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Start making sense: Compensatory responses to control- and meaning threats

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Introduction and overview

“Disorder is our worst enemy” – Hesiod, 700 B.C.

This introduction is partly based on Rutjens, B. T., van der Pligt, J., & van Harreveld, F. (in press). Regulating psychological threat: The motivational consequences of threatening contexts. In K. J. Jonas & T. Morton (Eds.) *Restoring civil societies: The psychology of intervention and engagement following crisis*. Wiley Blackwell.

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Rutjens, B. T., & Loseman, A. (2010). The society-supporting self: System justification and cultural worldview defense as different forms of self-regulation. *Group Processes and Intergroup Relations*, 13, 241-250.

Folk wisdom has it that there are ‘no atheists in foxholes’. This aphorism of course primarily refers to how extreme levels of uncertainty, stress, and fear, such as those occurring among soldiers during warfare, compel virtually anyone to enhance their faith in a higher power. Nonetheless, it can be argued that the general tenet of the saying is as follows: threat prompts people to seek compensatory cognitions and beliefs that help them to somehow take the sting out of the experienced threat and reduce its psychological impact. This general idea is supported by a substantial body of empirical research in the field of social and personality psychology. An extensive literature focuses on how threats related to uncontrollability, uncertainty, and existential anxiety, engender compensatory responses that are aimed at assuaging the threat at hand. And indeed, as the aforementioned aphorism indicates, many of the compensatory belief systems that the literature has identified involve a religious or supernatural component (e.g., belief in God or a higher power, magical thinking and superstitious belief).

Fortunately, most of us go through life without ever having to spend time on a battlefield, let alone in a foxhole, but this does not mean that we are safeguarded from threatening cognitions pertaining to uncontrollability, meaninglessness, unpredictability, and even death. On the contrary, life in modern society is often riddled with feelings of uncontrollability and reminders of our mortality. There are numerous examples of societal instability, crisis, and environmental threat that might instill the view that we are living in a risk society (Beck, 1992) or even in ‘the age of anxiety’ (Twenge, 2000). Examples of contemporary events and phenomena that might seem uncontrollable or unpredictable, and may illuminate life’s fragility, are the recent financial crises, climate-change, wars, and terrorist attacks, to name

but a few. The crumbling authority of experts (e.g., scientists and politicians) when it comes to providing interpretations for such phenomena (see, e.g., Gleick et al., 2010) is likely to sustain, or even enhance, the perceived uncontrollability and uncertainty associated with these threats. The feeling that we lack control over our lives and that events appear random is not only triggered by large-scale societal and natural threats, but can also easily be induced by personal and sometimes quite mundane events. When we decide to fly to our holiday destination, when our computer crashes, or when we unexpectedly get fired, we are likely to experience lowered levels of personal control. When someone close to us suddenly gets seriously ill or is involved in a serious accident, we may be struck by life's randomness and be compelled to ponder our own mortality. To put it plain and simple: sometimes life is uncontrollable, and it is a given that death is inevitable. The current dissertation focuses on how people cope with these threatening and sometimes undeniable and inevitable conceptions.

People are sense-making creatures and are highly motivated to impose causality and order on their world. We tend to infer controllability and meaning from the things we perceive in the world and the events that happen in our lives. Given that it is inevitable that we every now and then encounter events that threaten these cherished perceptions of control, order, and meaning, it is not surprising that human beings have developed a wide array of compensatory strategies that are aimed at restoring these perceptions. Religious belief, as suggested by the aphorism that opened this introduction, has often been shown to provide such compensation. Indeed, Spilka, Shaver, and Kirkpatrick (1985) contended that among the core psychological functions of religious belief are the effectuation of the human needs for control and

