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**Lost in the Wilderness:
Terror Management, Action Orientation, and Nature Evaluation**

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Abstract

We propose that wilderness is intrinsically associated with death, and, consequently, terror management concerns may promote more negative evaluations of wilderness. Consistent with our reasoning, wilderness inspired more thoughts about death than either cultivated nature or urban environments (Study 1), and death reminders reduced perceived beauty of wilderness (Study 2). We further hypothesized that active self-regulation facilitates suppression of the dark side of wilderness. In line with this, action orientation was positively related to perceived beauty of wilderness (Study 3) and, after viewing wilderness, action-oriented individuals were more efficient at suppressing the cognitive association between wilderness and death than state-oriented individuals (Study 4). Direct death reminders overruled the effects of action orientation on nature evaluation (Study 5), presumably because direct death reminders are difficult to suppress even for action-oriented individuals.

Lost in the Wilderness: Terror Management, Action Orientation, and Nature Evaluation

In a world that is increasingly urbanized and dominated by human artifacts, people's interactions with nature can no longer be taken for granted. To be sure, close encounters with wilderness are still possible in remote locations, where human civilization is barely noticeable. In most modern urban environments, however, people's interactions with wild nature are highly restricted, and largely dependent on people's willingness to invest time and resources in visiting the great outdoors. Remarkably, the growing distance between people and nature has gone hand in hand with more positive attitudes towards wilderness (Rudzitis & Johansen, 1991; Thacker, 1983). Even so, ancient fears of nature have not vanished, and may reemerge when people are exposed to wilderness (Bixler & Floyd, 1997; Öhman & Mineka, 2000). Modern individuals have thus come to feel deeply ambivalent towards wilderness, finding it both beautiful and terrifying, both awesome and awful (Burke, 1756/2001).

Wilderness may be defined as any environment without visible human influences in which natural processes are left free reign (see Shultis, 1999, on definitions of wilderness). For various reasons, it seems important to learn more about people's evaluations of wilderness. Attitudes towards large-scale environmental problems like pollution, urbanization, and deforestation are closely connected with people's evaluations of wilderness (Hartig, Kaiser, & Bowler, 2001; Van den Berg, De Vries & Vlek, in press). Improving our understanding of these evaluations may suggest new ways to combat these pressing issues. People's reactions towards wilderness are further of intrinsic psychological interest. For the greater part of evolutionary history, the human species lived in savage, uncultivated territories (Appleton, 1975; Orians, 1980). It is therefore plausible that the human psychological makeup has evolved, at least in part, to cope with the risks and challenges of wilderness.

environments. Studying people's reactions to wilderness may thus shed more light on the basic workings of the human mind.

In the present research, we seek to illuminate some of the motivational dynamics that underlie people's evaluations of wilderness. Our central assumption is that wilderness is charged with highly ambivalent meanings. The untamed forces of nature are intrinsically connected with uncontrollability and death. At the same time, wilderness embodies the vital forces of life and offers freedom from cultural constraints. Because these meanings represent equally valid aspects of wilderness, subjective psychological factors may regulate people's nature evaluations. Salient terror management concerns may sensitize people to their fears of uncontrolled nature. Conversely, active self-regulation may enable people to overcome their deeply rooted fears of wilderness. In the following paragraphs, we will consider these ideas in more detail and present five studies that empirically tested our analysis.

The Bright and Dark Sides of Wilderness

Wilderness often elicits very positive reactions in people. People generally rate wilderness as more beautiful than cultivated nature (Hartig & Evans, 1993; Van den Berg, 2003). Moreover, exposure to wilderness can promote both physical and psychological well-being (Hartig, Evans, Jamner, Davis, & Gärling, 2003; Van den Berg, Koole, & Van der Wulp, 2003). Some environmental scientists have argued that people have a "biophilia" motive, a biologically based affinity for life and life-like processes (Wilson, 1984; Ulrich, 1993). Encounters with wilderness may also satisfy deeply rooted psychological needs. The confrontation with wilderness inspires feelings of awe, and often leads to thoughts about spiritual meanings and eternal processes (Kaplan & Kaplan, 1989; Williams & Harvey, 2001). Wilderness provides opportunities for mastery and exploration, because it is not pre-organized and constrained by artificial boundaries. Finally, encounters with wilderness allow people to remove themselves from the obligations and pressures that are associated with the civilized world.

Wilderness also has a dark side. Wilderness is inherently associated with death and uncontrollability (Becker, 1962, 1973; Bixler & Floyd, 1997). The laws of nature dictate that all forms of life are finite, and therefore death and decay can be witnessed everywhere in the natural world. In addition, the forces of nature are by definition uncontrolled and often uncontrollable by humans. To be sure, humanity's control over the natural environment has increased dramatically since the modern age. Still, the forces of nature have never been tamed completely, a point that becomes tragically clear during natural disasters like floods and epidemics. Even during less dramatic events, close encounters with nature may give rise to feelings of apprehension (Van den Berg & Ter Heijne, 2004). For instance, modern urban youth commonly experience fear and discomfort when they are exposed to wilderness settings during mandatory school trips (Bixler & Floyd, 1997). In a related vein, many participants of wilderness programs report that being alone in the wilderness can invoke profound feelings of terror and anxiety (Kaplan & Kaplan, 1989)

In sum, wilderness is charged with highly ambivalent meanings. Life and death, freedom and chaos are equally valid aspects of wilderness. People's responses to wilderness are thus likely to vary depending on which side of nature is psychologically more salient. Koole and Van den Berg (2004) have recently argued that dynamic motivational processes play an important role in regulating people's responses to wilderness. In line with this argument, we will consider how deeply rooted existential concerns (Solomon, Greenberg, & Pyszczynski, 1991, 2004) and self-regulation (Kuhl, 1984; Kuhl & Koole, 2004) may influence people's sensitivity to the ambivalent meanings of wilderness.

Terror Management and the Dark Side of Wilderness

Given wilderness' association with death, responses to nature might be influenced by people's need to come to grips with some of their deepest existential fears. A systematic framework for understanding how people cope with existential fear is provided by *Terror Management Theory (TMT)*. TMT offers a theoretical analysis of the existential concerns that

underlie human behavior, an analysis that has been supported by over 100 experiments to date (see Solomon *et al.*, 2004, for a review). In recent years, TMT has been applied to human-nature relations (Goldenberg, Pyszczynski, Greenberg, & Solomon, 2000; Koole & Van den Berg, 2004).

According to TMT, human-nature relations have been profoundly affected by the development of self-awareness in humans. Although self-awareness has many adaptive sides, it also leads people to realize that their own death is ultimately inescapable. To manage the potential for terror that comes with this realization, TMT posits that people build up cultural worldviews that offer ways of achieving literal or symbolic immortality. This acculturation process enlarges the separation between humans and nature through a wide variety of cultural practices, such as eating with utensils and covering up one's genitals, and through the creation of cultural artifacts, like automobiles and fashionable clothing. According to TMT, this cultural separation helps to control existential anxiety. By enlarging the gap between humanity and nature, people implicitly affirm their beliefs that they are symbolic beings, which are not subject to the natural laws of death and decay¹. In support of TMT, research has shown that individuals who are reminded of death are more likely to distance themselves from their own biological functions (Goldenberg & Roberts, 2004), and are more inclined to support beliefs that humans are distinct from animals and to report being disgusted by animals (Goldenberg, *et al.*, 2001).

From a terror management perspective, nature may be experienced as especially threatening when the forces of nature do not obey cultural rules and conventions. Terror management concerns thus form a powerful motivation for cultivating the natural environment. Consistent with this, virtually all known cultures have presented their members with idealized images of cultivated nature, such as the biblical Garden of Eden and the Arcadian pastoral landscapes of the ancient Greeks (Eisenberg, 1998). Such idealized images convey that the savage forces of nature can be tamed, and may thereby alleviate the

existential anxiety that is aroused by the confrontation with nature. Accordingly, existential concerns may not only give rise to decreased preference for wilderness, but also increase preference for cultivated nature. Initial support for this reasoning was found in a study of 460 participants from various regions in the Netherlands (Van den Berg, 1999). In this study, concerns with personal safety were negatively correlated with preference for wild over cultivated natural landscapes. Though preliminary, these findings fit with the notion that existential fears promote a preference for greater human control over natural environments.

Self-Regulation and Suppression of the Dark Side of Wilderness

The need to defend oneself against existential anxiety accounts for a wide range of motivated behaviors (Pyszczynski, Greenberg, & Solomon, 1997). Yet people are not invariably driven by defensive needs. Throughout evolutionary history, people have inhabited environments that were highly dynamic and constantly changing (Sedikides & Skowronski, 1997). To live and prosper in such surroundings, people had to be at least somewhat open to new experiences, to explore new grounds and to develop new cognitive and behavioral capabilities. If people were always compelled to obey their defensive motives, they would probably not be prepared to take the risks that are involved in such expansive activities.

