

An enquiry concerning the principles of cultural norms and values: The impact of uncertainty and mortality salience on reactions to violations and bolstering of cultural worldviews[☆]

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Abstract

This enquiry concerning the principles of cultural norms and values focuses on the impact of mortality and uncertainty salience on people's reactions to events that violate or bolster their cultural norms and values. Five experiments show that both mortality and uncertainty salience influence people's reactions to violations and bolstering of their cultural worldviews, yielding evidence for both terror and uncertainty management theories. Interestingly, the five experiments consistently reveal that uncertainty salience has a bigger impact on people's reactions than mortality salience, suggesting that the former may be a more important antecedent of reactions to norms and values than the latter. Findings further suggest that uncertainty salience did not instigate death-thoughts whereas reactions to norms and values were stronger among mortality salient participants who thought of uncertainty as a result of the mortality salience manipulation than mortality salient participants who did not think of uncertainty following this manipulation. Implications are discussed.

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Introduction

Cultural norms and values constitute a fundamental feature of human life and hence many prominent lines of social psychological work have focused on these con-

cepts (see, e.g., Cialdini, Kallgren, & Reno, 1991; Fiske, Kitayama, Markus, & Nisbett, 1998). The present paper has been inspired by terror management theory's line of research on why cultural norms and values are important to people (e.g., Greenberg, Solomon, & Pyszczynski, 1997; Pyszczynski, Greenberg, & Solomon, 1999; Solomon, Greenberg, & Pyszczynski, 1991). Following the studies conducted within the terror management tradition, we investigate in this paper the antecedents of people's negative reactions toward events that violate their cultural norms and values and their positive reactions toward things that uphold or bolster these norms and values. In doing so, we will focus on people's reactions to fair versus unfair events and to praise versus criticism of personally relevant groups.

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Ever since, for example, Aristotle's formulation of his ideas about ethics (see [Beauchamp, 2001](#)) and [Hume's \(1777/1998\)](#) well-known book *An Enquiry Concerning the Principles of Morals*, scientists from various disciplines have been intrigued by fairness and related concepts, such as justice, morality, and ethics. Social psychologists have shown convincingly that fairness is one of the most important social norms and values in human life (see, e.g., [Folger, 1984](#); [Folger & Cropanzano, 1998](#); [Tyler & Smith, 1998](#)). In most situations, therefore, most people judge unfair treatment to be in violation with cultural norms and values and think of fair treatment as being in correspondence with norms and values of good behavior and conduct ([Lind & Tyler, 1988](#); [Tyler, Boeckmann, Smith, & Huo, 1997](#)). In other words, unfair treatment violates people's cultural worldviews whereas fair treatment bolsters people's cultural worldviews ([Van den Bos & Miedema, 2000](#); see also [Rosenblatt, Greenberg, Solomon, Pyszczynski, & Lyon, 1989](#)). Therefore, in Experiments 1, 2, and 5 of this paper we will study people's reactions to fair and unfair treatment.

Although fairness definitely constitutes one of the most important social norms and values in human life (e.g., [Folger, 1984](#); [Folger & Cropanzano, 1998](#); [Tyler & Smith, 1998](#)), people's reactions to cultural norms and values encompass more than how they react to fair and unfair treatment. Social groups and the values they convey enable individuals to alleviate existential concerns by providing self-esteem resources, and epistemic knowledge ([Greenberg et al., 1997](#)). More specifically, because university affiliation provides a source of existential meaning given the history and status of the university in particular and science in general ([Dechesne, Janssen, & Van Knippenberg, 2000](#)), it can safely be argued that praise of students' own university constitutes a bolstering of their cultural worldviews whereas criticism of the university represents a violation of the students' worldviews ([Dechesne et al., 2000](#)). In Experiments 3 and 4, therefore, we will investigate how students react to praise and criticism of their own university. We will base our research hypotheses on terror and uncertainty management theories.

Terror management

An important social psychological theory that explains people's reactions toward transgressions and upholding of cultural norms and values is terror management theory (for overviews, see, e.g., [Greenberg et al., 1997](#); [Pyszczynski et al., 1999](#); [Solomon et al., 1991](#)). According to this framework, the fear of death is rooted in an instinct for self-preservation. Although human beings share this instinct with other species, only humans are aware that death is inevitable. This combination of an instinctive drive for self-preservation with an awareness of the inevitability of death creates the potential for paralyzing terror. Furthermore, the theory

posits that this potential for terror is managed by a cultural anxiety buffer, a social psychological structure consisting of people's cultural worldviews and their self-esteem. To the extent that this buffer provides protection against death concerns, reminding individuals of their death should increase their need for that buffer. Thus, reminders of death should increase the need for the protection provided by the buffer and therefore lead to strong negative evaluations of events that impinge on the cultural worldview and lead to strong positive evaluations of things that uphold or provide an opportunity to reconstruct the worldview. (For more extensive introductions to terror management theory, see [Greenberg et al., 1997](#); [Pyszczynski et al., 1999](#); [Solomon et al., 1991](#).)

In this way, the theory explains why people care about the norms and values of their culture and predicts when people will react especially negatively toward transgressions of cultural norms and values and particularly positively toward upholding of these concepts. Although an elaborate overview of the empirical work on terror management is beyond the scope of this paper (for more complete descriptions, see, e.g., [Arndt, Greenberg, Solomon, Pyszczynski, & Schimel, 1999](#); [Dechesne et al., 2000](#); [Greenberg et al., 1990](#); [Harmon-Jones et al., 1997](#); [McGregor et al., 1998](#); [Rosenblatt et al., 1989](#)), results are in accordance with the theory's account of why cultural norms and values are important and indeed show that, compared to those who are not asked to think about their mortality, individuals who are asked to think about their mortality react more negatively toward people who violate their norms and values and react more positively toward people who bolster their cultural norms and values. For example, [Rosenblatt et al. \(1989\)](#) revealed that when mortality was made salient participants with relatively negative attitudes toward prostitution recommended harsher bonds for a prostitute than when mortality was not salient. Furthermore, the [Rosenblatt et al.](#) results also revealed that mortality salient participants recommended larger rewards for a hero who upheld cultural values than did mortality nonsalient participants. Similarly, [Van den Bos and Miedema \(2000\)](#) showed that reminding people of their mortality led to stronger affective reactions toward experiences of fair and unfair treatment than not reminding them of their mortality.

In the current paper, we would like to further explore the role of terror management's account of people's reactions to upholding and transgressions of cultural norms and values. We will do this by paying attention to another account of these reactions, the uncertainty management model.

Uncertainty management

Although a full review of the uncertainty management model is beyond the scope of this paper (for more

complete descriptions, see Lind & Van den Bos, 2002; Van den Bos & Lind, 2002), it is noteworthy that the model starts with the observation that the world is an uncertain place. For example, many people have jobs with indefinite tenure, and success at work often depends on adaptability and flexibility in the face of an uncertain future (Lord & Hartley, 1998). Rapid changes are happening everywhere and news of layoffs as well as national and international conflicts reaches us almost daily. Furthermore, people are unpredictable, and most of us have experienced both unanticipated disappointments and unexpected successes in our personal, work, or political worlds.

Based on various social psychological theories and notions (see, e.g., Festinger, 1954; Fiske & Taylor, 1991; Hogg & Mullin, 1999; Lopes, 1987; Sorrentino & Roney, 1986; Weary, Jacobson, Edwards, & Tobin, 2001), the model argues that people have a fundamental need to feel certain about their world and their place within it, that uncertainty can be threatening, and that people generally (but see, e.g., Sorrentino & Roney, 1986, for some exceptions to this rule) feel a need either to eliminate uncertainty or to find some way to make it tolerable and cognitively manageable. The model further proposes that the experience of fairness can have ameliorative effects on uncertainty by making things seem more certain, by making uncertainty more tolerable, or both. Consider the threats that can accompany uncertainty: Uncertainty deprives one of confidence in how to behave and what to expect from the physical and social environment within which one finds oneself. Uncertainty about one's attitudes, beliefs, feelings, and perceptions, as well as about one's relationship to other people, is generally aversive (e.g., Fiske & Taylor, 1991; Hogg & Mullin, 1999; Lopes, 1987; Sorrentino & Roney, 1986) and uncertainty therefore often motivates behavior that reduces subjective uncertainty (Van den Bos & Lind, 2002). Furthermore, epistemic motives related to uncertainty are important social psychological phenomena. Festinger (1954), for example, based social comparison theory on the proposition that knowing that one is correct is a critical human motivation that drives people to make interpersonal social comparisons when nonsocial means are unavailable.

Thus, the uncertainty management model argues that uncertainty and managing uncertainty play an important role in human life. This is not to say that people want to reduce uncertainty all the time or that all uncertainties are the same. Of course, being completely certain about all or many aspects of one's life may make one's life rather dull and there are clearly instances in which people strive for uncertainty rather than seek to reduce it. Sometimes people want to experience new, uncertain events, and on occasion they even seek the thrill of possible danger, like bungee jumping or parachuting. Furthermore, the uncertainty involved in a fair gamble is stimulating, at least for some people. But even when

uncertainty is sought, it usually is still managed, at least to some extent. The model further proposes that there are good reasons to assume that cultural norms and values can help to manage or tolerate uncertainty.

Empirical research by Van den Bos (2001a) focused explicitly on how people use perceptions of fair or unfair treatment to cope with uncertainty in their daily lives and argued that when people feel uncertain or when they attend to the uncertain aspects of their worlds they have especially strong concerns about fairness. Following the uncertainty management framework, Van den Bos (2001a) investigated the hypothesis that fairness matters especially to people when their uncertainties have been made salient. Van den Bos (2001a) conducted three experiments. Each experiment provides evidence that uncertainty salience itself is an important determinant of people's reactions to perceived fairness. We will discuss here only the first experiment in the series. In this experiment, participants in the uncertainty salient condition were asked two questions that solicited their thoughts and feelings of their being uncertain (see Van den Bos, 2001a). Participants in the uncertainty nonsalient condition were asked two questions that were similar in format, but that did not remind participants about their uncertainties. As is often done in procedural fairness experiments, the fairness manipulation varied whether participants received or did not receive an opportunity to voice their opinions about the percentage of tickets that they should receive relative to the other participant. The dependent variables were participants' negative affective reactions toward their treatment in the experiment.

Following the uncertainty management model, it was hypothesized that participants' reactions should be influenced more strongly by perceived fairness in the uncertainty salient conditions than in the nonsalient conditions. In fact, this prediction was supported as the effect of the procedural fairness manipulation was significantly stronger in the uncertainty salient condition than in the nonsalient condition. These findings support the predictions made on basis of the uncertainty management model and suggest that uncertainty salience influences reactions to perceived fairness: Asking people to think about their uncertainties leads to stronger effects of perceived fairness on affective reactions to treatment. Thus, these findings tell us something that is fundamental to the issues we are trying to investigate in this paper: Fairness (being an important cultural norm and value; see Folger, 1984; Folger & Cropanzano, 1998; Tyler & Smith, 1998) has particularly strong effects on people's reactions when they have been thinking about what makes them uncertain.

The current research

We have seen that two theoretical frameworks focus on different antecedents of people's reactions to

upholding and violations of cultural norms and values: Terror management theory highlights the impact of mortality salience (e.g., Greenberg et al., 1997; Rosenblatt et al., 1989; Van den Bos & Miedema, 2000) whereas the uncertainty management model pays special attention to the influence of uncertainty salience (Van den Bos, 2001a; Van den Bos & Lind, 2002).