meaning (see also Becker, 1962). Further evidence for the functional value of religious belief is provided by a recent special issue of *Personality and Social Psychology Review* (February, 2010) on the psychology of religiosity: this issue contains a contribution on religious belief as a means to compensate for low control (Kay, Gaucher, McGregor, & Nash, 2010), on religion as existential meaning provider (Vail et al., 2010), and an article on religion as uncertainty-reduction (Hogg, Adelman, & Blagg, 2010). Similarly, work on how people cope with threatening information about their health includes religiosity as a possible coping strategy (Rippetoe & Rogers, 1987). Moreover, archival data has shown that during times of threat (such as the Great Depression), conversion to religions providing high levels of order increased, as well as people's interest in books on supernatural sources of order (Sales, 1972; 1973; see also Toynbee, 1972). Importantly, besides religious belief, the literature on psychological threat also documents examples of powerful secular buffers against threats to control and meaning. Examples are defending or upholding important cultural worldviews, bolstering faith in a strong sociopolitical system, and subscribing to a powerful ingroup. A recent illustration concerns the threat posed by the 9/11 terrorist attacks on the World Trade Center in New York; in the aftermath of this event the American public showed, among other things, an increased faith in their political system (e.g., Pyszczynski, Solomon, & Greenberg, 2003; Ullrich & Cohrs, 2007). Later in this introduction I will return to this issue.

Thus, religious beliefs, but also certain secular beliefs and convictions, help to fulfill the needs for control and meaning. Importantly however, in this dissertation I draw upon the idea that control and meaning are two different (but partially overlapping) motivations. There is general consensus about how

the concept of control should be defined: it refers to the perceived ability to exert force and alter the environment, with the aim to obtain certain outcomes (Thompson & Schlehofer, 2007). Definitions of meaning, however, tend to vary. There is a distinction in the literature between meaning as comprehensibility and coherence, versus meaning as purposefulness and significance (see, e.g., Antonovsky, 1987; Becker, 1962; Heine, Proulx, & Vohs, 2006; Hill et al., 2000; Janoff-Bulman & Yopyk, 2004; Kray et al., 2010; Rothbaum et al., 1982; Wong & Fry, 1998). The first definition focuses particularly on expected relations and the identification of associations between events or variables. The latter, which can be dubbed existential meaning (or ‘meaning in life’), is the definition that I employ in this dissertation. Crumbaugh and Maholick (1964) defined this type of meaning as “the ontological significance of life from the point of view of the experiencing individual” (p. 201).

The need for control and the need for meaning are two fundamental motivations (Heckhausen & Schulz, 1995; Kay, Gaucher, Napier, Callan, & Laurin, 2008; Greenberg, Solomon, & Pyszczynski, 1997; Rutjens & Loseman, 2010; Shepherd, Kay, Landau, & Keefer, 2010); both are central to the research that I will present in this dissertation. The research described in the chapters to come investigates how people respond when perceptions of control and meaning are threatened. Building on an extensive body of literature, I look at the ways in which these two distinct but partly overlapping types of threat influence people’s compensatory beliefs and preferences, and the extent to which they help to regulate or reduce the threat. More specifically, in my research I investigated the effects of lack of control and existential threat on secular, scientific, and religious belief systems. Before providing an overview

of the studies that make up the empirical part of the current dissertation, I will first present an outline of the literature on control motivation and the need to perceive order, and on the ways that people have been shown to cope with threats to this motivation. Then, I will give an overview of the first four empirical chapters (parts I and II), that describe my own research concerning compensatory responses to control-threat. Next, I will proceed with introducing the concept of existential meaning motivation and how existential concerns related to mortality are managed. The relation between control and meaning motives will be discussed there as well, and will be further scrutinized in the general discussion of this dissertation. Subsequently, I will give an overview of the last two empirical chapters (part III) of the dissertation, which describe my research on compensatory responses to existential threat.

Control-threat and order motivation

Experiencing a certain level of personal control over the social environment and life's outcomes is considered to be a fundamental human motivation with important consequences for psychological and physical well-being. Control is all about people's perceived impact on events: exerting personal, or primary, control can be defined as the act of bringing the environment in line with the wishes and needs of the individual (Rothbaum, Weisz, & Snyder, 1982). More specifically, it involves the awareness that the person is able to take actions or exert force aimed at obtaining positive outcomes and preventing negative ones (Skinner, 2007; Thompson & Schlehofer, 2007). As such, the concept of control is related to constructs such as self-efficacy (Bandura, 1977) and personal causation (deCharms, 1968); both refer to the individual's ability to

influence external factors and thus increase assurance about future outcomes (see also Pittman, 1998).