Self-regulation may be one important mechanism through which people may overcome their instinctive fears. Self-regulation refers to central executive functions by which people can override their automatic behavior programs and select more appropriate behaviors (Baumeister, Heatherton, & Tice, 1994). People may use self-regulation to control their own negative emotions (Gross, 1999). Accordingly, self-regulation may enable people to overcome their deeply rooted fears of the wilderness. An extensive analysis of self-regulation of affective states is provided by *Personality Systems Interactions (PSI) theory* (Kuhl, 2000; Kuhl & Koole, 2004). According to PSI theory, the ability to self-regulate affect functions like a learned skill. Each time that people activate self-regulatory systems when unwanted affect becomes inhibited, people's ability to self-regulate affect will grow stronger. Over time

and depending on people's individual learning histories, people may develop more or less efficient self-regulation skills. Kuhl (1981) has referred to individuals with well-developed self-regulation skills as "action-oriented" individuals. Individuals with less developed self-regulation skills have been referred to as "state-oriented" individuals.

To date, more than 40 published studies have supported the validity of the action orientation construct (for reviews, see Dieffendorf, Hall, Lord, & Strean, 2000; Kuhl & Koole, 2004). As far as we can tell, no research has explicitly related action orientation to nature evaluation. Nevertheless, several findings suggest the theoretical relevance of action orientation to human-nature relations. Relative to their state-oriented counterparts, action-oriented individuals are more prone to explore unknown environments (Kuhl, 1984), feel less disoriented in alienating situations (Kuhl & Beckmann, 1994a), are better able to perceive coherence in a threatening context (Baumann & Kuhl, 2002), and are more prone to remove themselves from social obligations (Baumann & Kuhl, 2003; Kuhl & Kazén, 1994). Taken together, the psychological profile of action-oriented individuals seems highly compatible with wilderness environments. Conversely, the psychological profile of state-oriented individuals seems highly compatible with cultivated nature.

Both action- and state-oriented individuals are likely to be troubled by the problem of death. However, action-oriented individuals are probably more proficient in avoiding a full-blown confrontation with death concerns than state-oriented individuals. Research suggests that action-oriented individuals are equipped with highly efficient suppression skills, which operate largely on unconscious levels (Kuhl, 2001). The unconscious nature of action-oriented suppression seems highly adaptive, because it allows action-oriented individuals to remain focused on their goal pursuits even while they are suppressing unwanted states of mind. Action-oriented individuals may thus suppress the dark side of wilderness, and consequently be more able to enjoy the bright side of wilderness than state-oriented individuals. Of course, action-oriented suppression skills are not without limitations. Action-

oriented suppression is most likely to succeed in response to indirect death reminders (e.g., wilderness). This is because indirect death reminders can be processed at a meaningful level without fully confronting the problem of death. By contrast, when action-oriented individuals are directly confronted with the problem of death (e.g., through verbal death reminders), even the most efficient suppression skills are unlikely to keep death thoughts outside of awareness. Consequently, direct death reminders may force action-oriented individuals to face the problem of death, and thereby lead these individuals to respond defensively towards wilderness. Notably, this defensive position is likely to be chronic among state-oriented individuals.

The Present Research and Hypotheses

In the present studies, we sought to empirically test our theoretical analysis of human-nature relations. In Study 1, we explored the idea that people associate the ambivalent thoughts of death and freedom more strongly with wilderness than with cultivated nature or cities. In Study 2, we examined the influence of death reminders on evaluations of wild versus cultivated nature. We predicted that death reminders would lead participants become less favorable towards wilderness and more favorable towards cultivated nature. In Study 3, we tested the hypothesis that action orientation fosters appreciation of wilderness. In Study 4, we explored how action orientation regulates the cognitive association between wilderness and death. Finally, we examined the interactive influence of subliminal death reminders and action orientation on nature evaluation in Study 5.

Notably, our analysis treats evaluations of wilderness and evaluations of cultivated nature as systemic variables, in that more positive evaluations of wilderness imply more negative evaluations of cultivated nature and vice versa. Our predictions are thus not so much concerned with participants' evaluations of each separate nature type, as with participants' evaluations of wilderness *relative to* participants' evaluations of cultivated nature. In statistical terms, our analysis was concerned with variables influencing the *interaction*

between evaluations of wilderness and evaluations of cultivated nature, rather than with testing variables that influence evaluations of each type of nature separately (see Rosnow & Rosenthal, 1995, on the rationale of this approach; Tesser, 1988, for an analogous approach in the domain of self-evaluation maintenance).

Study 1

In Study 1, we asked participants to report how often they were inclined to think about specified topics when they were in a wilderness environment, relative to when they were in cultivated nature or in the city. In line with the dark side of nature, we predicted that wilderness would be more strongly associated with ruminations about death than the other environments. Notably, participants in Study 1 lived in predominantly urban environments (like the vast majority of people in The Netherlands), and thus they were likely to have encountered many more objectively life-endangering circumstances (e.g., traffic accidents) in the city than in the wilderness. Accordingly, the predicted link between wilderness and death thoughts was presumably based on symbolic associations rather than on the objective statistical association between wilderness and death.

We assessed the bright side of nature by asking participants in which environment they thought most often about freedom. We chose to focus on freedom because this topic is clearly related to the bright side of wilderness, whereas freedom is not necessarily associated with death (unlike topics such as life and spirituality, which are more closely connected with death concerns). Moreover, freedom is at approximately the same level of abstraction as death (unlike topics such as discovery or exploration, which refer to concrete activities) and, like death, freedom does not refer to a specific emotion (unlike topics such as awe or mastery). In line with the bright side of nature, we predicted that wilderness would be more strongly associated with ruminations about freedom than the other types of environments. Finally, based on the specificity of our analysis, we predicted that wilderness would not be associated

with positive or negative ruminations in general (i.e., ruminations unrelated to freedom or death).

Method

Participants. Ninety paid volunteers at the Free University Amsterdam (33 women and 57 men, average age 23) participated in the experiment².

Procedure and Equipment. Upon arrival in the laboratory, participants were seated in separate cubicles, each containing an Apple Macintosh (iMac) computer. The remaining instructions were administered via the computer. Participants were first informed that the investigation consisted of a series of separate studies. The first studies were unrelated to the present research, and lasted about 20 minutes. Participants then moved on to a questionnaire on "Environments and Thoughts". Next, all participants were asked to provide some biographical data regarding their gender and age. Finally, participants were probed regarding their perceptions of the experiment, debriefed, and paid.

Environments and Thoughts Questionnaire. In this questionnaire, participants were presented with eight different topics: relation problems, politics, family, money matters, death, art, studies, and freedom. In the first part of the questionnaire, participants were asked to choose whether they were most inclined to think about each topic in wild or cultivated nature. Wild nature was described as nature that has been hardly influenced by humans, such as an impenetrable forest, a primeval swamp, or a rain forest. Cultivated nature was described as nature that has been strongly influenced by humans, such as meadows, polders, or grain fields. The instructions stressed that the questions were not about how often participants thought in general about the topics. Rather, participants were asked to indicate how strongly they were inclined to think about the topics once they found themselves in a particular environment. The second part of the questionnaire dealt with the comparison between the city and wild nature. The city was described as an environment in which nature played almost no role, such as the down town area of a large city, highways, or industrial areas. The third and

last part of the questionnaire dealt with the comparison between cultivated nature and the city.

Results and Discussion

The results of Study 1 are shown in Table 1. As predicted, 76.7% of the participants reported that they were more inclined to think of death in the wilderness than in a cultivated environment. Likewise, 68.9% of the participants were more inclined to think of death in the wilderness than in the city. In both cases, the distributions were significantly different from a 50-50 (chance) distribution, $p < .001$. Also as predicted, wilderness was associated with thoughts about freedom. As many as 81.1% of the participants reported that they were more inclined to think of freedom in the wilderness than in a cultivated environment. Likewise, 77.8% of the participants were more inclined to think of freedom in the wilderness than in the city. Again, these distributions were significantly different from chance, $p < .001$. The double association between wilderness and thoughts about death and freedom supports the idea that wilderness activates ambivalent meanings.

Participants reported that they were *less* inclined to think about politics, personal finances, studies, and relation problems in the wilderness than in either a cultivated natural environment or in the city, $p < .001$. Notably, there was a marginal trend indicating that cultivated nature was more associated with thoughts about death than the city, $p = .073$. In addition, cultivated nature was more associated with thoughts about freedom than the city, $p < .0001$. Cultivated nature thus appears to be psychologically midway between wilderness and the city, in being somewhat more strongly associated with death and much more strongly associated with freedom than the city, but more weakly associated with death and freedom than wilderness. The contrast between wilderness and cultivated nature, which is the central focus in Studies 2-5, thus renders a more conservative test of our theoretical analysis than the contrast between wilderness and the city.

The questionnaire in Study 1 only tapped a few of the wealth of thoughts that people might entertain in wilderness, cultivated, or urban environments. Moreover, Study 1 was based on self-report data, and thus might be distorted by participants' cognitive biases, cultural preconceptions, and self-presentation motives. In spite of these potential caveats, the results of Study 1 provide preliminary support for our hypothesis that the confrontation with wilderness gives rise to reflections about deep existential concerns about death and freedom.