The uncertainty management model provides a novel social psychological explanation of people's reactions to violations and bolstering of their cultural worldviews. However, the model has never been tested against good other accounts. In the current paper, we would like to do this. More specifically, the uncertainty management model suggests that uncertainty is one of the key determinants of people's reactions toward transgressions and upholding of cultural norms and values. It would be interesting, therefore, to investigate within one experimental set-up the impact of both uncertainty and mortality salience, the latter being another, perhaps even more influential antecedent of people's reactions toward transgressions and upholding of cultural norms and values. Related to this, on the basis of terror management theory (cf. Greenberg et al., 1997; Pyszczynski et al., 1999; Solomon et al., 1991) one would expect especially mortality salience to cause the kinds of reactions to violations and bolstering of cultural worldviews described above, and this is another reason why it is important to study within one set-up the influence of mortality and uncertainty salience on people's reactions to these issues.

Others have speculated about the importance of uncertainty management processes to account for people's reactions to culture-related events (e.g., Martin, 1999; McGregor, Zanna, Holmes, & Spencer, 2001), but never studied the impact of both mortality and uncertainty salience within one study (Martin, 1999) or did so by operationalizing the latter by using temporal discontinuity as a self-integrity-threat induction (McGregor et al., 2001). This latter manipulation asked participants to compare events or persons from their childhood or adolescence with how these events or people would be in the year 2035 and hence was very different from the mortality salience manipulation commonly used in terror management studies (cf. Arndt et al., 1999; Dechesne et al., 2000; Greenberg et al., 1990; Harmon-Jones et al., 1997; Van den Bos & Miedema, 2000) and thus, methodologically speaking, did not yield a very clean comparison with the usual mortality salience manipulations.

In the present paper, we constructed a clear uncertainty salience manipulation that closely paralleled the mortality salience manipulations most often used in terror management studies. That is, following most previous terror management studies (for overviews, see, e.g., Greenberg et al., 1997; Pyszczynski et al., 1999; Solomon et al., 1991), the mortality salient condition was induced by having participants respond to two open-

ended questions concerning their thoughts and feelings about their death (cf. Arndt et al., 1999; Dechesne et al., 2000; Greenberg et al., 1990; Harmon-Jones et al., 1997; Van den Bos & Miedema, 2000): (1) "Please briefly describe the emotions that the thought of your death arouses in you," and (2) "Please write down, as specifically as you can, what you think physically will happen to you as you die." Participants in the uncertainty salient condition were asked two questions that were highly similar in format but that asked participants about their thoughts and feelings of their being uncertain (cf. Van den Bos, 2001a): (1) "Please briefly describe the emotions that the thought of your being uncertain arouses in you," and (2) "Please write down, as specifically as you can, what you think physically will happen to you as you feel uncertain." By thus replacing "death" with "uncertain" in the most commonly used manipulations of mortality salience, while leaving everything else the same, the uncertainty salience manipulation was constructed in such a way that it very closely resembled the mortality salience manipulation. As a result, the impact of these two manipulations on people's reactions toward transgressions and upholding of important cultural norms and values could be investigated in a way that scientifically was very important as it yielded a very clean comparison between the two manipulations. After presenting research findings of five experiments, we will thoroughly discuss the implications that studying this comparison has for the social psychology of terror and uncertainty management.

Experiment 1

In Experiment 1, participants ostensibly participated in two unrelated studies. In the first study, either mortality or uncertainty was made salient (cf. Van den Bos, 2001a; Van den Bos & Miedema, 2000). After this, the second study started in which participants were asked to imagine that they applied for a job and that the selection process for this job consisted of nine parts. Participants then learned that the procedures used to make the decision entailed the use of information that was either highly accurate (all parts were graded) or not so accurate (only one part was graded) (cf. Van den Bos, 2001a, Experiment 2; Van den Bos & Miedema, 2000, Experiment 3; Van den Bos, Vermunt, & Wilke, 1997). Because it is important to measure people's affective reactions to perceived fairness (see Tyler & Smith, 1998; Weiss, Suckow, & Cropanzano, 1999), and following previous justice research (e.g., Folger, Rosenfield, Grove, & Corkran, 1979; Van den Bos & Spruijt, 2002; Van den Bos & Van Prooijen, 2001), dependent variables were participants' affective reactions toward the way they were treated (cf. Van den Bos, 2001a; Van den Bos & Miedema, 2000). More specifically,

because careful pilot testing revealed that mortality salience yielded the strongest effects on negative affect reactions, and because it is important to assess anger following perceived fairness (e.g., Folger & Cropanzano, 1998; Folger et al., 1979), dependent variables assessed participants' anger toward treatment (cf. Van den Bos, 2001a, Experiments 2 and 3).

Method

Participants and design

One hundred students (35 men and 65 women)³ at Utrecht University participated in the experiment and were paid for their participation. Participants were randomly assigned to one of the conditions of the 2 (salience: uncertainty vs. mortality) \times 2 (procedure: accurate vs. inaccurate) factorial design. The design was balanced with 25 participants taking part in each of the conditions.

Experimental procedure

Students at Utrecht University were invited to the laboratory to participate in a study on how people perform tasks. On arrival at the laboratory, participants were led to separate cubicles, each of which contained a computer with a monitor and a keyboard. Next to the monitor, participants found pieces of paper and a pencil. Participants were told that the computers were connected to one another and that the experimenter could communicate with them by means of the computer network. The computers were used to present the stimulus information and to collect data on the dependent variables. Participants participated in the experiment and answered the questions that constituted the dependent variables checks before or after participating in other, unrelated studies. The studies lasted a total of 75 min, and participants were paid 10 Euros for their participation (1 Euro equaled approximately \$1 US at the time the studies in this paper were conducted).

The experiment was presented to the participants as two separate studies. In the first study, the salience manipulation was induced. Following most previous terror management studies (e.g., Arndt et al., 1999; Dechesne et al., 2000; Greenberg et al., 1990; Harmon-Jones et al., 1997; McGregor et al., 1998; Van den Bos & Miedema, 2000), participants in the mortality salient condition were asked to respond to two open-ended questions concerning their thoughts and feelings about their death: Participants were asked to write down on

the pieces of paper next to the computer their answers to the questions: (1) "Please briefly describe the emotions that the thought of your death arouses in you," and (2) "Please write down, as specifically as you can, what you think physically will happen to you as you die."

Following Van den Bos (2001a), participants in the uncertainty salient condition were asked questions that used exactly the same format but that asked them about their thoughts and feelings of their being uncertain: (1) "Please briefly describe the emotions that the thought of your being uncertain arouses in you," and (2) "Please write down, as specifically as you can, what you think physically will happen to you as you feel uncertain."

After this, all participants completed the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), on which they reported on 20 items how they felt at the moment. Following previous terror management studies (e.g., Arndt et al., 1999; Dechesne et al., 2000; Greenberg et al., 1990; Harmon-Jones et al., 1997; McGregor et al., 1998; Van den Bos & Miedema, 2000) and uncertainty salience experiments (Van den Bos, 2001a), the PANAS was included as a filler task and to determine if the salience manipulation engendered positive and negative affect. The PANAS consists of two 10-item subsets (Watson et al., 1988), one measuring positive affect (PA) and one measuring negative affect (NA), and both subsets were averaged to form reliable scales (α 's = .81 and .87, respectively).

After this, the second study started. In this study, participants were asked to imagine the following situation:

You are someone who wants a job. You have applied for a vacant position in an organization, MicroMac Inc., and you want this position very much. MicroMac informs you that they are interested in you and they invite you to participate in the selection process that, as a standard procedure, all screened applicants at MicroMac have to complete. The selection process consists of nine parts: an intelligence test, a personality test, a test assessing mathematics skills, a test assessing understanding of technical matters, a test assessing calculation skills, a test assessing language skills, a questionnaire assessing demographic data, a test assessing achievement motivation, and an interview with a personnel officer at MicroMac. You go to MicroMac and participate in the selection process.

This was followed by the manipulation of procedure. Participants read the sentence (manipulated information in italics):

A week after you participated in the selection process you are informed that *all 9 parts/1 of the 9 parts* of the selection process were graded.

After this, the dependent variables and manipulation checks were solicited. All ratings were made on 7-point

³ In all experiments presented here, gender was proportionally distributed among conditions. Gender had no main or interaction effects on the dependent variables of the experiments and hence was dropped from the analyses that are presented in this paper.

Likert-type scales. Dependent variables were the same anger toward treatment items measured in Van den Bos (2001a, Experiments 2 & 3): Participants were asked how angry (1 = not at all angry, 7 = very angry), hostile (1 = not at all hostile, 7 = very hostile), furious (1 = not at all furious, 7 = very furious), and infuriated (1 = not at all infuriated, 7 = very infuriated) they felt about the way they were treated. These ratings were averaged to form a highly reliable scale of anger toward treatment ($\alpha = .95$).

Following previous fairness studies, the manipulation of procedure was checked by asking participants how fair (1 = very unfair, 7 = very fair) and appropriate (1 = very inappropriate, 7 = very appropriate) they considered the way in which they had been treated. These judgments were averaged to form a reliable procedural fairness judgments scale ($\alpha = .93$). To assess whether participants in the uncertainty salient condition had not been thinking about death, all participants were asked whether (1 = definitely did not, 7 = definitely did) and to what extent (1 = very weak, 7 = very strong) they had been thinking about death when they were writing down their answers. These answers were averaged to form a reliable mortality salience scale ($\alpha = .97$). When the participants had answered these questions, and had completed the other experiments in which they would participate, they were thoroughly debriefed (see Van den Bos, 2003, for complete debriefing procedure) and paid for their participation.

Results

Manipulation checks

A 2×2 analysis of variance (ANOVA) on the procedural fairness scale yielded only a main effect of procedure, $F(1, 96) = 91.53$, $p < .001$. As expected, participants who had experienced an accurate procedure judged the procedure to be more fair ($M = 4.7$, $SD = 1.5$) than those who had experienced an inaccurate procedure ($M = 2.2$, $SD = 1.2$). This shows that the manipulation of procedure was successful in affecting the relative strength of participants' procedural fairness judgments in ways that were intended with this manipulation.

A 2×2 ANOVA on the mortality salience scale produced only a main effect of the salience manipulation, $F(1, 96) = 304.58$, $p < .001$. As intended, participants in the uncertainty salient condition had not been thinking about death ($M = 1.2$, $SD = 0.5$) whereas those in the mortality salient condition had ($M = 5.4$, $SD = 1.6$). To further assess whether participants in the uncertainty salient condition had not been thinking about death-related issues, two judges coded whether the answers that all participants wrote down during the salience manipulation had anything to do with death (0 = no, 1 = yes) or were related to uncertainty

(0 = no, 1 = yes).⁴ Independent of each other, the two judges indicated that in the mortality salient condition all of the answers were related to death and that in the uncertainty salient condition none of the answers were related to death but all answers were related to uncertainty. In correspondence with the results by Van den Bos (2001a), these findings suggest that death-related thoughts cannot explain the effects within the uncertainty salient condition.

Interestingly, the results of what participants wrote down also showed that, although all participants in the mortality salient condition had been thinking about death, some (24%) of the participants in the mortality salient condition had also been thinking of the same uncertainty-related issues as all participants in the uncertainty salient condition had. Uncertainty was clearly more salient in the uncertainty salient condition than in the mortality salient condition, $\chi^2(1) = 61.29$, $p < .001$, but the fact that some uncertainty-related thought was observed in the mortality salient condition is in line with arguments that have been put forward that an effect (but not the only effect) of manipulations of mortality salience may be the activation of uncertainty-related thought (e.g., Martin, 1999; McGregor et al., 2001; Van den Bos & Lind, 2002).⁵ We will return to this in Experiments 2–5 and the General discussion.