Not surprisingly, perceptions of control have been found to enhance well-being and the ability to cope with stress, to improve performance and persistence, to increase optimism, and to reduce anxiety and alleviate perceptions of pain (Fiske & Taylor, 1991; Glass et al., 1973; Luck, Pearson, Maddern, & Hewett, 1999; Skinner, 1996; Thompson & Spacapan, 1991). Along these lines, there is also an extensive body of literature providing evidence for the detrimental effects of lacking sufficient levels of control and predictability; low control is experienced as aversive, stressful, and detrimental to performance (e.g., Heckhausen & Schulz, 1995; Langer & Rodin, 1976; Maier & Seligman, 1976; Moulding & Kyrios, 2006; Pennebaker & Stone, 2004). Perhaps one of the most striking testimonies to the importance of control for human beings stems from a classic study by Rodin and Langer (1977). In their article, they describe a follow-up to a field study conducted more than a year earlier in which the effects of control were tested among elderly nursing home residents. The initial study (Langer & Rodin, 1976) showed that a simple intervention aimed at increasing a sense of control and choice yielded a number of benefits; residents who took part in the intervention reported more happiness and became more active than residents in the non-intervention comparison group. The intervention consisted of, besides communicating the message of residents' own responsibility (experimental group) versus responsibility of the staff over residents (comparison group), offering houseplants to take care of themselves. In the comparison group members of the staff watered the plants. The most startling finding however was observed in the follow-up study conducted 18 months

later: it was found that residents in the experimental group not only showed better health and activity ratings, but also that mortality rates among the comparison group were twice as high as mortality rates in the experimental group. In other words, simple interventions providing inhabitants of an elderly home with some control and choice over mundane daily activities (care for houseplants) actually reduced mortality rates. Adler (2011) and Schulz (1976) found similar beneficial effects of control and predictability on psychological and physical well-being. It can be concluded from these studies that a basic level of personal control over the environment is of fundamental importance for healthy and adaptive human functioning.

Given these clear psychological, and physical, benefits of personal control, an obvious question that arises is how people deal with fluctuating levels of it. Of course, control is often lower than we might desire. As I briefly touched upon earlier in this introduction, it is sometimes impossible to maintain perceptions of personal control, either because of societal developments (e.g., financial crisis, terrorist threat) or specific, more personal events or situations (e.g., getting fired, a relationship breakup, serious illness). Moreover, although control clearly is an important motivation, there might sometimes be instances in which we would rather leave responsibility to others (e.g., to the pilot when flying to our holiday destination, to the surgeon when deciding on the viability of an operation, see also Burger, 1989). This brings us to the question of how people cope with situations in which the fundamental motive to perceive personal control is threatened.

A seminal paper by Rothbaum et al. (1982) posits a two-process model of perceived control, outlining a number of so-called secondary control strategies people may employ when they lack personal (i.e., primary) control.

Remember that primary control refers to the person's ability to bring the environment in line with the self. Secondary control, then, can broadly be defined as the act of bringing the self in line with the environment. By engaging in secondary control strategies, people are still able to maintain perceptions of control, albeit, obviously, less direct than is the case with primary control. The secondary control strategies that probably sparked most follow-up research are illusory control and vicarious control (see Figure 1). Illusory control (Langer, 1975) refers to the attribution of events that are basically determined by chance and uncontrollable by one's own skills or abilities. In other words, people feel they have some control over events or things that are actually not under their control (e.g., believing that a powerful throw of dice will lead to a higher outcome). Indeed, many manifestations of superstitious behavior and magical thinking are driven by illusions of control (Matute, 1994; Matute et al., 2010; Vyse, 1997). Vicarious control refers to aligning oneself with a powerful other agent, such as a strong ingroup or a benevolent, controlling deity. Although there are different views on the extent to which primary control is to be preferred over secondary control (Heckhausen & Schulz, 1995), and some theorists even argue that secondary control can not be equated with control at all (but is merely a form of accommodation; Skinner, 2007), the recently introduced compensatory control model (Kay et al., 2008) argues that primary (i.e., personal) and secondary (i.e., compensatory) control are equally preferable, because they both aid to the basic and inclusive motivation underlying the need for control: *perceiving order*. Maintaining a belief in order and preventing perceptions of randomness in the environment can, according to this model, be achieved either through exerting personal control or through the endorsement of

external systems of control (i.e., compensatory control), such as God or government. Figure 1 summarizes the different forms of secondary control presented in this paragraph.