Study 2

In Study 2, we examined the effects of verbal death reminders on aesthetic evaluations of nature. Based on the link between wilderness and death, reminders of death might lead people to psychologically distance themselves from wilderness. We thus predicted that reminders of death would lead participants to rate wilderness as less beautiful. We focused on aesthetic evaluations because these are among the most validated markers of the psychological quality of nature (Daniel & Vining, 1983; Gifford, 2002; Van den Berg *et al.*, 2003). Moreover, people are able to judge the aesthetic quality of natural landscapes intuitively, quickly and effortlessly. The latter represents an important advantage, because the terror management motives that underlie distancing from nature presumably operate on intuitive levels (Goldenberg *et al.*, 2000).

To assess participants' nature evaluations, we developed a set of verbal descriptions of a series of Dutch natural landscapes. This verbal paradigm allows for a high level of experimental control and has been validated in previous research (De Groot & Van den Born, 2003; Van den Berg, De Vries, & Vlek, *in press*). We focused on Dutch nature because it was most familiar to our participant sample. Finally, we assessed two alternative landscape characteristics, i.e., perceived openness and safety/familiarity³. Openness and safety/familiarity are often correlated with cultivation, with typical cultivated landscapes being more open and less safe/familiar than wild landscapes, which often contain dense vegetation. Even so, cultivation cannot be reduced to openness. For instance, a polar

landscape or the Sahara desert might be perceived as very open and wild at the same time. Likewise, cultivation should not be equated with safety/familiarity. Safety/familiarity deals with threats that are explicitly perceived in the environment, whereas cultivation deals with the more implicit symbolic threat that is posed by the forces of nature. Accordingly, we predicted that openness and safety/familiarity would not explain any variance over and above the variance in cultivation of the landscapes under study.

Method

Participants and Design. Forty-eight paid volunteers at the Free University Amsterdam (27 women and 21 men, average age 22) were randomly assigned to two experimental conditions (death reminders: yes vs. no). The experimental design was 2 (death reminders: yes vs. no; between participants) x 2 (landscape type: wild vs. cultivated; within participants)⁴. The main dependent variable consisted of participants' beauty ratings.

Procedure. Upon arriving in the laboratory, participants were seated in separate cubicles, each containing an Apple Macintosh computer. The remaining instructions were administered via the computer. Participants were informed that the investigation consisted of a series of separate studies. The first study contained a number of personality questionnaires and our death reminder manipulation. Participants then continued with the second study, which consisted of a reaction time task and a series of word puzzles. These tasks were interpolated because past research has shown that mortality salience effects are most pronounced after a brief delay and distraction (Arndt, Cook, & Routledge, 2004). Participants then moved on to the third study, which was concerned with the evaluation of natural landscapes. During this study, participants were asked to judge the beauty of 17 Dutch natural landscapes. Participants then judged the entire set of landscapes three additional times, to indicate the cultivation, openness, and safety/familiarity of the landscapes. These perceptions were again scored on 9-point scales. To measure perceived safety/familiarity of the landscapes, we used a scale that was anchored on one side by the Dutch word "vertrouwd"

which means both "safe" and "familiar". The other side of the scale was anchored by the Dutch word "dreigend", which translates as "threatening".

Following the landscape evaluations, participants in the low mortality salience condition answered the FDI-D. Next, all participants were asked to provide some biographical data regarding their gender and age. Finally, participants were probed regarding their perceptions of the experiment, debriefed, and paid. During the debriefing, five participants expressed suspicion about the mortality salience treatment. These participants were excluded from further analyses.

Death Reminder Manipulation. Death reminders were manipulated as in prior TMT research (e.g., Florian & Mikulincer, 1997). Participants in the death reminder condition were given Dutch Fear of Death Inventory (FDI-D; Cronbach's alpha = .81) before rating the natural landscapes. The FDI-D consisted of five statements about the fear of death (e.g., "I am afraid of death, because I must part with my life when I die"; "I am afraid of death because I will stop thinking after I die"). Participants indicated their agreement with each statement on 9-point-scales (1 = not at all; 9 = completely). The FDI-D was administered at the end of the experimental session for participants in the no death reminder condition⁵.

Landscape Descriptions. The stimulus set consisted of verbal descriptions of 17 Dutch natural landscapes that had been generated by three Dutch landscape experts. These landscapes formed a representative set of Dutch natural landscapes that varied on the cultivation dimension. Specifically, 7 descriptions referred to highly cultivated landscapes and 5 descriptions referred to wild landscapes. Examples of highly cultivated landscapes are "A large-scale landscape with fields, straight ditches and straight roads." and "A planted forest with rows of thin trees and straight roads". Examples of wild landscapes are "An impenetrable swamp forest, thick overgrowth, wet grounds, much plant covering" and "A dune landscape with a view over the sea, hilly, hard low bushes, sand". Pilot tests within the same participant population confirmed that the cultivated landscapes were judged to be

relatively high on cultivation, whereas the wild landscapes were judged to be relatively low on cultivation. The five remaining landscapes (included as fillers) were judged to be intermediate on cultivation.

Results

Perceived Cultivation, Openness, and Safety/Familiarity. Cultivated landscapes were indeed perceived as more cultivated than wild landscapes, $F(1,41) = 337.41, p < .001$ ($M = 7.91$ vs. $M = 3.34$). Mean cultivation ratings of the 5 filler landscapes fell in between these ratings ($M = 5.58$). No effects of death reminders emerged on cultivation ratings, $Fs < 1$. As expected, wild landscapes were perceived as more closed ($M = 5.28$) and as less safe/familiar ($M = 4.88$) than cultivated landscapes (respective Ms 3.52 and 7.18 for openness and safety/familiarity), both $ps < .01$. However, cultivated landscapes were still perceived as reliably more cultivated than wild landscapes after we statistically controlled for perceived openness and safety/familiarity as covariates, $Fs > 84, ps < .001$. Conversely, when we statistically controlled for perceived cultivation as a covariate, the differences in perceived openness and safety/familiarity between wild and cultivated landscapes fell to non-significance, $Fs < 1$. Thus, variations in perceived openness and safety/familiarity did not contribute any variance over and above the variance in perceived cultivation of the experimental landscapes.

Perceived Landscape Beauty. We subsequently computed participants' average beauty ratings of the cultivated landscapes and their average beauty ratings of the wild landscapes. The resulting means were subjected to an 2×2 ANOVA. This analysis yielded a significant main effect of cultivation, which indicated that wild landscapes were generally rated as more beautiful than cultivated landscapes, $F(1, 41) = 67.48, p < .001$ ($M = 6.66$ vs. $M = 5.49$). This effect replicates previous research that found a consistent preference for wild over cultivated Dutch landscapes among highly educated Dutch samples (Van den Berg, 2003; Van den Berg & Vlek, 1998; Van den Berg, Vlek, & Coeterier, 1998). In addition, the predicted interaction

between death reminders and cultivation was obtained, $F(1, 41) = 8.18, p < .008$. Relevant means are presented in Table 2.

Participants reminded of death rated cultivated landscapes as somewhat more beautiful than participants who were not reminded of death, $F(1, 41) = 2.21, p = .145$ ($M = 5.49$ vs. $M = 4.95$). In addition, participants reminded of death rated wild landscapes as somewhat less beautiful than participants who were not reminded of death, $F(1, 41) = 2.22, p = .144$ ($M = 6.44$ vs. $M = 6.90$). The results could also be stated in terms of participants' relative preference for wild over cultivated landscapes. Under low mortality salience, participants displayed a very strong preference for wild landscapes over cultivated landscapes, $F(1, 20) = 66.56, p < .001$ (M difference = 1.95). Under high mortality salience, participants displayed a much weaker preference for wild landscapes over cultivated landscapes, although this preference was still reliably different from zero, $F(1, 21) = 13.40, p < .005$ (M difference = .95). An ANOVA on participants' average beauty ratings of the 5 filler landscapes revealed no significant effects of death reminders, $F < 1$.

Discussion

As predicted, death reminders led people to respond more positively towards cultivated landscapes and less positively towards wild landscapes. This finding fits well with the notion that terror management concerns sensitize people to the threatening aspects of wild, uncultivated nature. In addition, the effects of cultivation were not mediated by differences in perceived openness or safety/familiarity between wild and cultivated landscapes. This finding suggests the effects of death reminders and cultivation are independent of conscious feelings of threat or unfamiliarity that arise when people are exposed to nature. Notably, the effects of familiarity may have been minimized in Study 2 because all the landscapes under study were quite familiar to our Dutch sample.