PANAS findings

Following previous terror and uncertainty management experiments, the PANAS was administered immediately following the uncertainty salience manipulation, serving primarily as a filler task and to find out whether unintended effects of the salience manipulation on the positive and negative subsets are found. As expected, 2×2 multivariate analysis of variance (MANOVA) yielded no significant effects on both the PA and the NA scales. Overall means of the PA and NA scales were 2.8 ($SD = 0.7$) and 1.5 ($SD = 0.6$), respectively.

Dependent variables

Dependent variables assessed participants' anger toward the way they were treated. The means and standard deviations of the anger scale are displayed in Table 1. A 2×2 ANOVA on the anger scale yielded

⁴ For example, in response to the question "please briefly describe the emotions that the thought of your death arouses in you," some participants answered "uncertain and powerless" or "a scary feeling and an experience of uncertainty; stress and tension" and these answers were coded as being uncertainty-related.

⁵ It should be noted here that anger reactions of both mortality participants who wrote and who did not write about uncertainty were not significantly influenced by the procedure manipulation. Perhaps this absence of effects was due to the small number of participants in the cells of the ANOVA that had to be used to test these effects. We will come back to this in the other experiments and the General discussion.

Table 1
Means and standard deviations of experienced anger toward treatment as a function of salience and procedure (Experiment 1)

Procedure	Salience			
	Uncertainty		Mortality	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Accurate	2.9	1.3	2.8	1.3
Inaccurate	4.9	0.7	3.8	1.8

Note. Means are on 7-point scales, with higher values indicating more anger toward treatment.

main effects of procedure, $F(1, 96) = 32.35$, $p < .001$, and the salience manipulation, $F(1, 96) = 5.71$, $p < .05$; effects that were qualified by a significant interaction effect, $F(1, 96) = 4.19$, $p < .05$. Further testing these effects by testing for simple main effects showed a statistically significant procedure effect in the mortality salient condition, $F(1, 96) = 6.62$, $p < .02$, $\eta^2 = .07$, thus replicating earlier terror management findings (e.g., Van den Bos & Miedema, 2000). Furthermore, this also revealed that the procedure effect was three times as large in the uncertainty salient condition, $F(1, 96) = 29.92$, $p < .001$, $\eta^2 = .24$, than in the mortality salient condition, hence providing strong evidence for the uncertainty management model (e.g., Van den Bos & Lind, 2002).

As an aside, it can be noted here that the results indicated a significant salience effect within the inaccurate procedure condition, $F(1, 96) = 9.84$, $p < .01$, $\eta^2 = .09$, and a nonsignificant salience effect within the accurate procedure condition, $F(1, 96) = 0.06$, $p < .82$, $\eta^2 = .00$. We will return to this in the General discussion.

Discussion

The reported findings show that when people have been thinking about their being uncertain *and* when they have been thinking about their own death, their ratings of anger toward treatment are significantly influenced by variations in procedural fairness (viz. accurate vs. inaccurate procedures). This indicates supportive evidence for the impact of both mortality and uncertainty salience on people's reactions toward fairness of treatment, thus supporting both terror management theory and the uncertainty management model. Interestingly, the findings of Experiment 1 further reveal that even stronger fair process effects are to be found following uncertainty salience than following mortality salience. The results thus provide supportive evidence for uncertainty management model's reasoning that uncertainty-related thought is a key cause of people's reactions toward variations in procedural fairness and even suggest that uncertainty salience is a more important cause of people's reactions to experiences of procedural fairness than a strong other account (viz. terror management theory). Before strong conclusions are drawn on

the basis of these results, however, it is important to replicate them in a second experiment.

Experiment 2

Participants in Experiment 1 read a scenario and responded to this hypothetical situation. One might wonder whether similar results would be obtained when participants were exposed to a situation in which they directly experienced variations in procedural fairness. In Experiment 2, therefore, the procedure manipulation was directly experienced by participants. To get an indication of the robustness of the effects reported in Experiment 1, the procedural fairness manipulation that was used in of Experiment 2 consisted of the most generally accepted and best-documented manipulation in procedural fairness experiments: Participants were or were not allowed an opportunity to voice their opinions about a decision to be made (cf. Van den Bos, 2001a, Experiments 1 and 3; Van den Bos, Lind, Vermunt, & Wilke, 1997; Van den Bos & Miedema, 2000, Experiments 1 and 2).

Findings of Experiment 1 suggest that uncertainty salience has a stronger impact on people's reactions toward procedural fairness than mortality salience. The goal of Experiment 2 was to find out whether these effects could be replicated in an experiment in which participants directly experienced a procedure manipulation. An additional aim was to show that mortality salience yielded stronger procedure effects than a control condition that is commonly used in mortality salience research (Greenberg et al., 1997) and that does not remind participants about their uncertainties or their own death (Van den Bos, 2001a). Therefore, following previous terror and uncertainty management studies (Greenberg et al., 1997; Van den Bos, 2001a), participants were asked to describe their feelings and emotions when they were watching television. The uncertainty and mortality manipulations were the same as in Experiment 1. If the mortality salient condition would yield stronger process effects than the control condition and the uncertainty salient condition even stronger effects than the mortality salient condition, this would constitute strong evidence for the role of uncertainty salience as a key factor in causing people's reactions to procedural fairness.

Method

Participants and design

One hundred and twenty-six students (39 men and 87 women) at Utrecht University participated in the experiment and were paid for their participation. Participants were randomly assigned to one of the conditions of the 3 (salience: uncertainty vs. mortality vs. television) \times 2 (procedure: voice vs. no-voice) factorial design. The

design was balanced with twenty-one participants taking part in each of the conditions.

Experimental procedure

The experimental procedure was the same as in Experiment 1, except for the below-mentioned points. Participants participated in the experiment after and before participating in other, unrelated experiments. The experiments lasted a total of 60 min, and participants were paid 7 Euros for their participation.

In the first part of the instructions, participants were informed that they participated in the study with another person, referred to as Other. The experimental procedure was then outlined to the participants: After the experimental tasks were explained, participants would practice the tasks for 2 min, after which time they would work on the tasks for 10 min. Furthermore, participants were informed that, after all participants were run, a lottery would be held among all participants. The winner of this lottery would receive 50 Euros. (Actually, after all participants had completed the experiment, the 50 Euros were randomly given to one participant; a procedure to which none of the participants objected upon debriefing). Participants were told that a total of 200 lottery tickets would be divided among all participants. Furthermore, participants were told that after the work round the experimenter would divide some lottery tickets between them and Other. Seven practice questions were posed to ensure comprehension of the lottery. If participants gave a wrong answer to a question, the correct answer was disclosed and main characteristics of the lottery were repeated.

The task was then explained to the participants. Figures would be presented on the upper right part of the computer screen. Each figure consisted of 36 squares, and each square showed one of eight distinct patterns. On the upper left side of the computer screen one of the eight patterns would be presented, and participants had to count the number of squares with this pattern in the figure on the right side of the screen. When participants had indicated the correct number of patterns in the figure on the right side of the screen, another figure and another pattern would be presented on the screen. In both the practice round and the work round, the number of tasks that the participant had completed (i.e., the number of figures that the participant had counted) in the present round would be presented on the lower right side of the screen. On the lower left side of the screen the time remaining in the present round was shown.

The practice round then began, after which the work round began. After the work round had ended, participants were told how many tasks they had completed in the work round, and—in order to ensure that participants compared themselves to Other—it was communi-

cated to the participant that Other had completed an equivalent number of tasks. To assess whether participants thought of Other as a person who was comparable in the amounts of inputs he or she provided (cf. Van den Bos, Lind et al., 1997), they were asked to what extent Other had performed well in the work round relative to the performance of the participant self (1 = much worse, 4 = equally, and 7 = much better), to what extent Other did his/her best in the work round relative to the participant self (1 = much worse, 4 = equally, and 7 = much better), and to what extent Other was good in performing the tasks in the work round relative to the participant self (1 = much worse, 4 = equally, 7 = much better). After this, participants were asked to think for one minute about the percentage of lottery tickets that they should receive relative to Other.

Following Van den Bos (2001a) and Van den Bos and Miedema (2000), participants were then told that before the experimenter would divide the lottery tickets between them and Other, they would be asked to complete a number of questions, and that after they would have completed these questions, the study would continue. The salience manipulation was then manipulated. The uncertainty and mortality manipulations were the same as in Experiment 1. Participants in the television salient condition were asked two questions that were similar in format and that did not remind participants about their own death or their uncertainties (Greenberg et al., 1997; Van den Bos, 2001a): These participants were asked to write down on a piece of paper next to the computer their answers to the questions (1) “Please briefly describe the emotions that the thought of you watching television arouses in you,” and (2) “Please write down, as specifically as you can, what you think physically will happen to you as you watch television.” After this, all participants completed the PANAS, with both the positive and negative subsets again yielding reliable scales (both α 's = .80). After they had completed the PANAS, all participants were told that by pushing the return button on the keyboard the study would continue.

The procedure was then manipulated. In the voice condition, the experimenter allegedly asked participants, by means of the computer network, to type in their opinion about the percentage of tickets that they should receive relative to Other. (In reality, however, all stimulus information was preprogrammed.) Participants in the no-voice condition were informed that they would not be asked to type their opinion about the percentage of tickets that they should receive relative to Other.

After this, participants were asked questions pertaining to the dependent variables and manipulation checks. Dependent variables were the same anger items assessed in Experiment 1 ($\alpha = .86$). In addition, the same fairness judgment scale as in Experiment 1 was assessed ($\alpha = .96$). Following previous fairness studies, the manipulation of procedure was further checked by asking

participants to what extent they agreed with the statement that they had been given an opportunity to voice their opinion about the percentage of tickets that they should receive relative to Other (1 = strongly disagree, 7 = strongly agree) and to what extent they agreed with the statement that they had *not* been given an opportunity to voice their opinion about the percentage of tickets that they should receive relative to Other (1 = strongly disagree, 7 = strongly agree).

The salience manipulation was checked by asking participants whether (1 = definitely did not, 7 = definitely did) and to what extent (1 = very weak, 7 = very strong) they had been thinking about uncertainty when they were writing down their answers ($\alpha = .95$), whether (1 = definitely did not, 7 = definitely did) and to what extent (1 = very weak, 7 = very strong) they had been thinking about death when they were writing down their answers ($\alpha = .91$), and whether (1 = definitely did not, 7 = definitely did) and to what extent (1 = very weak, 7 = very strong) they had been thinking about watching television when they were writing down their answers ($\alpha = .96$). When the participants had answered these questions, and had completed the other experiments in which they would participate, they were thoroughly debriefed and paid for their participation.

Results

Manipulation checks

A 3×2 MANOVA on the two manipulation checks of procedure (the voice check and the no-voice check) yielded only a main effect of procedure at both the multivariate level and the univariate levels: multivariate $F(2, 119) = 245.34, p < .001$; for the voice check, $F(1, 120) = 376.71, p < .001$; for the no-voice check, $F(1, 120) = 401.90, p < .001$. Participants in the voice condition agreed more with the statement that they received an opportunity to voice their opinion ($M = 6.2, SD = 1.1$) than participants in the no-voice condition ($M = 1.7, SD = 1.5$). Participants in the no-voice condition agreed more with the statement that they did *not* receive an opportunity to voice their opinion ($M = 6.2, SD = 1.6$) than those in the voice condition ($M = 1.6, SD = 1.0$). This suggests that procedure was successfully operationalized.

Similar to Experiment 1, a 3×2 ANOVA on participants' procedural fairness judgments yielded only a main effect of procedure, $F(1, 120) = 96.07, p < .001$. As expected, participants who had received an opportunity to voice their opinion judged the procedure to be more fair ($M = 5.4, SD = 1.2$) than participants who did not receive such an opportunity ($M = 3.1, SD = 1.5$). This shows that the manipulation of procedure was successful in affecting the relative strength of participants' procedural fairness judgments in ways that were intended with this manipulation.

