ultimate* functions of ingroup defense is viable is not addressed by our data, and thus constitutes an exciting question for future research.

Irrespective of this possibility, our findings show that motivational processes located at more *proximate* levels of analysis, such as control motivation, can make a unique and important mediational contribution to the emergence of compensatory responses following death awareness. It is noteworthy that control motivation mediated MS/control deprivation effects on ingroup defense in Study 3, whereas death-thought accessibility failed to mediate MS effects. In addition to demonstrating the uniqueness and non-reducibility of the mediational role of control motivation to implicit death cognition, this finding suggests that death-thought accessibility may not play a critical mediational role in MS effects on ingroup defense. To our knowledge, there is not a single published study, reporting a statistical mediation of MS effects on ingroup defense by death-thought accessibility. In contrast, there is evidence suggesting that this might not be the case. For example, a line of research failed to find a mediation of MS effects on ingroup defense in several studies (Das et al., 2009). In addition, a recent set of studies investigating the interactive effect of MS and intrinsic religiosity on ingroup defense did not determine a mediation by death-thought accessibility as well (Golec de Zavala, Cichocka, Orehek, & Abdollahi, 2012). Although a negative relation between intrinsic religiosity and death-thought accessibility appeared in the MS condition, death-thought accessibility did not mediate the MS-induced decrease in intergroup hostility among persons with high intrinsic religiosity. Thus, our findings may be particularly valuable for understanding what goes on in people’s heads between MS inductions and ingroup defense. Given that group-related worldview defense or ingroup defense represents the traditional and most extensively investigated type of compensatory response after diverse existential threats (cf. Routledge & Vess, 2012), our mediational insights into the motivational dynamics underlying terror management and control restoration should be of interest to the entire threat compensation literature.

The main theoretical contribution of our investigation may thus be the provision of conceptual clarity about which motivational process drives control-conferring compensatory responses to MS, namely the need to perceive order and prevent perceptions of randomness (Kay et al., 2009). This is of major importance since it has been pointed out that similar effects of different threats (e.g., MS and control deprivation) on a particular outcome (e.g., ingroup defense) do not imply that those effects are driven by the same processes or motivations, because the same outcome may result from different motivational processes (Routledge & Vess, 2012). While it is not disputed that “mortality salience, expectancy violations, threats to personal control, or feelings of uncertainty can at times foster similar outcomes in the laboratory”, Routledge and Vess (2012) emphasize that “this does not, in and of itself, provide any conceptual clarity about whether compensatory responses to these threats are fueled by the same motivation or process” (p. 377). We believe that our mediational approach to explaining ingroup defense may be particularly promising because it provides ‘non-difference’ evidence (MS vs. control deprivation) in conjunction with mediational evidence. Previous alternative perspectives to TMT, by contrast, only provided ‘non-difference’ evidence (e.g., MS vs. expectancy violation; Proulx & Heine, 2008; cf. Routledge & Vess, 2012), without investigating the underlying motivational dynamics via mediation analyses. Our mediational approach might therefore be especially helpful for differentiating the multifarious worldview defenses with regard to their motivational underpinnings: Which motivational process mediates MS effects on a particular compensatory response? For instance, does the need for order uniquely mediate MS effects on control-conveying outcomes, as well as the need for certainty on certainty-providing outcomes, and the need for death-transcendence on symbolic immortality-conferring outcomes?

A related question is whether our findings mean that MS is functionally equivalent to control deprivation *in general* (i.e., irrespective of the particular compensatory response)? It is imperative to note that our control-related process model of MS effects is solely applicable to outcomes that may offer a sense of control/order. Our approach is mute about MS outcomes that are not likely to serve the desire for control but rather other needs, such as the need for death-transcendence. It is therefore quite improbable that MS effects on various manifestations of this death-specific need (e.g., desire for offspring, Fritsche et al., 2007; symbolic immortality, Shepherd et al., 2011) are mediated by control motivation (see also footnote 1 and Routledge & Vess, 2012). It may well be that MS effects on such outcomes are mediated by the accessibility of thoughts related to death or immortality. Summing up, our control-related account of MS effects pertains only to outcomes that may enable people to restore control. Consequently, mortality awareness should be only functionally equivalent to control deprivation with respect to control-conveying types of worldview defense (e.g., ingroup defense; Fritsche et al., 2008). This means that, in general, MS and control deprivation are not the same things. Accordingly, worldview defense is not generally the same as control restoration, since people’s worldviews provide not only control but also other psychological resources, such as meaning, identity, and symbolic immortality. This is in line with TMT which posits that affirmations of control, meaning, or belongingness are ultimately strategies for terror management (instead of being ends in themselves) (Pyszczynski et al., *in press*).