Study 3

In Study 3, we tested our prediction that action-oriented individuals would have more positive evaluations of wilderness than state-oriented individuals. We further introduced some methodological innovations in Study 3. First, our stimulus set included both nature photographs and verbal descriptions. Photographic nature simulations are the most widely used type of simulations in environmental psychology (Gifford, 2002; Hull & Stewart, 1992). People's evaluations of photographic nature simulations closely match their reactions to *in vivo* exposure to nature (Gifford, 2002; Hartig *et al.*, 2003; Hull & Stewart, 1992), and are strongly and systematically related to alternative measures of landscape quality (Van den Berg *et al.*, 2003). Accordingly, it seemed important to extend our findings to photographic stimuli. Second, we assessed participants' perceived complexity of the landscape photographs. We predicted that perceived complexity would not explain any variation over and above the variation in perceived cultivation of the landscapes under study.

Method

Participants and Design. Sixty paid volunteers at the Free University Amsterdam (32 women and 28 men, average age 23) participated in the experiment. Based on their scores on the AOT-scale (Kuhl, 1994), participants were classified into action- versus state-oriented individuals. Thus, the experimental design was 2 (AOT: state vs. action; between subjects) x 2 (type of nature: wild vs. cultivated; within subjects). The main dependent variable consisted of participants' beauty ratings of the landscape photographs and descriptions.

Procedure. The procedure and equipment were largely similar to those used in Studies 1 and 2. After being seated, participants first completed some personality questionnaires, which included the threat-related action orientation (AOT) scale. Participants then moved on to an unrelated study, which lasted about 15 minutes. Next, participants evaluated a series of nature photographs and nature descriptions. The verbal stimulus set consisted of the same descriptions of 17 Dutch natural landscapes that were used in Study 2. Subsequently, all

participants provided some biographical data regarding their gender and age. Finally, participants were probed regarding their perceptions of the experiment, debriefed, and paid.

Measurement of Action Orientation. The AOT-scale has been developed and extensively validated by Kuhl and others (Kuhl & Beckmann, 1994b). Effects of AOT have been found across a wide range of different measures and domains, including cognitive performance, event-related brain potentials, medicine intake, therapeutic outcomes, athletic performance, and work psychology. Research indicated that the effects of AOT are not due to self-efficacy or control beliefs (Kuhl, 1981), achievement motivation (Heckhausen & Strang, 1988), neuroticism (Baumann & Kuhl, 2002), extraversion (Koole, 2004a), self-esteem (Koole & Jostmann, 2004), or conscious emotion regulation strategies (Koole, 2004b), and occur over and above the effects of the "Big Five" personality dimensions (Dieffendorff *et al.*, 2000).

Each of the items of the AOT describes a particular situation that requires the use of self-regulatory skills and two alternative ways of coping with the situation. One of these alternatives always refers to an action-oriented way of coping with the situation, whereas the other alternative refers to a state-oriented way of coping with the situation. Illustrative items of the AOT are "When I have lost something that is very valuable to me and I can't find it anywhere: A. I have a hard time concentrating on anything else. B. I put it out of my mind after a little while." and "When I am being told that my work is completely unsatisfactory: A. I don't let it bother me for too long. B. I feel paralyzed". For these respective items, the action-oriented choices are B and A. For each item, participants are asked to choose which of two alternative responses would best describe their reaction. Notably, the AOT does not ask participants to provide introspective judgments of their self-regulation abilities, but rather asks participants to report on the consequences that these volitional abilities have for their behavior. This minimal reliance on introspection is intended to maximize the AOT's ability to tap into unconscious self-regulation skills (Kuhl & Koole, 2004).

We coded action-oriented choices as '1', and state-oriented choices as '0' (Cronbach's alpha = .82). Participants who made 7 or more action-oriented choices on the AOT were assigned to the action-oriented group, the remaining participants were assigned to the state-oriented group². This cut-off point was chosen as the conceptual midpoint of the AOT and was the normative midpoint in a study among Dutch university students ($N = 1460$).

Nature Photographs. The stimulus set consisted of 28 high-resolution color photographs of natural landscapes. These landscapes formed a representative set of West-European natural landscapes that varied in degree of human influence. Following Van den Berg *et al.* (1998), the kinds of human influence studied were restricted to visible signs of regulative activities, such as mowing, ploughing, horticulture, and other signs of activities that indicate human control over nature. Based on pilot-testing studies, 13 landscapes were classified as wild natural landscapes. The remaining 15 landscapes were classified as

cultivated natural landscapes. Each of the landscape photographs appeared in a 20 by 27 cm format on the computer screen. After three seconds, a 9-point rating scale was superimposed on the landscape photograph and participants were asked to type in their beauty ratings (1 = not at all beautiful; 9 = very beautiful). The landscapes were presented in a different random order for each participant. After providing their beauty ratings, participants were again presented with the set of landscape photographs, this time in a 6.5 x 10.5 cm format. During this second presentation, participants rated the cultivation and complexity of the landscapes, again on 9-point scales (1 = very little; 9 = very much).

Results

Perceived Cultivation and Complexity. Cultivated landscape photographs were indeed perceived as more cultivated than wild landscape photographs, $F(1,58) = 281.12, p < .001$ ($M = 7.24$ vs. $M = 3.67$). Perceived cultivation was unaffected by AOT, $F_s < 1$. Unexpectedly, wild nature photographs were perceived as less complex than the cultivated nature photographs of, $F(1,58) = 33.63, p < .001$ ($M = 4.71$ vs. $M = 5.60$). However, cultivated landscapes were still perceived as reliably more cultivated than wild landscapes after we statistically controlled for perceived complexity, $F(1,58) = 157.66, p < .001$. Conversely, when we statistically controlled for perceived cultivation, the differences in perceived complexity between wild and cultivated landscapes fell to non-significance, $F(1,58) = 1.18, p = .280$. Thus, perceived complexity did not vary between the wild and cultivated landscapes over and above the variance that was explained by perceived cultivation.

Perceived Beauty of Nature Photographs. We computed participants' average beauty ratings of the photographs of wild versus cultivated landscapes and subjected these to a 2 (AOT) x 2 (nature type) ANOVA. Relevant means are displayed in the left half of Table 3. The analysis revealed a significant effect of landscape type, which indicated that wild landscapes were generally rated as more beautiful than cultivated landscapes, $F(1,58) =$

23.05, $p < .001$ ($M = 6.55$ vs. $M = 5.94$). In addition, the predicted two-way interaction between action orientation and nature type was significant, $F(1,58) = 6.67, p < .02$. Subsequent tests revealed that only action-oriented participants displayed a clear preference for wild over cultivated landscapes, $F(1,25) = 18.68, p < .001$ (M difference = .97). State-oriented participants, by contrast, did not show a reliable preference for wild over cultivated landscapes, $F(1,25) = 2.00, p = .167$ (M difference = .25). Another way to interpret this interaction is to note that action-oriented participants evaluated wild landscapes as non-significantly more beautiful than state-oriented participants, $F(1,25) = 2.08, p = .155$ ($M = 6.85$ vs. $M = 6.32$), whereas action-oriented participants evaluated cultivated landscapes as non-significantly less beautiful than state-oriented participants, $F(1,25) < 1$ ($M = 5.83$ vs. $M = 6.02$). As in Study 2, the results were stronger for relative preference for wilderness than for the separate evaluations of each nature type.

Perceived Beauty of Nature Descriptions. We then computed participants' average beauty ratings of the verbal descriptions of wild versus cultivated landscapes. The correlation between participants' relative preference for wild over cultivated nature in photographic and verbal landscape simulations was substantial, $r(60) = .75, p < .001$. The results for verbal simulations converged with the results for photographic simulations. A 2 (AOT) x 2 (nature type) ANOVA yielded an effect of landscape type, which indicated that wild landscapes were generally rated as more beautiful than cultivated landscapes, $F(1,58) = 60.40, p < .001$ ($M = 6.10$ vs. $M = 4.21$). In addition, the predicted two-way interaction between action orientation and nature type was significant, $F(1,58) = 5.29, p < .03$. As can be seen in the right half of Table 3, the obtained pattern was very similar to the pattern obtained for photographic simulations. There was one substantive difference with the landscape photographs: Evaluations of cultivated landscapes were lower for the verbal descriptions than for the photographs. This difference fits with prior research showing that verbal labels that imply

human influence are often negatively evaluated (Hodgson & Thayer, 1980; Tahvanainen *et al.*, 2000).

Discussion

As predicted, action-oriented participants displayed a stronger preference for wild nature than state-oriented participants, across both evaluations of photographic landscape simulations and verbal landscape descriptions. This methodological convergence attests to the robustness of the effects of action orientation and validates the use of verbal descriptions of nature in Studies 2 and 3. Additional analyses indicated that wild landscapes were perceived as *less* complex than cultivated landscapes, even though wild landscapes were generally rated as more beautiful than cultivated landscapes. Though we did not explicitly predict this finding, it is consistent with our theoretical perspective. Even when wilderness is perceptually simple (e.g., the Sahara desert), its lack of controllability may signal a lack of existential security, and thus, activate defense motivation. Notably, our analyses indicated that differences in perceived complexity did not contribute any variance over and above the variance that was explained by the perceived cultivation of the landscapes in Study 3. Thus, even though wild landscapes were perceived as less complex than cultivated landscapes, this effect could not explain the effects of cultivation on beauty ratings.