A 3×2 MANOVA on the uncertainty, mortality, and television salience scales indicated only a main effect of the salience manipulation at both the multivariate level and the univariate levels: multivariate $F(6, 236) = 45.95, p < .001$; for the uncertainty salience scale, $F(1, 120) = 39.07, p < .001$; for the mortality salience scale, $F(1, 120) = 39.07, p < .001$; for the television salience scale, $F(1, 120) = 39.07, p < .001$. To interpret these effects we performed on each salience scale a least significant difference test for multiple comparisons between means ($p < .05$), with the three conditions of the salience manipulation serving as the independent variable. As intended this showed that participants in the television salient condition had been thinking about watching television ($M = 4.5, SD = 2.3$) whereas those in the uncertainty and mortality salient conditions had not ($M_s = 1.4$ and $1.5, SD_s = 0.9$ and 0.8 , respectively). The least significant difference test indicated that the difference between the television and the other two conditions was significant and that the latter two conditions did not differ significantly from each other.

Results further showed that participants in the mortality salient condition had been thinking about death ($M = 3.9, SD = 2.2$) whereas those in both the uncertainty and television conditions had not ($M_s = 1.3$ and $1.2, SD_s = 0.5$ and 0.6 , respectively). The differences between the first and the other two conditions were statistically significant and the difference between the latter two conditions was not. To further assess whether participants in the uncertainty salient condition had not been thinking about death-related issues, two judges coded whether the answers that all participants wrote down during the salience manipulation had anything to do with death (0 = no, 1 = yes), were related to uncertainty (0 = no, 1 = yes), or were related to watching television (0 = no, 1 = yes). Independent of each other, the two judges indicated that in the mortality salient condition all of the answers were related to death, that in the television salient condition none of the answers were related to death but all answers were related to watching television, and that in the uncertainty salient condition none of the answers were related to death but all answers were related to uncertainty. These findings are in correspondence with the results of Experiment 1 and those of Van den Bos (2001a) and suggest that death-related thoughts cannot explain the effects within the uncertainty salient condition.

In correspondence with Experiment 1, the results of what participants wrote down also showed that, although all participants in the mortality salient condition had been thinking about death, some (36%) of the participants in the mortality salient condition had also been thinking of uncertainty-related issues. Uncertainty was clearly more salient in the uncertainty salient condition than in both the mortality salient condition, $\chi^2(1) = 61.29, p < .001$, and the television salient condi-

tion, $\chi^2(1) = 84.00$, $p < .001$, but the fact that some uncertainty-related thought could be detected in the mortality salient condition, and significantly more so than in the television salient condition, $\chi^2(1) = 84.00$, $p < .001$, is in line with arguments that have been put forward that an important component of mortality salience effects may be the triggering of uncertainty-related thought (e.g., Martin, 1999; McGregor et al., 2001; Van den Bos & Lind, 2002).⁶ We will return to this below.

Least significant differences analyses on the uncertainty salience scale also revealed that, as intended, participants in the uncertainty salient condition had been thinking significantly more about uncertainty ($M = 5.5$, $SD = 1.7$) than participants in both the mortality salient ($M = 3.3$, $SD = 1.9$) and the television salient ($M = 2.3$, $SD = 1.5$) conditions. This showed that, as intended, uncertainty was more salient in the uncertainty condition than in the other two conditions. It can be concluded that the manipulation-check findings reported here suggest that the salience manipulation was successful in influencing the relative strength of participants' thoughts in ways that were intended with this manipulation.

Interestingly, the results of the least significant difference test on the uncertainty salience scale also showed that uncertainty was more salient in the mortality condition than in the television condition. This provides support for suggestions that have been put forward in the literature that mortality salience manipulations may induce uncertainty-related thought (e.g., Martin, 1999; McGregor et al., 2001; Van den Bos & Lind, 2002). In fact, findings showed that 36% of the mortality participants scored higher than "4" on the uncertainty salience scale, suggesting that for these participants uncertainty clearly was a salient issue.⁷ It can be concluded that, in accordance with the aims of the current paper, our manipulation check findings show that our uncertainty salient condition was successful in affecting uncertainty-related thought more directly than the mortality salient condition did, and that in line with arguments that have been put forward in the literature, the findings also suggest that an important (yet not the only) consequence of mortality salience manipulations may be the activation of uncertainty-related thought (e.g., Martin,

1999; McGregor et al., 2001; Van den Bos & Lind, 2002). We will return to this in Experiments 3–5 and the General discussion.

PANAS findings

In correspondence with Experiment 1, a 3×2 MANOVA on participants' scores on the PANAS subsets showed no significant effects. Overall means of the PA and NA subsets were 2.8 ($SD = 0.6$) and 1.3 ($SD = 0.4$), respectively.

Comparability measures

As expected, participants' comparability judgments yielded no significant effects at both the multivariate level and the univariate levels in a 3×2 MANOVA. Participants indicated that the other participant had performed equally well in the work round ($M = 4.0$, $SD = 0.3$), had done equally his/her best in the work round ($M = 4.0$, $SD = 0.4$), and was equally good in performing the tasks ($M = 3.9$, $SD = 0.3$). Thus, participants thought of the other person as a comparable person with respect to the tasks that were completed in the experiment.

Percentage findings

Participants who were allowed voice ($n = 63$) typed in their opinion about the percentage tickets that they should receive relative to the other participant. A one-way ANOVA yielded no significant effect of the salience manipulation. Inspection of the means indicated that participants typed in that the lottery tickets should be divided equally between themselves and the other participant: Sixty-one participants answered that they should get 50% of the tickets and the mean percentage was 50.6% ($SD = 6.4$). These findings are supportive of equity theory (cf. Adams, 1965): Participants preferred to divide outcomes equally between themselves and the other participant (who contributed an equal amount of inputs, and who hence deserved—according to equity theory—to receive the same amount of outputs as the participants themselves).

Dependent variables

Dependent variables measured participants' anger toward the way they were treated. The means and standard deviations of the anger scale are displayed in Table 2. A 3×2 ANOVA on the anger scale yielded a main effect of procedure, $F(1, 120) = 16.93$, $p < .001$; an effect that was qualified by the interaction effect, $F(2, 120) = 4.15$, $p < .02$. The salience main effect was not significant, $F(1, 120) = 1.02$, n.s. In accordance with what one would expect on the basis of Experiment 1, a stronger procedure effect was found in the mortality salient condition, $F(1, 120) = 4.83$, $p < .04$, $\eta^2 = .04$, than in the television condition, $F(1, 120) = 0.19$, $p < .67$, $\eta^2 = .00$, thus replicating earlier terror management find-

⁶ In fact, anger reactions of mortality participants who wrote about uncertainty were significantly influenced by the procedure manipulation, $F(1, 118) = 6.02$, $p < .02$, whereas anger reactions of mortality participants who only wrote about death and did not write about uncertainty were not significantly influenced by variations in procedure, $F(1, 118) = 0.84$, n.s. These findings are in accordance with our line of reasoning.

⁷ Anger reactions of these participants were significantly influenced by the procedure manipulation, $F(1, 114) = 4.01$, $p < .05$, whereas reactions of the other mortality participants were not significantly influenced by variations in procedure, $F(1, 114) = 1.55$, n.s. These findings are in accordance with the results regarding what participants wrote down (see Footnote 6).

Table 2
Means and standard deviations of experienced anger toward treatment as a function of salience and procedure (Experiment 2)

Procedure	Salience					
	Uncertainty		Mortality		Television	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Voice	1.3	0.4	1.9	1.0	2.3	1.5
No voice	2.9	1.4	2.7	1.0	2.5	1.3

Note. Means are on 7-point scales, with higher values indicating more anger toward treatment.

ings (e.g., Van den Bos & Miedema, 2000). Furthermore, the procedure effect found in the uncertainty salient condition, $F(1, 120) = 20.21$, $p < .001$, $\eta^2 = .14$, was three times as large as in the mortality salient condition, thereby replicating the findings of Experiment 1 and providing supportive evidence for the conclusion that uncertainty salience is a key antecedent of people's reactions toward fairness of treatment (Van den Bos & Lind, 2002).

In addition, it can be noted here that there was a statistically nonsignificant effect of salience within the no-voice condition, $F(2, 120) = 0.53$, n.s., $\eta^2 = .00$, and a significant salience effect within the voice condition, $F(2, 120) = 4.63$, $p < .03$, $\eta^2 = .07$, the latter effect being more due to the difference between the uncertainty and mortality salient conditions, $F(1, 120) = 3.11$, $p < .09$, $\eta^2 = .03$, than the difference between the mortality and television salient conditions, $F(1, 120) = 1.60$, $p < .21$, $\eta^2 = .01$. We will come back to this in the General discussion.

Discussion

In correspondence with Experiment 1, findings of Experiment 2 show that asking people to think about issues that are related to their own uncertainties or their own mortality lead their anger toward treatment ratings to be strongly influenced by variations in procedural fairness. Furthermore, in both experiments it was found that uncertainty salience has an even bigger impact on people's reactions than mortality salience. These findings were obtained when people reacted to a hypothetical procedure (Experiment 1) and when they directly experienced the procedure (Experiment 2), and when the procedure varied accuracy (Experiment 1) and voice opportunities (Experiment 2). This supports the uncertainty management model's reasoning that reminders of uncertainty are a key determinant of people's reactions toward variations in procedural fairness and even suggest that uncertainty salience is a more important cause of people's reactions to fairness of treatment than an important other account. Before conclusions were drawn, however, another experiment was conducted.

Experiment 3

Although there is no doubt that fairness is one of the most important social norms and values in human life (e.g., Folger, 1984; Folger & Cropanzano, 1998; Tyler & Smith, 1998), it was considered important to assess reactions to other elements of people's cultural worldviews as well. Previous terror management research used ingroup–outgroup differences to study mortality salience effects (see, e.g., Greenberg et al., 1990, 1997; Solomon et al., 1991). Furthermore, Dechesne et al. (2000) showed that praise of students' own university constitutes a bolstering of their cultural worldview whereas criticism of the university represents a violation of participants' worldviews. In Experiment 3, therefore, university students read and responded to an article in which a student from an important rival university was either positive or negative about the participants' own university, and the effects of mortality and uncertainty salience manipulations on participants' reactions to these articles were assessed.

In two other ways the stimulus materials of Experiment 3 tried to shed light on the robustness of the findings obtained in Experiments 1 and 2. As mentioned before, pilot testing showed that mortality salience yielded the strongest effects on negative affect reactions. Besides anger (which was measured in Experiments 1 and 2), sadness constitutes another important negative affective state (e.g., Bodenhausen, Sheppard, & Kramer, 1994; Schwarz, 1990). Therefore, both anger and sadness were measured in Experiment 3. Thus far, dependent variables assessed participants' anger toward the way in which they had been treated. Because this might have biased the results into the direction of a fairness model (such as the uncertainty management framework), Experiment 3 solicited people's general feelings of anger and sadness (rather than how angry and sad they felt about the way in which they had been treated).

Method

Participants and design

Eighty-four students (27 men and 57 women) at Utrecht University participated in the experiment and were paid for their participation. Participants were randomly assigned to one of the conditions of the 2 (salience: uncertainty vs. mortality) \times 2 (article: positive vs. negative) factorial design. The design was balanced with 21 participants taking part in each of the conditions.

Experimental procedure

The experimental procedure was the same as in Experiment 1, except for the below-mentioned points. Participants participated in the experiment before participating in other, unrelated experiments. The

experiments lasted a total of 30 min, and participants were paid 4 Euros for their participation.