Limitations and future research

Two possible limitations of our findings deserve special attention. While our findings show that MS-immanent control deprivation significantly contributes to the emergence of ingroup defense following mortality reminders, we cannot conclude that ingroup defense occurs *solely* due to the control deprivation that death entails. It could also be, for instance, that MS-immanent uncertainty drives MS effects in addition to control deprivation (Van den Bos, Poortvliet, Maas, Miedema, & van den Ham, 2005). We cannot rule out this possibility since we did not include uncertainty-related mediator candidates, neither did we include an uncertainty condition in addition to MS and control deprivation. Thus, the only two conclusions that our results certainly suggest are: a) there is a significant contribution of control deprivation to the emergence of MS effects on ingroup defense and b) there is no significant (mediational) contribution of death-thought accessibility to MS effects on ingroup defense. Further potential mediators including needs for certainty and meaning await further investigation. It is worthy of note, however, that a meta-analysis has determined that MS effects differ from meaninglessness and uncertainty effects in terms of their time course: While MS effects tend to increase over time, meaninglessness and uncertainty effects tend to decrease (Martens et al., 2011). Since we included several delay tasks in all our experiments between threat induction and outcome measurement, control deprivation seems to work similarly lastingly to mortality awareness.

It is also important to note that our mediational approach essentially entailed comparing control-specific and death-specific mediator candidates with regard to the mediation of MS and control deprivation effects on ingroup defense. Such an approach may work best when the processes that compete for mediation are operationalized in a similar fashion. In Study 3, we compared death-thought accessibility, measured with a word-stem completion task, with the need for structure, measured with explicit items. These mediator variables were selected because they are regarded as the main mediator candidates in the respective literatures – death-thought accessibility in TMT (Hayes et al., 2010) and need for structure in compensatory control research (Kay et al., 2009). Yet, future research may compare mediator candidates that are operationalized more similarly, such as implicit death cognition vs. implicit low control cognition (similar to Study 2

where we contrasted explicit thoughts of death, lacking control, and boredom), to obtain a more balanced comparison of the mediating processes.

Future research may also explore in more detail which types of worldview defense may be attributed to the desire for order and aversion to randomness (i.e., control motivation) and which may not be. As stated above, we believe that MS effects on outcomes that are unlikely to serve the control motive are not explainable by our approach. We believe, for example, that MS effects on compensatory bolstering of epistemic certainty may well be mediated by the MS-deprived need for certainty (McGregor, Zanna, Holmes, & Spencer, 2001), instead of the need for control, regardless of whether uncertainty management ultimately functions to assuage existential anxiety (Pyszczynski et al., in press), or is an end in itself. This exploration of unique mediating processes in existential threat research might be complemented by an investigation of unique moderating variables. While self-esteem buffered both MS and control deprivation effects in Studies 1 and 3 – which is in line with both TMT and control-related theorizing on the functional similarity between self-esteem and personal control (Fritsche et al., 2008; Pyszczynski et al., in press) – there may be personality traits that specifically moderate certain threats but not others. For example, a candidate variable for uniquely moderating MS effects might be the belief in a God who provides literal immortality, as it is typical for intrinsic religiosity (Jonas & Fischer, 2006). The belief in a controlling God, by contrast, may uniquely moderate control loss effects (Kay et al., 2008).

To conclude, our mediational findings strongly suggest that mortality awareness is accompanied by a profound control deprivation that fuels compensatory responses aimed at restoring a sense of order in the world. Researchers investigating the contextual precursors and psychological functions of ingroup defenses, such as prejudice and xenophobia, may therefore want to pay particular attention to the order-offering features of these belief systems.

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Appendix A. Poems

- 1) Death-related poem
Final Act (Reiner Maria Rilke, 1917)
Death is grand.
We are his
With laughing mouths.
When we feel most alive,
He dares to cry
In the midst of us.
- 2) Lack of control-related poem
The Power (Rosemarie Brunetti, 2009)
The hardest and cruellest power,
which man has to accept,
is powerlessness.²²
- 3) Winter-related poem
Winter, You Rough Man... (Fritz Lemmermayer, n.d.)
Winter, you rough man,
Winter, I do not love you!
Trembling due to your frost,
I strive upwards to the light.

²² Please note that the translation of the materials is literal. The literal translation of the German word *Ohnmacht* is “powerlessness”. However, this term rather means global lack of control in the German language than powerlessness in the social domain, which would be this term’s meaning in the English language.

Appendix B. Illusory pattern perception

- 1) Conspiracy-related scenario
You are working on a group project with three fellow students. The project entails writing a term paper. Since you have questions concerning the term paper which your colleagues cannot answer, you visit your supervisor in her office hour. As you open the door to her study, you see that one of your colleagues is already talking to the supervisor. You are asked to wait outside the room. While you are waiting, you have the feeling that the topic of discussion in the room is you. You have the feeling you heard your name being mentioned in the room. A few minutes later your colleague comes out and you enter the room. During the conversation you feel as though the supervisor is not very friendly to you, even though she answers you questions. You write the term paper a few weeks later and are informed of the mark soon afterwards. It is not a good mark and you are surprised, as you have put a lot of work into it.
- 2) Superstition-related scenario
You attend a party in a shared apartment that a fellow student of yours has invited you to. You get to know her roommates there; one of them has quite an unusual hobby. She is engaged with voodoo. She shows you her voodoo tools – dolls and needles – and explains to you how the corresponding practices are performed. After the conversation you go on the balcony to smoke a cigarette and hear one of the party guests saying that she is cold. Since you are cold as well, you go back inside to fetch your jacket. On the way to get your jacket, you notice a voodoo doll on a desk wearing a green bodice that reminds you of the color of the person’s pullover who was freezing on the balcony. You lay the doll on the warm radiator for fun and return to the balcony with your jacket. To your surprise, a few minutes later the person with the green pullover says she feels it has become significantly warmer.

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