Study 4

Why would action orientation be associated with more positive evaluations of wilderness? Based on PSI theory, we suspect that action-oriented individuals may be more efficient at suppressing the cognitive association between wilderness and death than state-oriented individuals. Presumably, action-oriented suppression is mediated by non-conscious mechanisms that are more effective than consciously intended suppression, which often leads to a rebound of unwanted mental contents (Wegner, 1994). Action-oriented individuals may thus suppress the dark side of wilderness, and thereby be able to enjoy the bright side of wilderness more than state-oriented individuals.

In Study 4, we took a closer look at the suppression mechanisms through which action-oriented individuals come to terms with the dark side of wilderness. In this study, we first exposed participants to a series of photographs of wilderness. This manipulation was expected to trigger suppression of the dark side of wilderness among action-oriented participants. To track the dynamics of the suppression process, we used a primed lexical-decision task. In this task, participants had to decide as quickly and as accurately as possible whether letter strings on a computer screen are words or non-words. Among the target letter strings, we included words related to mortality, vitality, punishment, and reward. Prior to the presentation of each target letter string, we briefly primed either words related to wilderness or words related to cultivated nature. Based on past research, strength of cognitive associations was indicated by the facilitation or inhibition of lexical-decision latencies due to the priming stimuli (e.g., Mussweiler & Förster, 2000; Wentura, 2000). Because the lexical decision task did not include neutral primes, we use the terms "facilitation", "inhibition", and "suppression" only in a relative sense.

Our key prediction in Study 4 was that action-oriented participants would suppress the cognitive association between wilderness and death after viewing wilderness photographs. This suppression mechanism should be evidenced by a slow-down in lexical decision latencies towards mortality words that were primed with wilderness words rather than cultivated nature words. This suppression effect was not predicted to occur among state-oriented individuals, because these are presumably not equipped with the same suppression skills as action-oriented individuals. After being primed with wilderness photographs, state-oriented individuals were expected to show an association between wilderness and death. This cognitive association should be evidenced by faster lexical decisions towards mortality words that were primed with wilderness words rather than cultivated nature words.

Our design of Study 4 also included a control group of participants to photographs of cultivated nature. We expect that this control condition would not trigger suppression

among action-oriented participants. Thus, after viewing cultivated nature, action-orientated participants were expected to display a cognitive association between wilderness and mortality. By contrast, we reasoned that viewing cultivated nature might help state-oriented participants to inhibit the association between wilderness and death. This is because cultivated nature symbolically conveys that human civilization can control the wild forces of nature. Past research has indeed found that state-oriented individuals benefit greatly from an emotionally supportive environment (Koole, Kuhl, Jostmann, & Vohs, *in press*). Viewing cultivated nature might thus allow state-oriented individuals to disconnect nature from their concerns with death. We did not predict the latter effect for action-oriented participants, because action-oriented individuals are inclined to shield themselves off from social influences, even when these influences are emotionally comforting (Koole, 2004b; Kuhl & Kazén, 1994).

Method

Participants and Design. Forty-eight paid volunteers at the Free University Amsterdam (29 women and 19 men, average age 21) participated in the experiment. Based on their scores on the AOT-scale, participants were classified into action- versus state-oriented individuals. Thus, the experimental design was 2 (AOT: action vs. state; between participants) x 2 (photographic prime: wild vs. cultivated nature; between participants) x 2 (lexical prime: wild vs. cultivated nature; within participants) x 2 (target category: natural versus social; within participants) x 2 (target valence: negative versus positive; within participants).

Procedure. The procedure and equipment were similar to those used in Studies 1-3. After being seated, participants first completed some personality questionnaires, which included the AOT-scale ($\alpha = .83$). Next, participants performed a "dot recognition" task that contained our nature photograph priming manipulation. Following the dot recognition task, participants continued with an unrelated filler task, which lasted about 5 minutes.

Participants then proceeded with the primed lexical decision task. Participants subsequently proceeded with some unrelated studies, provided some biographical data, were debriefed and paid.

Photographic Priming. Participants were told that the investigators were interested in the speed of visual perception processes. During the task, photographs of landscapes would be flashed on the computer screen. In between these landscapes, red dots would appear on the screen. Participants' task was to count the number of red dots in between the landscapes. Participants were shown two sets of landscapes. The first set consisted of six landscapes that were interspersed with four red dots, the second set consisted of five landscapes that were interspersed with three red dots. The landscapes and dot stimuli were presented for about 100 ms before they were replaced by the next stimulus. We used these brief presentations to ensure that we evoked participants' intuitive reaction to the landscapes. In the *wild nature photographs* condition, the two sets of landscapes consisted of Dutch natural landscapes that had been pre-tested as relatively wild. In the *cultivated nature photographs* condition, the two sets of landscapes consisted of Dutch natural landscapes that had been pre-tested as relatively cultivated.

Primed Lexical Decision Task. During the lexical decision task, participants were informed that a number of letter strings would appear individually in the center of the computer screen. Some of these strings would be genuine words, whereas others would be non-words. Participants were to decide as quickly and accurately as possible whether the presented letter string was a word or a non-word. Each trial began with the presentation of a row of five X-es that remained in the center of the computer screen for one second. The row of X-es was replaced by a priming word, which remained on the computer screen for 16 ms. Previous research has shown that prime words cannot be consciously detected at such brief intervals (Arndt et al., 2004). The priming word was replaced by the target letter string, which remained on screen until participants had pressed an appropriate response button. If the letter

string was an existing word, participants had to press the "A" button (left of the keyboard); if the letter string was a non-word, participants had to press the "6" button (right of the keyboard).

After four warm-up trials, participants proceeded with 112 experimental trials. One half of these trials had words as targets: seven words were related to nature and mortality (*cadaver, skull, maggots, decomposition, fatal, corpse, cancer*), seven words were related to nature and vitality (*flowers, birds, spacious, creek, blossom, water, nature*), seven words were related to social punishment (*punishment, hate, scold, badger, mean, lie, sneaky*), and seven words were related to social reward (*reward, love, kiss, stroke, tender, truth, honest*). The target words were presented twice: once preceded by one of seven wilderness primes (*prairie, swamp, desert, savannah, primeval forest, wilderness, jungle*), and once preceded by one of seven cultivated nature primes (*meadow, polder, community garden, park, public garden, field, golf course*). Each prime word was paired equally often with each of the four target categories. Note that the prime words were all single words in Dutch, because subliminal priming effects are most reliable for single words (Greenwald, 1992). The remaining half of the experimental trials had non-words as targets. The presentation order of the trials was randomized for each participant, and response latencies were recorded using appropriate software.

Results

Before analyzing the results, we first removed wrong responses from the lexical decision task (1.5% of all responses) and converted lexical-decision latencies longer than 1,000 ms (i.e., more than three standard deviations above the mean) into 1,000 ms.

We subjected average lexical-decision latencies to a 2 (AOT) x 2 (photographic prime) x 2 (lexical prime) x 2 (target category) x 2 (target valence) ANOVA. The analysis yielded a main effect of target valence, which indicated that lexical decisions were faster to positive than to negative targets, $F(1, 44) = 51.35, p < .001$ ($M = 623$ vs. $M = 655$). The

analysis further yielded a set of two-, three- and four-way interactions, and the predicted five-way interaction between AOT, photographic prime, lexical prime, target category, and target valence, $F(1, 44) = 3.90, p = .055$. The latter effect indicated that it was appropriate to analyze the results separately by target category. For each word type, we found a significant two-way interaction between AOT and photographic prime, $p < .05$. Across each word type, action-oriented participants generally displayed slower lexical decisions after viewing wild rather than cultivated nature, $F(1, 44) = 3.99, p = .052$ ($M = 679$ vs. $M = 622$). State-oriented participants displayed a trend in the opposite direction, but this effect was not significant, $F(1, 44) = 1.48, p = .228$ ($M = 606$ vs. $M = 643$). No other effects emerged for words related to vitality, punishment, and reward.

For mortality words, however, the analysis yielded a three-way interaction between AOT, photographic prime, and lexical prime, $F(1, 44) = 23.26, p < .001$. Relevant means are displayed in Table 4. We proceeded with more focused tests. In the condition in which participants had been exposed to wild nature photographs, there emerged a main effect of AOT, $F(1, 22) = 7.05, p < .02$, consistent with slower lexical decisions among action-versus state oriented participants ($M = 716$ vs. $M = 633$). There was also an interaction between AOT and lexical prime, $F(1, 22) = 15.14, p < .002$. After viewing wild nature, action-oriented participants were slower to respond to mortality words when these were primed by wilderness words rather than cultivated nature words, $F(1, 12) = 8.23, p < .02$ ($M = 737$ vs. $M = 695$). The latter effect is consistent with the notion that action-oriented participants suppressed the cognitive association between wilderness and death after viewing wilderness. By contrast, after viewing wild nature, state-oriented participants were quicker to respond to mortality words when these were primed by wilderness words rather than cultivated nature words, $F(1, 10) = 7.02, p < .03$ ($M = 611$ vs. $M = 653$).