The experiment was presented to the participants as two separate studies. In the first study, the same salience manipulation as in Experiment 1 was induced. The positive and negative subsets of the PANAS again yielding reliable scales (α 's = .84 and .85, respectively).

After this, the second study started. In this study, participants were asked to read an article that ostensibly recently had appeared in "De Mare," the newspaper of Leiden University. In this article, a Leiden University student answered the question whether there had been an instance in which s/he had taken a course at another university. In the positive article condition, participants read the following materials:

Last year, I took a course at Utrecht University. I had been looking for an opportunity to take some classes elsewhere and there happened to be a course at Utrecht University that was relevant for my major. So, I signed up for the course, bought the textbook, and went to Utrecht University twice a week for a period of three months. Lectures were well taught and there was ample room to ask questions. It was fun attending the seminars. We had to complete assignments in small groups and it was great working together with these Utrecht University students. Interactions with teachers and students were excellent, so I did not have to adapt to another environment or something like that. The teaching was not very different from Leiden University's teaching, so I passed the exam with no difficulty. If you are interested in doing so, I certainly would like to recommend to take a course somewhere outside of Leiden someday!

The negative article read as follows:

Last year, I took a course at Utrecht University. That was a complete disaster! During lectures all students were talking out loud, so I hardly could follow the lectures. Seminars hit an all time low. I was getting the impression that everyone over there were just serving their time. The standards of these Utrecht University students are really low: No one prepares anything and no one asks interesting questions. Worst of all was the fact that I had to complete assignments with a couple of those students. It was very hard working together with those kind of people! If they showed up at all, they only made stupid remarks. Fortunately, things are much better here at Leiden University. The students over here are motivated and really interested in discussions. The only positive thing of my Utrecht experience was that I passed the exam, so that I do not have to see these Utrecht University students again!

After this, the dependent variables and manipulation checks were solicited. All ratings were made on 7-point Likert-type scales. Dependent variables were experienced anger (cf. Experiments 1 and 2) and sadness (cf. Van den

Bos, 2001a, 2001b). Anger was measured by asking participants how angry (1 = not at all angry, 7 = very angry), hostile (1 = not at all hostile, 7 = very hostile), furious (1 = not at all furious, 7 = very furious), and infuriated (1 = not at all infuriated, 7 = very infuriated) they felt at this moment (α = .94). Sadness was solicited by asking participants how sad (1 = very weak, 7 = very strong) and disappointed (1 = very weak, 7 = very strong) they felt at this moment (α = .76). The uncertainty and mortality salience conditions were checked in the same way as in Experiment 2 (α 's this time: .94 and .96, respectively). When the participants had answered these questions, and had completed the other experiments in which they would participate, they were thoroughly debriefed and paid for their participation.

Results

Manipulation checks

A 2×2 MANOVA on the uncertainty and mortality salience scales indicated the expected main effects of the salience manipulation at both the multivariate level and the univariate levels: multivariate $F(2, 79) = 75.72$, $p < .001$; for the uncertainty salience scale, $F(1, 80) = 19.02$, $p < .001$; for the mortality salience scale, $F(1, 80) = 117.04$, $p < .001$. As intended, participants in the mortality salient condition had been thinking about death ($M = 5.0$, $SD = 1.8$) whereas those in the uncertainty condition had not ($M = 1.4$, $SD = 0.7$). As in Experiments 1 and 2, two judges coded whether the answers that participants wrote down during the salience manipulation had anything to do with death (0 = no, 1 = yes) or were related to uncertainty (0 = no, 1 = yes). Independent of each other, the two judges indicated that in the mortality salient condition all of the answers were related to death, and that in the uncertainty salient condition none of the answers were related to death but all answers were related to uncertainty. These findings are in correspondence with the results of Experiments 1 and 2 and those of Van den Bos (2001a) and suggest that death-related thoughts cannot explain the effects within the uncertainty salient condition.

In further correspondence with Experiments 1 and 2, what participants wrote down showed that, although all participants in the mortality salient condition had been thinking about death, 50% of the participants in the mortality salient condition had also been thinking of uncertainty-related issues. Uncertainty was clearly more salient in the uncertainty salient condition than in the mortality salient condition, $\chi^2(1) = 28.00$, $p < .001$, but the fact that uncertainty-related thought was observed in the mortality salient condition, corresponds with Experiments 1 and 2 and with the line of reasoning that an important component of mortality salience effects may be the activation of uncertainty-re-

lated thought (e.g., Martin, 1999; McGregor et al., 2001; Van den Bos & Lind, 2002).⁸ We will come back to this below.

As intended, analyses on the uncertainty salience scale showed that participants in the uncertainty salient condition had been thinking significantly more about uncertainty ($M = 5.3$, $SD = 1.6$) than those in the mortality salient condition ($M = 3.7$, $SD = 1.8$). This showed that, as intended, uncertainty was more salient in the uncertainty condition than in the mortality salient condition. Interestingly, the results regarding the uncertainty salience scale also showed that 45% of the mortality participants scored higher than “4” on the uncertainty salience scale, suggesting that for these participants uncertainty clearly was a salient issue.⁹ Thus, as in the previous experiments, our uncertainty salient condition was successful in affecting uncertainty-related thought more directly than the mortality salient condition did and findings of Experiment 3 again indicate that an important (albeit not the only) consequence of mortality salience manipulations may be the activation of uncertainty-related thought (e.g., Martin, 1999; McGregor et al., 2001; Van den Bos & Lind, 2002). We will return to this issue in Experiments 4 and 5 and the General discussion.

PANAS findings

In correspondence with Experiments 1 and 2, the PANAS yielded no reliable effects in a 2×2 MANOVA. Overall means of the PA and NA scales were 3.0 ($SD = 0.6$) and 1.5 ($SD = 0.5$), respectively.

Dependent variables

Dependent variables assessed participants' general feelings of anger and sadness. The means and standard deviations of these two dependent variables are presented in Table 3. As expected, a 2×2 MANOVA on the dependent variables yielded a multivariate main effect of

Table 3

Means and standard deviations of experienced anger and sadness as a function of salience and article (Experiment 3)

Dependent variable	Article	Salience			
		Uncertainty		Mortality	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Anger	Positive	1.8	1.1	1.6	0.9
	Negative	2.7	1.2	3.1	1.4
Sadness	Positive	1.3	0.6	1.6	0.5
	Negative	2.4	1.3	1.8	1.1

Note. Means are on 7-point scales, with higher values indicating more positive ratings of the dependent variable in question.

the article manipulation, $F(2,79) = 13.30$, $p < .001$; an effect that was qualified by a significant multivariate interaction effect, $F(2,79) = 3.56$, $p < .04$.

Univariate analyses (2×2 ANOVAs) revealed that the main effect of the article manipulation on participants' anger reactions, $F(1,80) = 22.51$, $p < .001$, was not qualified by a significant salience \times article interaction effect, $F(1,80) = 1.52$, $p > .22$. This shows that in both mortality and uncertainty salient conditions, participants were more angry following reading the negative article than following the positive article. This provides evidence that both mortality and uncertainty salience manipulations had significant effects on participants' anger reactions, revealing additional evidence that both manipulations were induced successfully. These findings thus support predictions by both terror and uncertainty management theories.

More interestingly, participants' feelings of sadness revealed a main effect of the article manipulation, $F(1,80) = 9.09$, $p < .01$, and a significant interaction effect, $F(1,80) = 4.36$, $p < .05$. In accordance with Experiments 1 and 2, this revealed that the effect of the article manipulation was stronger in the uncertainty salient condition than in the mortality salient condition. In fact, the article effect was significant in the uncertainty salient condition, $F(1,80) = 13.02$, $p < .001$, and was not statistically significant in the mortality salient condition, $F(1,80) = 0.43$, n.s. These findings provide supportive evidence for uncertainty management's predictions (e.g., Van den Bos & Lind, 2002) that it is especially under conditions of uncertainty that people start to react strongly toward issues related to cultural norms and values (such as an outgroup member communicating favorably or unfavorably about one's own ingroup).

As an aside, it can be noted here that the sadness results indicated a nonsignificant salience effect within the positive article condition, $F(1,80) = 0.97$, n.s., and a marginally significant effect within the negative article condition, $F(1,80) = 3.87$, $p = .05$. We will come back to this in the General discussion.

⁸ Although sadness reactions of mortality participants who wrote and did not write about uncertainty were not significantly influenced by the procedure manipulation (perhaps due to the relatively small number of participants in the cells of the ANOVA; cf. Footnote 5), anger reactions of mortality participants who wrote about uncertainty were stronger influenced by the article manipulation, $F(1,78) = 14.36$, $p < .001$, $\eta^2 = .16$, than those who only wrote about death and did not write about uncertainty, $F(1,78) = 4.98$, $p < .05$, $\eta^2 = .06$. We will return to this observation later in Experiment 3 and in the General discussion.

⁹ Sadness reactions of these participants were not stronger influenced by the article manipulation than sadness reactions of the other mortality participants, but anger reactions of these participants were stronger influenced by the article manipulation, $F(1,76) = 14.05$, $p < .001$, $\eta^2 = .16$, than anger reactions of the other mortality participants, $F(1,76) = 5.98$, $p < .05$, $\eta^2 = .07$. These findings correspond with the results regarding what participants wrote down (see Footnote 8).

Discussion

The findings of Experiment 3 show that when people have been thinking about their being uncertain and when they have been thinking about their own death, their ratings of anger are significantly influenced by the favorability of information about personally relevant groups (viz. positive vs. negative information about one's own university). This indicates supportive evidence for the impact of both mortality and uncertainty salience on reactions toward events that bolster or violate people's cultural worldviews. Interestingly, the findings of Experiment 3 further reveal that even stronger reactions toward the valence of ingroup information can be found on people's feelings of sadness following uncertainty salience than following mortality salience. In accordance with the findings of Experiments 1 and 2, these results provide supportive evidence for uncertainty management's claim that it is particularly under conditions of uncertainty that people start to react strongly toward issues related to cultural norms and values. These findings thus reveal that the impact of uncertainty salience is not restricted to reactions toward fair and unfair events (Experiments 1 and 2) and that uncertainty salience also can have a bigger impact on people's reactions than mortality salience when cultural worldview issues are studied that have served a more prominent role in previous terror management studies and theorizing (Experiment 3) (see, e.g., Dechesne et al., 2000; Greenberg et al., 1990, 1997; Solomon et al., 1991).

Experiment 4

A critic might note at this point that it would be important to show the effects predicted here on people's reactions to defend their cultural worldviews, being often the main dependent variable in terror management studies. Therefore, following earlier terror management research (see, e.g., Dechesne et al., 2000), in Experiment 4 we assessed to what extent participants agreed or disagreed with the opinions ventilated in the articles of Experiment 3. Agreement or disagreement with opinions of outgroup members is typically used in terror management research to assess worldview defense (see, e.g., Dechesne et al., 2000) and in Experiment 4, therefore, participants' worldview-defense reactions were measured following the manipulations of Experiment 3.

Another reason why this was considered to be important was because a critic might note that in Experiment 3 there was no statistically significant effect found of the article manipulation in the mortality salience condition. Another goal of Experiment 4 was therefore to show a significant article effect in the mortality salient condition and to assess whether the article effect would then still

found to be stronger in the uncertainty salient condition than in the mortality salient condition. Following our line of reasoning, it was predicted that worldview-defense reactions would be stronger influenced in the uncertainty salient than in the mortality salient conditions.

Method

Participants and design

One hundred and four students (24 men and 80 women) at Utrecht University participated in the experiment and were paid for their participation. Participants were randomly assigned to one of the conditions of the 2 (salience: uncertainty vs. mortality) \times 2 (article: positive vs. negative) factorial design. The design was balanced with 26 participants taking part in each of the conditions.