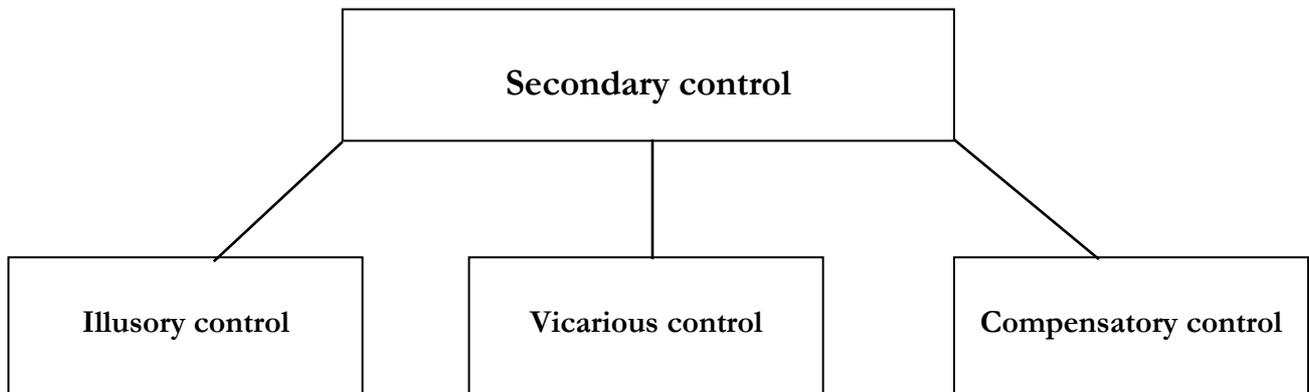


Figure 1. Three forms of secondary control. Rothbaum et al. (1982) originally described four types of secondary control, of which illusory control and vicarious control are the most relevant for the current dissertation¹. Compensatory control, which is based on vicarious control, is described comprehensively by Kay et al. (2008).

Although the concept of compensatory control is closely related to vicarious control, there is an important difference: whereas vicarious control refers to the acknowledgment that there is a powerful other agent (e.g., God, a strong leader) with which one can align to perhaps share in the power (or that can be influenced to exert control for the individual, for example via prayer), compensatory control refers to merely endorsing faith in a powerful other and thus ascertaining oneself that “things are under control” (see Kay et al., 2008, p. 32). In other words, the main motivation is to perceive the world in which we live as a predictable place in which things do not just happen haphazardly. Compensatory control, such as the endorsement of external religious and

¹ The other two forms of secondary control described by Rothbaum et al. (1982) are predictive control and interpretative control.

sociopolitical systems, does therefore not encompass an attempt to regain personal control.

The compensatory control model (Kay et al., 2008, 2010) forms the theoretical basis of the part of my dissertation that focuses on control-threat and compensation (Chapters 1 to 4). The model proposes that personal control and compensatory control function in a hydraulic fashion as different means to meet preferred levels of order². This entails that these two forms of control are substitutable; if one of these forms is lowered, the motivation to increase the other is increased, and vice versa (see also Kay et al., 2010). The idea that perceiving order and structure, and preventing perceptions of randomness and chaos, is a powerful human motivation resonates throughout the literature. As I mentioned earlier in this introduction, people are strongly motivated to believe that the world in which they live, their social environment, is orderly, predictable, and that it makes sense (Janoff-Bulman, 1992; Krantz, 1998; Kruglanski & Webster, 1996; Landau et al., 2004; Lerner, 1980; Pittman, 1998). Whitson and Galinsky (2008) found that people even tend to falsely identify patterns in random-noise stimuli and events when perceptions of control are threatened. Moreover, the naturally occurring tendency to impose patterns and structure on all that we perceive in our environments (dubbed ‘patternicity’ by Shermer, 2010) has been argued to stem from the evolutionary fitness motive to protect oneself from making type II errors (e.g., overlooking a pattern, resulting in getting eaten by a sabretooth tiger; see Foster & Kokko, 2009). A recent study suggests that the innate

² The notion that exerting control is one way to perceive order is also present in the work of Pittman (1998), who argued that control provides people with the idea that their direct environment (and the world as such) is predictable, structured and coherent (see also Krantz, 1998).

preference for order over disorder extends beyond humans (Chiandetti & Vallortigara, 2011).