In the condition in which participants had been exposed to cultivated nature photographs, there was also an interaction between AOT and lexical prime, $F(1, 22) = 8.68,$

$p < .008$. However, the pattern of means was opposite to the pattern in the wild nature photographs condition. After viewing cultivated nature, action-oriented participants were quicker to respond to mortality words when these were primed by wilderness words rather than cultivated nature words, $F(1, 12) = 5.01, p < .05$ ($M = 631$ vs. $M = 662$). The latter effect is consistent with the notion that action-oriented participants activated the cognitive association between wilderness and death after viewing cultivated nature. By contrast, after viewing cultivated nature, state-oriented participants were somewhat slower to respond to mortality words when these were primed by wilderness words rather than cultivated nature words, $F(1, 10) = 3.77, p = .081$ ($M = 689$ vs. $M = 655$).

Discussion

After viewing photographs of wilderness, lexical decision latencies of action-oriented participants revealed that wilderness words inhibited words related to death. This finding fits with the notion that action-oriented individuals suppress the cognitive association between wilderness and death after viewing wilderness. Notably, action-oriented individuals did not invariably inhibit the cognitive association between wilderness and death after viewing cultivated nature. Indeed, after viewing cultivated nature, action-oriented participants displayed a facilitation between wilderness and death words. Action-oriented individuals may thus be rather flexible in their suppression processes, and only suppress the dark side of wilderness after they have encountered wilderness environments.

There was an unexpected slow-down in lexical-decision latencies among action-oriented participants after viewing wilderness. Such a slow-down in responding has been associated with bringing self-regulation processes on-line (Kazén, Baumann, & Kuhl, 2003). The observed slow-down in lexical decision times among action-oriented participants thus suggests that action-oriented participants used active self-regulation in coping with the dark side of wilderness. This additional evidence therefore fits with our reasoning that action-

oriented individuals engaged in more self-regulation processes after viewing wilderness than after viewing cultivated nature.

State-oriented participants displayed a complete reversal of the cognitive associations that were found among action-oriented participants. After viewing wilderness, state-oriented participants activated the cognitive association between wilderness and death. This effect is consistent with the notion that encounters with wilderness serve to potentiate automatic cognitive associations between wilderness and death among state-oriented participants. After viewing cultivated nature, however, state-oriented participants displayed an inhibited association between wilderness and death. Presumably, encounters with cultivated nature provide state-oriented with symbolic assurance that the wild forces of nature can be controlled by human civilization..

Study 5

Based on Study 4's findings, action-oriented individuals seem particularly efficient in suppressing death thoughts in their encounters with wilderness. However, there are times when the psychological confrontation with death may be inevitable even for action-oriented individuals. When exposed to direct death reminders, even the most efficient suppression skills are unlikely to keep death thoughts at bay. Consequently, direct death reminders may sensitize action-oriented individuals to the dark side of wilderness and thus lower their evaluations of wilderness. At the same time, direct death reminders can be expected to have little effect on state-oriented individuals' evaluations of wilderness. This is because, as Study 4 indicates, merely viewing wilderness may be already sufficient to highlight the problem of death among state-oriented individuals.

We designed Study 5 to address the interactive effects of action orientation and direct death reminders on nature evaluation. We further included some additional methodological improvements in Study 5. First, we used a subliminal priming method to manipulate direct death reminders (Arndt, Greenberg, Solomon, & Pyszczynski, 1997). Second, we contrasted

the death reminders condition with both neutral and aversive priming control conditions. In the neutral control condition, participants were subliminally primed with four x-es. In the aversive control condition, participants were subliminally primed with the word 'pain'. This second control condition allowed us to examine whether our results were indeed specific to death concerns, or whether they were due to the more general accessibility of aversive cognitions. Finally, we included a systematic assessment of participants' mood changes in Study 5. Past TMT research has found little evidence that verbal death primes influence mood, even though verbal death primes reliably elicit defensive responses (Greenberg, Solomon, & Pyszczynski, 1997). We therefore predicted no effects of subliminal death reminders on subjective mood.

Method

Participants and Design. One hundred and eleven paid volunteers at the Free University Amsterdam (72 women and 43 men, average age 23) participated in the experiment. Based on their scores on the AOT-scale, participants were classified into action-versus state-oriented individuals. Thus, the experimental design was 2 (AOT: state vs. action; between participants) x 3 (subliminal priming: xxxx vs. death vs. pain; between participants) x 2 (nature type: wild vs. cultivated; within participants).

Procedure. The procedure and equipment were similar to those used in Study 2. Participants first completed some personality questionnaires, which included the AOT scale (Cronbach's alpha = .80). Next, participants rated their moods on the brief Profile of Mood Scales (POMS; Shacham, 1983) translated into Dutch (Van den Berg *et al.*, 2003). Participants then moved on to a study "on word associations", which contained our subliminal priming manipulation. Following this task, participants rated their moods for a second time on the POMS and performed a brief filler task. After this, participants evaluated the same set of landscape photographs as in Study 3, completed another filler, and rated their moods for a third time on the POMS. Subsequently, all participants provided some biographical data

regarding their gender and age. Finally, participants were probed regarding their perceptions of the experiment, debriefed, paid, and dismissed.

Subliminal Death Priming. The subliminal priming task was modeled after Arndt *et al.* (1997). Participants were explained that for each trial of the word-completion test, two words would be presented sequentially on the computer screen. Some of these word pairs would be related to each other, such as *rose* and *flower*, whereas other word pairs would be unrelated to each other, such as *cabbage* and *rope*. After each word pair was flashed on the screen, participants were asked to indicate whether the words were related by typing a '1' to signify that the words were unrelated, or a '2' if the words were related. Participants were instructed to keep their eyes fixed on the center of the screen during the stimulus presentation, because the word pairs would be presented very briefly on the computer screen. Participants were also told that the computer would randomly select a second word from a list after the presentation of the first word, so that they might sometimes see a brief flash in between the presentation of the two words. After these instructions, participants received two practice items. The correct answer to these items was provided, and participants were offered the opportunity to try the practice items again if they wished.

Participants proceeded with the word-relation test. Each of the 10 trials consisted of a sequential presentation of three stimuli centered on the screen. The first and third words were the words for which the participants were supposed to determine the presence of absence of a relationship. In reality, these words served as a forward mask (and fixation point) and backward mask, respectively. The critical subliminal prime was presented between the two mask words for 34 ms. In the death priming condition, the subliminal prime was "*dood*" (Dutch for "*death*" or "*dead*"). In the xxxx-priming condition, the subliminal prime was a string of four X's. In the pain-priming condition, the subliminal prime was "*pijn*" (Dutch for "pain").

Mood Measurement. During the three consecutive mood assessments, participants rated their current feelings on the POMS. The 32 mood items formed five subscales, which assessed feelings of depression, anger, tension, vigor, and anxiety. Cronbach's alphas for the POMS scales ranged between .83 and .95 across the three separate measurements.

Results

Subliminality Check. At the end of the experiment, participants were probed regarding their awareness of the subliminal primes that were presented during the word-relation test, using a funneled debriefing procedure (Bargh & Chartrand, 2000). During this procedure, three participants claimed that they had seen an additional word being flashed on the computer screen in between the two test words. These three participants were unable to guess which word had been flashed when the priming word was presented along with three alternative words. Even so, they might have been able to detect some of the subliminal primes. Hence, we removed the three suspicious participants from the dataset.

Perceived Cultivation and Complexity. Participants perceived the cultivated landscapes as more cultivated than the wild landscapes, $F(1,110) = 719.25, p < .001 (M = 7.19 \text{ vs. } M = 3.77)$. Perceptions of cultivation were not affected by AOT or the subliminal priming manipulation, $F_s < 1$. As in Study 3, wild nature was perceived as less complex than cultivated nature, $F(1,110) = 87.25, p < .001 (M = 4.52 \text{ vs. } M = 5.60)$. However, the cultivated landscapes were still perceived as reliably more cultivated after we statistically controlled for perceived complexity as a covariate, $F(1,109) = 370.91, p < .001$. Conversely, when we statistically controlled for perceived cultivation as a covariate, the differences in perceived complexity between wild and cultivated landscapes fell to non-significance, $F(1,109) < 1$. Thus, variations in perceived complexity did not contribute any variance over and above the difference in perceived cultivation between the wild versus cultivated landscapes.

Beauty Ratings. We subjected participants average beauty ratings to a 2 (AOT) x 3 (subliminal priming) x 2 (nature type) ANOVA. This analysis yielded a main effect of nature type, $F(1,105) = 46.57, p < .001$, which indicated that average beauty ratings for wild nature were higher than average beauty ratings for cultivated nature ($M = 6.37$ vs. $M = 5.69$). In addition, the analysis revealed a two-way interaction between AOT and subliminal priming, $F(2,105) = 3.32, p < .05$, a two-way interaction between AOT and nature type, $F(1,105) = 5.00, p < .03$, and the predicted three-way interaction between AOT, subliminal priming, and nature type, $F(2,105) = 4.66, p < .02$. Relevant means are displayed in Table 5.