Experimental procedure

The experimental procedure was the same as in Experiment 3, except for the below-mentioned points. Participants participated in the experiment before participating in other, unrelated experiments. The experiments lasted a total of 30 min, and participants were paid 3 Euros for their participation.

The experiment was presented to the participants as two separate studies. In the first study, the same salience manipulation as in Experiment 3 was induced. The positive and negative subsets of the PANAS again yielding reliable scales (α 's = .77 and .83, respectively).

After this, the second study started, which consisted of the same article manipulation as in Experiment 3. After this, the dependent variables and manipulation checks were solicited. Dependent variables asked participants to what extent they disagreed or agreed with the general idea of the person in the article (1 = strongly disagree, 7 = strongly agree) and to what extent they disagreed or agreed with the remarks of the person with respect to content (1 = strongly disagree, 7 = strongly agree). Items such as these are typically used in terror management research to assess worldview defense (see, e.g., Dechesne et al., 2000) and to construct a reliable scale of participants' worldview-defense reactions, participants' answers to these questions were reverse coded and averaged (α = .76). The uncertainty and mortality salience conditions were checked in the same way as in Experiment 3 (α 's = .92 and .97, respectively). When the participants had answered these questions, and had completed the other experiments in which they would participate, they were thoroughly debriefed and paid for their participation.

Results

Manipulation checks

A 2×2 MANOVA on the uncertainty and mortality salience scales indicated the expected main effects of the

salience manipulation at both the multivariate level and the univariate levels: multivariate $F(2,99) = 217.30$, $p < .001$; for the uncertainty salience scale, $F(1,100) = 70.94$, $p < .001$; for the mortality salience scale, $F(1,100) = 294.51$, $p < .001$. As intended, participants in the mortality salient condition had been thinking about death ($M = 5.3$, $SD = 1.5$) whereas those in the uncertainty condition had not ($M = 1.3$, $SD = 0.7$). As in Experiments 1–3, two judges coded whether the answers that participants wrote down during the salience manipulation had anything to do with death (0 = no, 1 = yes) or were related to uncertainty (0 = no, 1 = yes). Independent of each other, the two judges indicated that in the mortality salient condition all of the answers were related to death, and that in the uncertainty salient condition none of the answers were related to death but all answers were related to uncertainty. These findings are in correspondence with the results of Experiments 1–3 and indicate that death-related thoughts cannot explain the effects within the uncertainty salient condition.

In further correspondence with Experiments 1–3, what participants wrote down showed that, although all participants in the mortality salient condition had been thinking about death, a substantial minority (27%) of the participants in the mortality salient condition had also been thinking of uncertainty-related issues. Uncertainty was clearly more salient in the uncertainty salient condition than in the mortality salient condition, $\chi^2(1) = 59.88$, $p < .001$, but the fact that uncertainty-related thought was observed in the mortality salient condition, corresponds with Experiments 1–3 and with the line of reasoning that an important component of mortality salience effects may be the activation of uncertainty-related thought (e.g., Martin, 1999; McGregor et al., 2001; Van den Bos & Lind, 2002).¹⁰ We will come back to this below.

As intended, analyses on the uncertainty salience scale showed that participants in the uncertainty salient condition had been thinking significantly more about uncertainty ($M = 5.8$, $SD = 1.2$) than those in the mortality salient condition ($M = 3.5$, $SD = 1.6$). Thus, as intended, uncertainty was more salient in the uncertainty condition than in the mortality salient condition. Interestingly, the results regarding the uncertainty salience scale also showed that 37% of the mortality participants scored higher than “4” on the uncertainty salience scale, suggesting that for these participants uncertainty clearly

Table 4

Means and standard deviations of worldview-defense reactions as a function of salience and article (Experiment 4)

Article	Salience			
	Uncertainty		Mortality	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Positive	3.0	1.0	3.4	0.9
Negative	4.9	1.3	4.4	1.3

Note. Means are on 7-point scales, with higher values indicating greater dislike for the opinions ventilated in the article.

was a salient issue.¹¹ Thus, as in the previous experiments, our uncertainty salient condition was successful in affecting uncertainty-related thought more directly than the mortality salient condition did and findings again indicate that an important (albeit not the only) consequence of mortality salience manipulations may be the activation of uncertainty-related thought (e.g., Martin, 1999; McGregor et al., 2001; Van den Bos & Lind, 2002). We will return to this issue in Experiment 5 and the General discussion.

PANAS findings

As in Experiments 1–3, the PANAS yielded no significant effects in a 2×2 MANOVA. Overall means of the PA and NA scales were 2.8 ($SD = 0.6$) and 1.4 ($SD = 0.5$), respectively.

Dependent variables

Dependent variables assessed participants' worldview-defense reactions (cf. Dechesne et al., 2000). The means and standard deviations of this dependent variable are presented in Table 4. As expected, a 2×2 ANOVA on this variable yielded a main effect of the article manipulation, $F(1,100) = 41.87$, $p < .001$; an effect that was qualified by the predicted interaction effect, $F(1,100) = 4.29$, $p < .05$. Testing for simple main effects revealed that the effect of the article manipulation was statistically significant in the mortality salient condition, $F(1,100) = 9.68$, $p < .01$, $\eta^2 = .09$, thereby replicating earlier terror management studies. More interestingly, compared to the effect within the mortality salient condition, the article effect was three times as large in the uncertainty salient condition, $F(1,100) = 13.02$, $p < .001$, $\eta^2 = .27$. These findings provide supportive evidence for uncertainty management's predictions (e.g., Van den Bos & Lind, 2002) that it is especially under conditions of uncertainty that people's worldview-defense reactions are strongly influenced by experiences that are positive versus negative about one's cultural worldview.

¹⁰ In correspondence with our line of reasoning, worldview-defense reactions of mortality participants who wrote about uncertainty were significantly influenced by the article manipulation, $F(1,98) = 10.22$, $p < .01$, whereas reactions of mortality participants who only wrote about death and did not write about uncertainty were not significantly influenced by the article manipulation, $F(1,98) = 2.97$, n.s.

¹¹ Worldview-defense reactions of these participants were significantly influenced by the article manipulation, $F(1,96) = 13.19$, $p < .001$, whereas reactions of the other mortality participants were not significantly influenced by the article manipulation, $F(1,96) = 1.41$, n.s. These findings correspond with the results regarding what participants wrote down (see Footnote 10).

It can further be noted here that nonsignificant salience effects were found within the positive article condition, $F(1,100) = 1.80$, n.s., and the negative article condition, $F(1,100) = 2.52$, n.s. We will return to this issue in the General discussion.

Experiment 5

The findings of Experiment 4 are important, because they indicate that on measures of worldview defense, uncertainty salience seems to be a more important antecedent than mortality salience of how people react to information that is positive or negative about their ingroup. Thus, the package of studies presented thus far all converge on the same point that uncertainty salience may be driving more of people's reactions to cultural norms and values than mortality salience.

It should be noted, however, that one could object to this conclusion by stating that the results of Experiment 2 were somewhat ambiguous since they yielded a statistically not significant effect of the procedural justice manipulation in the television salient (control) condition. Our goal of our fifth and last experiment, therefore, was to obtain a significant procedural justice effect in the control condition, to find stronger effects of this justice manipulation in the mortality salient condition, and then to see whether the uncertainty salience condition would be stronger in the uncertainty salient condition than in the mortality salient condition.

Method

Participants and design

One hundred and eighty students (45 men and 135 women) at Utrecht University participated in the experiment and were paid for their participation. Participants were randomly assigned to one of the conditions of the 3 (salience: uncertainty vs. mortality vs. television) \times 2 (procedure: accurate vs. inaccurate) factorial design. The design was balanced with 30 participants taking part in each of the conditions.

Experimental procedure

The experimental procedure was the same as in Experiment 1, except for the below-mentioned points. Participants participated in the experiment after participating in other, unrelated experiments. The experiments lasted a total of 40 min, and participants received 4 Euros or course credit for their participation.

The experiment was presented to the participants as two separate studies. In the first study, the same salience manipulation as in Experiment 2 was induced. The positive and negative subsets of the PANAS again yielding reliable scales (α 's = .83 and .82, respectively).

After this, the second study started, which included the same procedure manipulation as in Experiment 1. After this, the dependent variables and manipulation checks were measured. Dependent variables consisted of experienced anger, sadness, and worldview-defense reactions. Anger was assessed in the same way as in Experiments 1 and 2 ($\alpha = .91$), similar items as in Experiment 3 were used to measure how sad (1 = not at all sad, 7 = very sad) and disappointed (1 = not at all disappointed, 7 = very disappointed) participants felt about the way they had been treated ($\alpha = .64$), and participants' worldview-defense reactions were measured in a similar way as in Experiment 4 by asking participants to what extent they agreed with the general idea of MicroMac (1 = strongly disagree, 7 = strongly agree) (reverse coded) and to what extent they agreed with the remarks of MicroMac with respect to content (1 = strongly disagree, 7 = strongly agree) (reverse coded) ($\alpha = .83$).

The same fairness judgment scale as in Experiments 1 and 2 was used to check for the manipulation of procedural fairness ($\alpha = .95$). The uncertainty, mortality, and television salience conditions were checked in the same way as in Experiment 2 (α 's: .96, .95, and .98, respectively). When the participants had answered these questions, and had completed the other experiments in which they would participate, they were thoroughly debriefed and paid for their participation.

Results

Manipulation checks

A 3×2 ANOVA on the procedural fairness judgment scale yielded only a very strong main effect of the procedure manipulation, $F(1,174) = 224.32$, $p < .001$, indicating that the accurate procedure clearly led to more positive fairness judgments ($M = 5.1$, $SD = 1.2$) than the inaccurate procedure ($M = 2.5$, $SD = 1.2$). Thus, as in Experiment 1 the procedure manipulation was successful in affecting participants' procedural fairness judgments in ways that were intended with this manipulation.

A 3×2 MANOVA on the uncertainty, mortality, and television salience scales only showed the expected main effects of the salience manipulation at both the multivariate level and the univariate levels: multivariate $F(6,344) = 66.94$, $p < .001$; for the uncertainty salience scale, $F(2,174) = 49.20$, $p < .001$; for the mortality salience scale, $F(2,174) = 66.07$, $p < .001$; for the television salience scale, $F(2,174) = 96.14$, $p < .001$. As in Experiment 2, a least significant difference test ($p < .05$), with the three conditions of the salience manipulation serving as the independent variable, showed that participants in the television salient condition had been thinking about watching television ($M = 4.6$, $SD = 2.1$) whereas those in the uncertainty and mortality salient conditions had not (M s = 1.3 and 1.6, SD s = 0.8 and 1.1, respectively). The

least significant difference test indicated that the difference between the television and the other two conditions was significant and that the latter two conditions did not differ significantly from each other.

Results further showed that participants in the mortality salient condition had been thinking about death ($M = 3.6$, $SD = 2.1$) whereas those in both the uncertainty and television conditions had not ($M_s = 1.2$ and 1.3 , $SD_s = 0.6$ and 0.7 , respectively). The differences between the first and the other two conditions were statistically significant and the difference between the latter two conditions was not. Following the earlier experiments reported here, two judges coded whether the answers that all participants wrote down during the salience manipulation had anything to do with death (0 = no, 1 = yes), were related to uncertainty (0 = no, 1 = yes), or were related to watching television (0 = no, 1 = yes). Independent of each other, the two judges indicated that in the mortality salient condition all of the answers were related to death, that in the television salient condition none of the answers were related to death but all answers were related to watching television, and that in the uncertainty salient condition none of the answers were related to death but all answers were related to uncertainty. These findings are in correspondence with the results of Experiments 1–4 and indicate that death-related thoughts cannot explain the effects within the uncertainty salient condition.