Returning to the compensatory control model; several lines of research have shown that lacking personal control leads to the endorsement of external systems, both secular and religious, that are perceived as capable of controlling the social world (and thus restore perceptions of order and guard against randomness). This may result in, for example, a tendency to bolster a strong government or defend the legitimacy of the social system (i.e., system justification; Jost, Glaser, Kruglanski, & Sulloway, 2003), an enhanced belief in a controlling higher power (i.e., a deity; Kay et al., 2008, 2010), and defending a powerful ingroup (Fritsche, Jonas, & Fankhänel, 2008). Judging from these findings, it seems that restoring perceptions of order in many cases involves affirming belief in an external system, or agent, which has the power to control outcomes in the world. Especially religion seems to offer a powerful compensatory control mechanism, since belief in God is not dependent on fluctuations in perceived strength of the agent, which is arguably more the case when dealing with the governmental system that one lives in, or of the ingroup one subscribes to. Indeed, long before the compensatory control model was introduced, Spilka et al. (1985) and Rothbaum et al. (1982) argued that an important psychological function of religious belief is that it effectuates the need for control.

Overview of parts I and II of the dissertation

Chapters 1 to 4 build on and extend the existing compensatory control literature. Based on the presumed importance of order and structure perceptions, and more specifically on the assertion of the compensatory control model that perceiving order is the primary motivation behind control

effects, this research generally tested two related ideas. First, I sought to obtain evidence for the idea that an agent or external system in the process of coping with control-threat is optional but not essential: if the primary motivation behind the need to regulate threats to personal control is to affirm order (Kay et al., 2008, 2010), then alternative order affirmations that do not involve an explicit agent should also suffice. In other words, there should be no inherent preference for order provided by an agent versus order not provided by an agent. Moreover, a second and related idea that builds upon the first is that order affirmations can be drawn from a more diverse array of belief systems than previously assumed (and thus extend beyond the domain of religious and sociopolitical beliefs), for example from scientific theories that impose adequate levels of order on reality, and from relatively abstract societal beliefs (i.e., belief in progress).

Chapter 1 investigates the effects of control-threat on preference for three different theories about the origin of life. These theories varied in the extent to which they provide order and/or an agent that provides compensatory control. I employed descriptions of a religious belief system (Intelligent Design: providing order and an agent) and two scientific theories: Darwin's Theory of Evolution (providing neither order nor agent) and an alternative version of Darwin's theory, which views evolution as an orderly and predictable process (providing order but no agent). By letting participants choose between one out of two theories, this set-up allowed a clear test of the relative importance of order through an agent versus order without an agent when dealing with low levels of personal control.

Chapter 2 describes three studies with the aim to show that control-threat leads to the motivation to find order *within* different types of scientific

theories that aim to explain the same phenomena. More specifically, I investigated whether stage theories (versus non-stage theories) become more appealing when control is threatened, and also investigated a possible mediating mechanism. Moreover, I also assessed whether preference for stage theories would be observed when the stage theory provides *negative* predictability (compared to a more uncertain and simultaneously more hopeful alternative theory). Such a finding would indicate that the need to perceive order overrules the importance of valence of the outcomes predicted by the theory. This line of research was inspired by an observation by Shermer (2008), who suggested that an important reason for the ubiquity of stage theories in science (think about for example Kohlberg's stages of moral development, or the well-known five stages of grief) is that they provide in people's need to detect patterns and meaning in the world. Moulding complex behavioral and environmental variables into an orderly series of stages enhances the feeling that we can understand, and perhaps more importantly predict, future outcomes. In this context the presence or absence of an external agent is not relevant and, moreover, an enhanced belief in stage theories would show that the motivational consequences of threats to control extend beyond the realm of religious and political system bolstering.