To facilitate the interpretation of these effects, we subtracted participants' evaluations of cultivated nature from their evaluations of wild nature, such that higher scores indicated greater preference for wilderness. We then conducted separate tests among action- and state-oriented individuals. Among state-oriented individuals, subliminal priming had no significant effects, $p > .10$. By contrast, among action-oriented individuals, subliminal priming significantly influenced preference for wilderness, $F(2,42) = 3.64, p < .04$. Follow-up tests showed that action-oriented participants primed with xxxx or pain had an equally strong preference for wilderness, $F < 1$ ($M = 1.40$ vs. $M = 1.27$). Action-oriented participants who had been primed with death, however, had lower preference for wilderness than action-oriented participants primed with xxxx, $F(1,42) = 6.17, p < .02$ ($M = .41$ vs. $M = 1.27$), and action-oriented participants primed with pain, $F(1,42) = 3.87, p = .056$ ($M = .41$ vs. $M = 1.40$). Another way to interpret the interaction pattern is to note that action-oriented participants had a stronger relative preference for wilderness than state-oriented participants after being primed with xxxx, $F(1,36) = 8.65, p < .007$, and after being primed with pain, $F(1,34) = 7.10, p < .02$. After being primed with death, however, action-oriented participants had an equally low preference for wilderness as state-oriented individuals, $F < 1$.

We also examined our results separately for wild versus cultivated nature. For beauty ratings of cultivated nature, no significant effects emerged, $p > .10$. For beauty ratings of

wild nature, the analysis revealed a marginal main effect of AOT, $F(1, 105) = 2.84, p = .095$, which was qualified by an interaction effect between AOT and subliminal priming, $F(2, 105) = 5.53, p < .006$. Subsequent tests revealed that action-oriented participants rated wild nature as non-significantly *more* beautiful than state-oriented participants after being primed with xxxx, $F(1, 36) = 1.30, p = .265$, and significantly so after being primed with pain, $F(1, 34) = 9.67, p < .005$. After being primed with death, however, action-oriented participants tended to rate wild nature as non-significantly *less* beautiful than state-oriented participants, $F(1, 35) = 2.53, p = .120$. Thus, as in Studies 2 and 3, the effects were stronger for relative preference than for absolute beauty ratings of wilderness.

Mood Ratings. Mood ratings were scored such that higher ratings signified higher negative affect (all Cronbach's alphas $> .95$). We performed a 2 (AOT) \times 3 (subliminal priming) \times 3 (time) on participants' average mood ratings. The analysis revealed no effects of subliminal priming, $p > .10$. A similar pattern of results was found when the various subscales of the POMS were analyzed separately. Average mood ratings were uncorrelated with ratings of wild or cultivate nature ($p > .10$) and the results obtained for beauty ratings did not change when mood ratings were included as covariates.

Discussion

As predicted, subliminal death reminders inhibited the influence of action orientation on nature evaluation. When participants were subliminally primed with neutral words or pain, action orientation was positively related to preference for wilderness. The non-death priming conditions thus mirrored the results of Study 3. However, when participants were subliminally primed with death, the influence of action orientation on preference for wilderness was eliminated.

State-oriented participants displayed relatively low evaluations of wilderness regardless of subliminal death priming. The lower reactivity of state-oriented participants to verbal death reminders compared to their action-oriented counterparts may be explained by

Study 4's observation that state-oriented participants activate death thoughts in response to wilderness even in the absence of direct death reminders. Accordingly, the death primes in Study 5 may not have affected state-oriented participants because state-participants were already attuned to the psychological threat of wilderness. Unexpectedly, death priming led to a non-significant trend among state-oriented participants to increase their preference for wilderness. It should be noted that this trend did not contribute to the statistical significance of our predicted effects, because our results were statistically reliable even when action-oriented participants were considered separately. Speculatively, the confrontation with the double threat of death reminders and wilderness may have led some state-oriented individuals to down-play the threat of wilderness on a conscious level. This conscious strategy may be analogous to the trivialization strategies that people use to reduce cognitive dissonance after alternative dissonance reduction strategies have been blocked (Simon, Greenberg, & Brehm, 1995). However, we must caution against heavy-handed interpretations of the effect of subliminal death priming among state-oriented participants, given that this effect was not statistically reliable.

Some other aspects of Study 5 are also noteworthy. First, Study 5 found that verbal pain primes did not yield similar effects as priming death. This is clear-cut evidence that our central results are uniquely due to death concerns, as opposed to any kind of negative rumination. Second, Study 5 found no evidence that the effects of verbal death primes and action orientation on nature evaluation were not mediated by changes in subjective mood, a finding that is consistent with previous TMT research (Arndt *et al.*, 2004). Finally, Study 5 replicated Study 3's finding that the effects of wild versus cultivated nature were not mediated by differences in perceived complexity between these different nature types.

Would we have obtained similar results if we had used supraliminal death reminders? Although we do not have direct evidence on this matter, the results of Study 4 indicated that the effects of action orientation are capable of operating on subliminal levels. Moreover, past

TMT research indicates that the effects of subliminal death primes are qualitatively similar to the effects of supraliminal death primes (Arndt *et al.*, 2004). Finally, Baumann and Kazén (2003) found that action-oriented individuals show increases in worldview defense after supraliminal death primes, even to a greater degree than state-oriented individuals. Overall, the available evidence suggests that supraliminal death primes are likely to have similar effects as the subliminal death primes that were used in Study 5.

General Discussion

In the present research, we explored some of the motivational dynamics that underlie people's nature evaluations. In Study 1, we found that participants were more inclined to think about death in the wilderness than in either cultivated or urban environments. Based on the psychological association between wilderness and death, we hypothesized that terror management concerns may sensitize people to the dark side of nature. Consistent with this, Study 2 showed that death reminders subdued people's appreciation of the beauty of wilderness. We further hypothesized that people may actively suppress the dark side of wilderness through self-regulation. In line with this reasoning, Study 3 showed that action orientation is positively linked with perceived beauty of wilderness and Study 4 showed that action-oriented individuals are better than state-oriented individuals at suppressing the association between wilderness and death. Finally, Study 5 found that subliminal death primes eliminate the influence of action orientation on nature evaluation, in line with the idea that action-oriented individuals' suppression skills can be bypassed by direct death reminders.

The present findings attest to the relevance of terror management motives in human-nature relations (Goldenberg *et al.*, 2000). Indeed, Study 1 showed that wilderness environments were more strongly associated with death ruminations than cultivated or urban environments, and Study 4 found evidence for cognitive associations between wilderness and death that are even potent on subliminal levels. Importantly, both Studies 1 and 4 showed that wilderness was not associated with negative ruminations in general. The dark side of

wilderness thus appears to relate specifically to the problem of death (Koole & Van den Berg, 2004).

Some people may be capable of suppressing the dark side of wilderness. Indeed, Study 4 found that action-oriented individuals unconsciously suppressed the cognitive association between wilderness and death after encountering wilderness. Even so, action-oriented individuals cannot completely escape the dark side of wilderness. Study 5 showed that direct reminders of death can induce action-oriented individuals to lower their evaluations of wilderness. Thus, even highly efficient suppression skills may not compensate for the increase in death thought accessibility that results from direct death reminders. State-oriented individuals are not equipped with the same suppression skills as action-oriented individuals. It thus seems understandable that state-oriented individuals had a markedly lower appreciation of wilderness relative to action-oriented individuals. By contrast, state-oriented individuals appear to be relatively favorably disposed towards cultivated nature. Cultivated nature may thus provide a viable setting for state-oriented individuals in which they can enjoy some of the positive benefits of nature.

The present research also found support for a bright side of wilderness. First, Study 1 showed that participants were more inclined to think about freedom in the wilderness than in either cultivated nature or the city. Second, there was a general trend among participants in Studies 2, 3, and 5 to rate wilderness as relatively beautiful. Indeed, the lowest average beauty rating of wilderness in the present research was 5.79, which is well above the conceptual midpoint of the 9-point scales that were being used. This general liking of wilderness, at least on the surface, might seem at odds with our contention that wilderness is intrinsically associated with terror management concerns. However, participants in the present research were judging wilderness landscapes in the safety and comfort of a psychological laboratory. Within this context, the levels of psychological threat that were associated with wilderness were probably minimal. People's affective reactions towards wilderness become considerably more

intense and negative during actual wilderness experiences, for instance, during heavy storms or encounters with wild animals (Van den Berg & Ter Heijne, 2004). Under more realistic conditions, therefore, the influence of terror management concerns on nature evaluation will probably be considerably enhanced.