In further correspondence with Experiments 1–4, what participants wrote down showed that, although all participants in the mortality salient condition had been thinking about death, some (28%) of the participants in the mortality salient condition had also been thinking of uncertainty-related issues. Uncertainty was clearly more salient in the uncertainty salient condition than in both the mortality salient condition, $\chi^2(1) = 67.01$, $p < .001$, and the television salient condition, $\chi^2(1) = 120.00$, $p < .001$, but the fact that some uncertainty-related thought could be detected in the mortality salient condition, and significantly more so than in the television salient condition, $\chi^2(1) = 19.81$, $p < .001$, corresponds with what we noted earlier, namely that an important component of mortality salience effects may be the triggering of uncertainty-related thought (e.g., Martin, 1999; McGregor et al., 2001; Van den Bos & Lind, 2002).¹² Below we will come back to this point.

¹² Although anger and worldview-defense reactions of mortality participants who wrote and did not write about uncertainty were not differentially influenced by the procedure manipulation (perhaps due to the relatively small number of participants in the cells of the ANOVA; cf. Footnote 5), sadness reactions of mortality participants who wrote about uncertainty were twice as much influenced by the procedure manipulation, $F(1, 172) = 17.38$, $p < .001$, $\eta^2 = .09$, than those who only wrote about death and did not write about uncertainty, $F(1, 172) = 8.10$, $p < .01$, $\eta^2 = .04$. We will come back to this observation later in Experiment 5 and in the General discussion.

Least significant differences analyses on the uncertainty salience scale also revealed that, as intended, participants in the uncertainty salient condition had been thinking significantly more about uncertainty ($M = 5.4$, $SD = 1.5$) than participants in both the mortality salient ($M = 3.3$, $SD = 1.8$) and the television salient ($M = 2.5$, $SD = 1.6$) conditions. This showed that, as intended, uncertainty was more salient in the uncertainty condition than in the other two conditions. It can be concluded that the manipulation-check findings reported here suggest that the salience manipulation was successful in influencing the relative strength of participants' thoughts in ways that were intended with this manipulation.

Furthermore, in correspondence with the findings reported earlier in this paper, the results of the least significant difference test on the uncertainty salience scale also showed that uncertainty was more salient in the mortality condition than in the television condition. This provides support for suggestions that have been put forward in the literature that mortality salience manipulations may induce uncertainty-related thought (e.g., Martin, 1999; McGregor et al., 2001; Van den Bos & Lind, 2002). In fact, findings showed that 35% of the mortality participants scored higher than "4" on the uncertainty salience scale, suggesting that for these participants uncertainty clearly was a salient issue.¹³ Thus, in correspondence with the findings reported earlier in this paper, our uncertainty salient condition was successful in affecting uncertainty-related thought more directly than the mortality salient condition did and findings again indicate that an important (albeit not the only) consequence of mortality salience manipulations may be the activation of uncertainty-related thought (e.g., Martin, 1999; McGregor et al., 2001; Van den Bos & Lind, 2002). We will return to this issue in the General discussion.

PANAS findings

As in Experiments 1–4, the PANAS yielded no significant effects in a 3×2 MANOVA. Overall means of the PA and NA scales were 2.6 ($SD = 0.6$) and 1.4 ($SD = 0.4$), respectively.

¹³ Worldview-defense reactions of these participants were not differentially influenced by the procedure manipulation than worldview-defense reactions of the other mortality participants, but among the former participants the procedure manipulation had at least twice as much impact on anger, $F(1, 168) = 32.19$, $p < .001$, $\eta^2 = .16$, and sadness, $F(1, 168) = 20.26$, $p < .001$, $\eta^2 = .11$, than among the other mortality participants, for anger, $F(1, 168) = 15.36$, $p < .001$, $\eta^2 = .08$; for sadness, $F(1, 168) = 5.94$, $p < .02$, $\eta^2 = .03$. These findings correspond with the results reported earlier and provide further correspondence for our line of reasoning. We will return to these findings in the General discussion.

Dependent variables

Dependent variables assessed participants' general feelings of anger, sadness, and worldview-defense reactions. The means and standard deviations of these three dependent variables are presented in Table 5. As expected, a 3×2 MANOVA on the dependent variables yielded a multivariate main effect of the procedure manipulation, $F(3, 172) = 68.20$, $p < .001$; an effect that was qualified by a significant multivariate interaction effect, $F(6, 344) = 7.12$, $p < .001$.

A 3×2 ANOVA on *anger* showed a main effect of procedure manipulation, $F(1, 174) = 177.84$, $p < .001$; an effect that was qualified by a significant salience \times procedure interaction effect, $F(2, 174) = 21.82$, $p < .001$. Inspection of the means indicated a statistically significant procedure effect in the television salient condition, $F(1, 174) = 14.44$, $p < .001$, $\eta^2 = .08$, thereby replicating earlier procedural justice findings. More interestingly, the procedure effect was twice as large in the mortality salient condition, $F(1, 174) = 41.22$, $p < .001$, $\eta^2 = .19$, as in the television salient condition, and was twice as large in the uncertainty salient condition, $F(1, 174) = 165.83$, $p < .001$, $\eta^2 = .49$, as in the mortality salient condition. In accordance with our line of reasoning, this provides evidence that the television condition was a good replication condition of earlier justice experiments and that both mortality and uncertainty salience manipulations had stronger effects on participants' anger reactions, with uncertainty salience having the biggest effect.

A 3×2 ANOVA on participants' feelings of *sadness* revealed a main effect of the procedure manipulation, $F(1, 174) = 82.58$, $p < .001$, and a significant interaction effect, $F(2, 174) = 3.77$, $p < .03$. In accordance with the anger findings, this revealed that the effect of the procedure manipulation was statistically significant in the television salient condition, $F(1, 174) = 13.80$, $p < .001$, $\eta^2 = .07$, was nearly twice as large in the mortality salient condition, $F(1, 174) = 21.12$, $p < .001$, $\eta^2 = .11$, as in the television salient condition, and was twice as large

in the uncertainty salient condition, $F(1, 174) = 55.19$, $p < .001$, $\eta^2 = .24$, as in the mortality salient condition. These findings provide supportive evidence for uncertainty management's predictions that it is under conditions of uncertainty that people will react the strongest toward fair and unfair events.

A 3×2 ANOVA on participants' *worldview-defense* reactions yielded a significant main effect of the procedure manipulation only, $F(1, 174) = 63.12$, $p < .001$, and a statistically nonsignificant interaction effect, $F(1, 174) = 2.04$, $p = .13$. Thus, these findings are the first in the literature to show that a procedural justice manipulation can influence people's worldview-defense reactions. Furthermore, although the procedure effect was more than twice as large in the uncertainty salient condition, $F(1, 174) = 38.17$, $p < .001$, $\eta^2 = .18$, than in both the mortality salient condition, $F(1, 174) = 12.89$, $p < .001$, $\eta^2 = .07$, and the television salient condition, $F(1, 174) = 15.59$, $p < .001$, $\eta^2 = .08$, the salience \times procedure effect was less strong on participants' worldview-defense reactions than was hoped for. We will discuss the implications of these findings in the General discussion.

As an aside, it can be noted here that the anger results revealed significant effects of the salience manipulation in both the accurate procedure condition, $F(1, 174) = 12.53$, $p < .001$, and the inaccurate procedure condition, $F(1, 174) = 12.05$, $p < .001$. The former effect was more due to the difference between the mortality and television salient conditions, $F(1, 178) = 3.85$, $p = .05$, than to the difference between the mortality and uncertainty salient conditions, $F(1, 178) = 1.92$, $p < .17$, and the latter effect was more due to the difference between the uncertainty and mortality salient conditions, $F(1, 178) = 8.99$, $p < .01$, than to the difference between the mortality and television salient conditions, $F(1, 178) = .04$, $p < .85$.

The worldview-defense findings showed a significant effect of salience in the inaccurate procedure condition, $F(1, 174) = 3.72$, $p < .03$. As with the anger findings

Table 5

Means and standard deviations of experienced anger and sadness toward treatment and worldview-defense reactions as a function of salience and procedure (Experiment 5)

Dependent variable	Procedure	Salience					
		Uncertainty		Mortality		Television	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Anger	Accurate	1.8	0.7	2.3	0.8	2.9	0.9
	Inaccurate	4.7	0.9	3.7	1.0	3.8	0.9
Sadness	Accurate	2.5	1.3	2.8	0.9	3.1	1.0
	Inaccurate	4.5	1.0	4.0	1.0	4.1	0.9
Worldview defense	Accurate	3.8	0.8	3.9	1.2	3.7	1.0
	Inaccurate	5.5	0.9	4.9	1.1	4.8	1.3

Note. Means are on 7-point scales, with higher values indicating more positive ratings of the dependent variable in question.

within the inaccurate procedure condition, this effect was more due to the difference between the uncertainty and mortality salient conditions, $F(1,178) = 2.42$, $p < .12$, $\eta^2 = .01$, than to the difference between the mortality and television salient conditions, $F(1,178) = 0.17$, $p < .69$, $\eta^2 = .00$. Other salience effects within the two procedure conditions were not statistically significant. The implications of these findings will be discussed below.

General discussion

As expected, the findings of Experiment 5 show that when people have neither been thinking about uncertainty nor about death, their affective reactions (both anger and sadness) can significantly be influenced by experiences of fair versus unfair procedures, thereby replicating earlier procedural justice findings. More interestingly, in accordance with our line of reasoning, reactions to procedural justice tend to be stronger when people have contemplated their own death, and tend to be even more strongly when they have been thinking about their being uncertain. Thus, results of all five experiments of this paper provide supportive evidence for uncertainty management's claim that it is particularly under conditions of uncertainty that people start to react strongly toward issues related to cultural norms and values.

In the current paper, the uncertainty salience manipulation was constructed in such a way that it very closely paralleled the mortality salience manipulation most commonly used in terror management studies (cf. Arndt et al., 1999; Dechesne et al., 2000; Greenberg et al., 1990; Harmon-Jones et al., 1997; Van den Bos & Miedema, 2000),¹⁴ thus making it possible to investigate the impact of these two salience manipulations in a way that scientifically was very important as it yielded a very clean comparison between the two manipulations. Furthermore, we used dependent variables that extensive pilot testing had shown to yield the strongest effects of mortality salience among our population of participants. Future research—with other dependent variables, other populations of research participants, and other cultural norms and values and other concepts related to terror and uncertainty management (for suggestions, see, e.g., Greenberg et al., 1997; McGregor et al., 2001; Pyszczynski et al., 1999; Solomon et al., 1991; Van den Bos & Lind, 2002)—is needed, of course, but the findings of the studies presented here converge on the same point.

On the basis of the uncertainty management model one would predict uncertainty salience to be the key antecedent of reactions toward events that violate and uphold important cultural norms and values (Van den Bos

& Lind, 2002). Terror management theory focuses strongly on the importance of death to account for social psychological effects and states, among other things, that mortality salience is a very important antecedent of people's reactions toward transgressions and upholding of cultural norms and values (e.g., Greenberg et al., 1997; Pyszczynski et al., 1999; Solomon et al., 1991). On the basis of terror management theory one would therefore be inclined to expect mortality salience to be a prime, perhaps even the main cause of people's reactions to the fair and unfair procedures (Experiments 1, 2, and 5) and positive and negative information about one's ingroup (Experiments 3 and 4) studied here. After reviewing the consistent findings of all five experiments of the current paper the conclusion seems warranted that mortality salience is important in predicting people's reactions to these cultural issues but that uncertainty salience can be even more important, and in fact was more important in the studies presented in this paper.