Limitations and Future Perspectives

The present research only studied reactions to simulated environments. It is therefore important to ask whether our results would generalize to actual environments. Fortunately, people's reactions to simulated and actual environments show considerable convergence (Coeterier, 1983; Gifford, 2002; Hull & Stewart, 1992). There are thus grounds to believe that the present results will generalize to more realistic encounters with nature. A further limitation is that the present research used only Dutch participants. There is reason to suspect, however, that our findings are relevant to other cultures as well. Investigations in other countries, such as the United States, have corroborated people's fears of wilderness (Bixler & Floyd, 1997) and an action-oriented mindset to overcome such fears (Kaplan & Kaplan, 1989; Korpela, Hartig, Kaiser, & Führer, 2001), the two central notion that underlie the current analysis. Still, it would be informative to extend the present findings to other cultures, in particular cultures that advocate less ecocentric views on human-nature relations (Buttel, 1987; Catton & Dunlap, 1980).

Though many important questions must await future research, the present research attests to the great potential for integration between personality/motivation theory and environmental psychology. Traditionally, these areas have been largely separate domains of inquiry. In recent years, however, there has been a growing interest in how motivation and personality interface with the physical environment (Aarts & Dijksterhuis, 2003; Gosling, Ko, Mannarelli, & Morris, 2002; Koole & Van den Berg, 2004). In view of these promising developments, future theory and research may benefit enormously from a continued

interchange between environmental psychology and research on personality and motivation processes.

Concluding Remarks

People have longed to live in harmony with nature ever since human civilization created a rift between homo sapiens and other life forms. Yet with today's growing list of environmental problems, the ideal of striking a perfect balance between civilization and nature seems more and more difficult to attain. In the present research, we have argued that some of the roots of the perennial conflict between people and nature may lie at the core of the human psyche, in people's difficulty in coming to terms with their own finitude. People may thus need to reconcile themselves with their own deepest anxieties before they can engage in more positive exchanges with the natural environment. To live in harmony with nature, people must first find harmony within themselves.

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Footnotes

1. Our theoretical perspective distinguishes between fear of nature and fear of chaos or uncertainty. Although nature can be chaotic and disorganizing from the viewpoint of human society, many natural events are simultaneously lawful and terrifying. For instance, the natural decay of the body proceeds in more or less the same orderly and predictable sequence for every human being, but the thought of this physical decay is still anxiety-provoking for most people (Goldenberg & Roberts, 2004). Thus, although fear of chaos may sometimes contribute to fear of nature, fear of nature cannot be reduced to fear of chaos or uncertainty.

2. Throughout Studies 1-5, no reliable effects of gender emerged. Accordingly, this variable was dropped from all the analyses.

3. Kuhl (1994) introduced the label "failure-related" action orientation to refer to AOT. However, we prefer the label "threat-related", because the effects of AOT are theoretically not specific to failure but rather involve a broad range of psychological threats, including negative affect (Baumann & Kuhl, 2002), external pressure (Kazén *et al.*, 2003), and controlling relationship partners (Koole, 2004b).

4. In Studies 1, 3, 4, and 5, analyses using continuous AOT scores yielded similar results as analyses using median splits.

5. Though the ANOVA approach is conventional within social and personality research, it results in information loss by neglecting continuous variations in cultivation. To examine the influence of continuous variations in cultivation, we re-analyzed the data reported in Studies 2, 3 and 5 using multilevel analysis (Bryk & Raudenbusch, 1992; for an application in landscape evaluation, see Van den Berg *et al.*, 1998). Multilevel analysis allows for the

testing of our hypotheses while a) including landscapes with an infinite range of levels of cultivation, and b) treating cultivation as a continuous variable. In these multilevel analyses, evaluations of the different landscapes were considered as lower level observations nested under the upper level unit, persons. As it turned out, the results of the multilevel analyses were highly similar to those produced by the ANOVA approach. Because the ANOVA approach is more conventional and easier to interpret for most readers, we chose to remain with the ANOVA approach in the main body of this article.

6. Following the suggestion of an anonymous reviewer, we explored whether our results in Study 2 were moderated by explicit fear of death. From a TMT perspective, low expressed fear of death may often reflect a tendency to deny one's existential fears. Accordingly, individuals with low expressed fear of death might be especially prone to engage in intuitive terror management defenses (Greenberg *et al.*, 1995; Harmon-Jones, Greenberg, Solomon, & Simon, 1996). To address this issue, we performed a median split on participants DFDI scores, and performed a 2 (mortality salience; high vs. low) x 2 (expressed fear of death: high vs. low) between-participants ANOVA on participants' average preference for wild over cultivated nature. This analysis yielded a main effect of mortality salience, $F(1, 39) = 9.18, p < .005$, and a marginal interaction between mortality salience and expressed fear of death, $F(1, 39) = 2.95, p = .094$. Subsequent tests showed that mortality salience led to a significant reduction in preference for wild over cultivated nature among participants with low expressed fear of death, $F(1, 39) = 10.39, p < .004 (M = .80 \text{ vs. } M = 2.46)$. Among participants with high expressed fear of death, mortality salience led to a non-significant reduction in preference for wild over cultivated nature $F(1, 39) = 1.26, p = .268 (M = 1.02 \text{ vs. } M = 1.48)$. Although this effect might appear counter-intuitive, it is consistent with TMT's reasoning that the *denial* of death anxiety causes terror management defenses to emerge, rather than death anxiety per se.

Table 1

Percentages of Participants (N = 90) Inclined to Think More about Specified Topics in Wild vs. Cultivated Nature, Wild Nature vs. the City, and Cultivated Nature vs. the City (Study 1)

| Topic | Comparison | | |
|--------------------------|-------------------|-------------|-------------------|
| | Wild > Cultivated | Wild > City | Cultivated > City |
| Relationship Problems | 48.9 | 36.7 | 35.5 |
| Politics | 16.7 | 8.9 | 12.2 |
| Family | 42.2 | 48.9 | 50.0 |
| Personal finances | 11.1 | 2.2 | 11.1 |
| Death | 76.7 | 68.9 | 60.0* |
| Art | 51.1 | 43.3 | 37.8 |
| Studies | 12.2 | 4.4 | 11.1 |
| Freedom | 81.1 | 77.8 | 76.7 |

Note 1: Wild > cultivated = percentage more inclined to think about the specified topic in wild nature than in cultivated nature; wild > city = percentage more inclined to think about the specified topic in wild nature than in the city; cultivated > city = percentage more inclined to think about the specified topic in cultivated nature than in the city.

Note 2: Bold-printed proportions differ significantly from chance at $p < .03$; proportions marked with an asterisk differ from chance at $p < .08$.

Table 2

Landscape Evaluations as a Function of Death Reminders and Nature Type (Study 2).

| | Nature Type | |
|--------------------------------|----------------|----------------|
| | Cultivated | Wild |
| No Death Reminder ($N = 22$) | 4.95 (1.21) | 6.90 (.83) |
| Death Reminder ($N = 21$) | 5.49 (1.19) | 6.44 (1.17) |

Note: Ratings were made on scales ranging from 1 = not at all beautiful, to 9 = very beautiful.

Table 3

Beauty Ratings of Wild and Cultivated Nature as a Function of Simulation and Action

Orientation (Study 3; Standard Deviations between Brackets).

| | Type of Simulation | | | |
|-------------------------------------|--------------------|----------------|---------------------|----------------|
| | Nature Photographs | | Nature Descriptions | |
| | Cultivated | Wild | Cultivated | Wild |
| Action Orientation (<i>N</i> = 34) | 5.88 (1.26) | 6.85 (1.28) | 3.97 (1.63) | 6.51 (1.60) |
| State Orientation (<i>N</i> = 26) | 6.07 (1.30) | 6.32 (1.50) | 4.41 (1.34) | 5.79 (1.52) |

Note: Ratings were made on scales ranging from 1 = not at all beautiful, to 9 = very beautiful.

Table 4

Lexical Decision Latencies of Natural Mortality Words as a Function of Action Orientation, Photographic Priming, and Subliminal Lexical Priming (Study 4; Standard Deviations between Brackets).

| Photographic Prime | | | |
|--------------------|--------------------------|-------------------|--------------------------|
| | Wilderness | Cultivated Nature | |
| | Subliminal Lexical Prime | | Subliminal Lexical Prime |
| Action Orientation | 737 (90) | 695 (98) | 631 (54) |
| State Orientation | 611 (61) | 653 (98) | 689 (107) |
| | | | 662 (73) |
| | | | 654 (91) |

Table 5

Beauty Ratings of Wild and Cultivated Nature as a Function of Subliminal Priming and Action Orientation (Study 5; Standard Deviations between Brackets).

| | Action Orientation | | | State Orientation | | |
|-------------------|--------------------|--------|--------|-------------------|--------|--------|
| | xxxx | pain | death | xxxx | pain | death |
| Subliminal Prime | | | | | | |
| Wild Nature | 6.65 | 7.31 | 6.08 | 6.17 | 5.95 | 6.70 |
| | (1.11) | (.57) | (1.32) | (1.38) | (1.38) | (1.02) |
| Cultivated Nature | 5.25 | 6.04 | 5.67 | 5.81 | 5.61 | 5.85 |
| | (1.37) | (1.19) | (1.08) | (1.14) | (.99) | (1.27) |

Note: Ratings were made on scales ranging from 1 = not at all beautiful, to 9 = very beautiful.