Related to this, in all experiments reported here, uncertainty salience did not instigate death-related thoughts whereas in four out of five experiments, manipulation check findings suggested (see Footnotes 6–13) that among participants where mortality salience triggered uncertainty-related thought, reactions were more strongly influenced by the procedure or ingroup information manipulations, whereas for participants where mortality salience did not activate uncertainty-related thought, weaker or nonsignificant differences between the procedure or ingroup information conditions were obtained. This suggests that—although mortality salience effects may not always, or perhaps even not often, be purely the result of uncertainty concerns (see Greenberg et al., 1997)—at least sometimes it may be the uncertainty component of mortality salience manipulations that may be driving people's reactions to violations and bolstering of cultural worldviews.

A close inspection of the results reported here indicates that in Experiment 1 significant effects of salience were found within the unfair procedure conditions and not within the fair procedure conditions. In Experiment 2, salience effects tended to be stronger in the fair procedure conditions than in the unfair procedure conditions, in Experiment 3, salience effects tended to be stronger in the negative article conditions than in the positive article conditions, and in Experiment 5, salience effects tended to be stronger in the unfair procedure conditions than in the fair procedure conditions. These differential findings may have been caused, among other things, by the difference in psychological impact of the fair and unfair procedures and positive and negative articles studied and the different dependent variables in the experiments reported here. Future research may want to find out when fairness versus unfairness and positive versus negative ingroup information as well as other dependent variables more strongly influence people's reactions as

¹⁴ Basically, the only thing that we did was to replace the word "death" with "uncertain."

a function of salience manipulations. The findings presented in the current paper are important, however, because they suggest that salience manipulations can lead to stronger reactions following fair treatment (cf. Experiments 2 and 5), unfair treatment (cf. Experiments 1 and 5), and negative information about one's ingroup (cf. Experiment 3). This conclusion is in correspondence with both terror and uncertainty management theories as both theories try to explain people's reactions to both events that bolster and events that violate people's cultural norms and values (e.g., Rosenblatt et al., 1989; Van den Bos, 2001a).

What accounts for the effects of uncertainty salience?

We think that there are good conceptual reasons why uncertainty has a big impact on reactions to violations and bolstering of cultural norms and values. After all, various social psychological theories have pointed at the crucial role that uncertainty plays in diverse important social psychological processes and have noted that uncertainty is an aversive state that people feel needs to be managed, at least to some extent (see, e.g., Festinger, 1954; Fiske & Taylor, 1991; Hogg & Mullin, 1999; Lopes, 1987; Sorrentino & Roney, 1986). The uncertainty management model notes that cultural norms and values are particularly well-suited to help in processes of uncertainty management (for details, see Lind & Van den Bos, 2002; Van den Bos & Lind, 2002). By providing evidence that uncertainty salience is a more important determinant of reactions to cultural worldview issues than a significant other antecedent (viz. mortality salience), the present paper provides an impetus to this line of reasoning.

Furthermore, it is noteworthy that, at least one earlier terror management article (Solomon, Greenberg, Pyszczynski, & Prybylinski, 1995) noted a clear conceptual similarity between the effects of mortality salience inductions and certainty-oriented individuals (cf. Sorrentino & Roney, 1986). This conceptual similarity is in accordance with our position, in which we argue that gaining or regaining a sense of self-certainty is a crucial motive that may drive various important human reactions, including people's responses to violations and bolstering of cultural norms and values (Van den Bos & Lind, 2002).

Related to this, the current paper fits into a line of thought of other papers that recently have explored the relationship between terror and uncertainty management processes and that have argued for the important role of uncertainty in social psychology. Martin (1999), for example, discussed research findings that indicated that individuals who had been reminded about their mortality experienced more uncertainty than those who had not been thinking about mortality. Related to this, McGregor et al. (2001) argued that mortality salience caused uncertainty-related feelings and reported

that in pilot studies they found that responses in mortality salient conditions were more strongly related to uncertainty than to "fear, pain, or anything resembling annihilation terror" (p. 480). In their uncertainty management chapter, Van den Bos and Lind (2002) proposed that these findings suggest that an important (albeit not the only) consequence of mortality salience manipulations may be the activation of uncertainty-related thought. In other words, an important aspect of mortality salience may be that it may be conceived of as an indirect manipulation of uncertainty salience. When developing the research presented in the current paper, we reasoned that if this line of reasoning would be true then this should imply that directly reminding people about their uncertainties would constitute a more direct manipulation of uncertainty salience and hence should have a bigger impact on reactions to violations and bolstering of cultural norms and values. The findings of the experiments reported here suggest that asking people to think about their uncertainties is indeed a more direct manipulation of uncertainty salience and that this manipulation indeed can yield stronger reactions toward cultural worldview issues.

Notable in this respect, we think, are research findings that show that reminders of mortality lead to a decrease in situational self-esteem (e.g., Koole, Dechesne, & Van Knippenberg, 2002; Van den Bos, 2001b). If people with low self-esteem are more uncertain about themselves than those with high self-esteem (see, e.g., Heatherton & Polivy, 1991; see also Baumgardner, 1990; cf. Sedikides & Strube, 1997), then self-esteem measures can be taken as indicators of perceived uncertainty, which would imply that the terror and uncertainty management perspectives converge on the important role of self-related uncertainty in social psychological processes (Van den Bos, 2001b, 2004a). Paradoxically, the fact that we will die some day is almost the only thing we humans can be absolutely certain about. However, this does not imply that being reminded about one's own mortality may not make people uncertain about themselves (cf. Martin, 1999; McGregor et al., 2001). We would therefore like to make a plea for broadening the scope of terror management theory to explicitly encompass the role of self-related uncertainty and would urge researchers to explore this implication of the current paper. This may imply the incorporation of pivotal aspects of the terror management model (such as the uncertainty-related components of mortality salience manipulations) into a broader framework.

It should also be noted that in all five studies reported here both uncertainty and mortality salience had no significant effects on the PANAS scales and items whatsoever. This suggests that salience manipulations by themselves do not trigger strong affective responses and that it is only in combination with variations in fairness of treatment or communication about one's in-

group that affective responses are instigated. Another possibility would be that both uncertainty and mortality salience are immediately suppressed after exposure to them (see Pyszczynski et al., 1999). Future research is clearly needed to sort this out. In this respect it is interesting that very recent research findings suggest that people are more likely to show the strong interaction effects with uncertainty manipulations reported here when they are inclined to react intensely to affect-laden events and are in an experiential mode (compared to react in a non-intense way to affect and being in a rationalistic mode; Maas & Van den Bos, 2004). This indicates that affect intensity, together with experientiality, is an important antecedent to obtain the effects reported here, and suggests that the uncertainty management model is an affective-experiential model of reactions to cultural norms and values.

Related to this are recent data that show that bringing people into active states induces more active responsiveness and therefore leads them to react more strongly to fair and unfair events than people whose states are less active (see Van den Bos, 2004b). This indicates that activity of human states is an important moderator of fairness reactions. Perhaps future research will reveal that activity of human states, possibly together with related concepts such as arousal, underlie the salience interaction effects reported in the current paper.

Caveats

It is important to emphasize here that it would not really be accurate to say that terror management theory predicts that only thoughts of death would produce increased striving to maintain aspects of the cultural anxiety-buffer. What the theory does claim is that the problem of death lies at the root of the need for self-esteem and faith in one's worldview, which does not imply that no other class of aversive events would increase striving for these psychological entities. The present paper (see also Martin, 1999; McGregor et al., 2001) suggests that uncertainty may well be one of these entities and may sometimes even yield bigger effects on human reactions than reminders of mortality do (see also Burris & Rempel, 2004, and Cozzolino, Dawn Staples, Meyers, & Samboceti, 2004, for recent suggestions of other fascinating entities and important processes).

We are not saying here that the research findings that were presented here imply that uncertainty concerns underlie all terror management effects. In all likelihood, we would predict that future research will show that non-existence does have a motivational force, over and beyond the uncertainty aspects that may be related to reminders of mortality, and we are therefore not arguing that fear of the termination of life, non-existence, and decay are just side effects of uncertainty with no motiva-

tional properties. There is no data that speaks to this latter position and personally we think that it would be unreasonable to expect that in the future there will be data that will show this.

We are also not implying here that uncertainty accounts for all of the findings that have come out of the terror management literature. The mortality salience paradigm is the most widely used paradigm in the terror management field (for overviews, see, e.g., Greenberg et al., 1997; Pyszczynski et al., 1999; Solomon et al., 1991), but there are definitely other approaches to testing the theory as well. For example, Mikulincer, Florian, Birnbaum, and Malishkevich (2002) showed that imagining being separated from a relationship partner enhanced subsequent death-thought accessibility and it may be difficult to explain these findings from an uncertainty management account. This suggests that some elements of theory and research on terror management are unrelated to uncertainty and are specific to death-related thought (Greenberg et al., 1997). However, we do argue that there is also the possibility that sometimes and/or some aspects of mortality salience effects may be caused by uncertainty concerns and we do think the research findings presented here may help in the progress toward understanding the subtle and intriguing relationship between uncertainty and terror management effects. This may lead to the conclusion that some core elements of terror management theory (cf. the current experiments) may be part of a broader conceptual framework related to uncertainty management, whereas other elements of the theory (cf. Mikulincer et al., 2002) clearly are not related to uncertainty and may be uniquely associated with the psychology of death.

We hope that the implications of the current paper will further future theorizing and new empirical work. For example, there is always the possibility, of course, that future research may reveal that other experimental paradigms or other dependent variables may show different effects than the findings reported here. This may yield more thorough insights into the psychology of both mortality and uncertainty. Related to this, one could argue that we are always faced with uncertainties but that they may vary greatly in importance and level of uncertainty, and that this may affect people's reactions considerably. Furthermore, the uncertainty of whether one will enjoy the next Harold Pinter play is not the same as uncertainty about layoffs or death. Thus, all uncertainties are not the same and cannot be expected to have the same effects. However, the research findings presented here have revealed that just asking participants two questions of their being uncertain leads to very strong reactions towards violations and bolstering of important cultural norms and values. These findings thus show that uncertainty salience plays a key role in the psychology of cultural norms and values and the findings are important because they tested the

uncertainty management prediction against another important account (viz. terror management theory).

Conclusions

Future research is needed to further investigate the boundaries of the uncertainty management model (cf. Landau et al., 2003, Study 4; Routledge, Arndt, & Gold-berg, 2003, Study 2). For example, perhaps this may reveal that if the sample of a research study is older than the samples used here, fear of death may take on a greater role. This said, however, the experiments presented here have shown that there are instances in which the model explains people's reactions to the violations and bolstering of norms and values studied here rather well. We hope that future researchers will be stimulated by the current paper to further explore the uncertainty and terror management implications of the findings presented. As research accumulates concerning the psychology of cultural norms and values, as it has in this study, we begin to understand the conditions when the effects reported here do occur and when they are less likely to occur or do not occur at all. This knowledge in turn promises to advance our understanding of fundamental issues in the social psychology of the role of cultural norms and values in basic social relations.

At the end of the day there are at least two sets of findings of these studies that promise to have enduring importance: First, across all five studies reported here, it was revealed that both mortality and uncertainty salience have strong effects on reactions to violations and bolstering of important cultural norms and values, with uncertainty salience having a bigger impact in all five studies reported. Second, findings also revealed that uncertainty salience did not instigate death-thoughts whereas reactions to norms and values were stronger among mortality salient participants who spontaneously thought of uncertainty as a result of the mortality salience manipulation than mortality salient participants who did not think of uncertainty following this manipulation. These two sets of research findings are now out in the open and we are pretty certain that these results will spur future research on the psychology of uncertainty and terror management. We therefore think that the present enquiry, as well as the future studies that will explore the implications that follow from the findings presented here, may stimulate social psychologists to better understand the principles of cultural norms and values.

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