Chapters 3 and 4 focus on the compensatory control function of more abstract beliefs. More specifically, in these chapters I investigate the relation between threat and belief in moral and social, and scientific and technological, progress. As is the case with the scientific theories in Chapter 2, belief in progress does not involve a religious or political system, or agent, that people may put their faith in. Rather, belief in progress encompasses the faith that, over time, things will get better. In other words, the course of human history is

not cyclical, but follows an upward linear trend. What is interesting about the concept of belief in progress is that it is future-oriented and entails optimism about what will come. It is also an abstract belief, with no clear agent or system that provides compensatory control; rather, progress is facilitated by ‘mankind’ (e.g., scientists, politicians, literature and arts, societal forces). So why would control-threats motivate people to enhance their belief in progress? First, progress entails the promise of humanity gradually advancing; technological and societal advances converge with an increasing ability to exert control over our environment (Gray, 2004; Russell, 1929). In other words, progress entails a promise of future control. Second, a gradually progressing course of human history is an orderly, inevitable, and to some extent predictable course, caused by logical laws of cause and effect (Bury, 1955). A third incentive to expect a potential relation between belief in progress and control-threat lies in its resemblance with religion (Gray, 2007). I will elaborate more on this idea in Chapter 3. In other words, progress promises future control as well as an orderly perspective on our world. The four studies I describe in Chapter 3 investigate the hypothesis that control-threat leads to a tendency to defend the idea of progress, to invest in progress-related research and development, and to a more general faith in moral, societal, and technological progress.

Chapter 4 follows up on Chapter 3 and aims to extend the findings presented in the first three chapters, by directly investigating whether affirming the idea of progress actually helps to restore order perceptions (in other words, does the compensatory control function of such beliefs actually work?). In four studies, belief in progress was manipulated instead of measured as a dependent variable, after which order perceptions as well as the

motivation to exert personal control were assessed. It was hypothesized that affirming progress would increase perceptions of order, while questioning progress would increase perceptions of disorder and randomness. Similarly, based on the hydraulic relation between personal control and external systems of control, I expected that affirming progress would reduce the motivation to exert personal control. In this chapter I focused on sustainable behavior and sustainability intentions as means to exert personal control over outcomes (see Banfield, Nadolny, and Kay, 2011, for a similar rationale regarding prosocial behavior). Examples are behavioral intentions aimed at reducing carbon dioxide emission or reducing waste. In other words, because engaging in sustainable behavior can be seen as taking matters in ones own hand, it is expected to function as a means to affirm personal control - and thus perceptions of order - when order-perceptions are lowered via questioning scientific advances. Such a finding would be in line with the basic tenet of the compensatory control model that personal control and external sources of control work in a hydraulic way to meet the primary motivation to perceive order in the world; Kay et al., 2010). Study 4.4 directly tested this assumption, by investigating whether a personal control affirmation task that followed the manipulation of belief in progress would eliminate the effects of that manipulation on sustainable intentions and behavior. Thus, the studies in Chapter 3 sought evidence for the effects of control-threat on the motivation to defend, invest in, and belief in progress, presumably because belief in progress restores perceptions of order. The studies described in Chapter 4 aimed to show that affirming progress actually functions that way; bolstering faith in the progress of science and society was expected to provide a potent means to cope with threats to control and order.

In sum, the research presented in Chapters 1 to 4 investigates how threats that undermine our cherished perceptions that we live in an orderly and predictable world – a world that is under control - lead to the motivation to bolster and increase our confidence in a variety of belief systems that serve as compensation for these threats.

Control-threat versus meaning-threat

As described earlier in this introduction, the current dissertation focuses on threats to control on the one hand, and existential threat on the other. Importantly, my point of departure is the basic tenet that control-threat first and foremost triggers the motivation to affirm perceptions of order, while existential threat primarily triggers the need for meaning. Although I view these two types of threat as distinct I also think that they are partially overlapping and should not be seen as psychologically independent constructs (see, e.g., Shepherd et al., 2010, for a similar view). Indeed, the problem of mortality might pose the ultimate uncontrollable fact of life (see Pyszczynski, Greenberg, & Solomon, 1998), and thinking about death and the meaning of life may therefore very well instill a sense of uncontrollability in a person, just as someone who thinks about randomness and lack of control might conjure thoughts related to mortality. Moreover, from the perspective of large-scale societal threats, it is likely that the same phenomenon (e.g., a terrorist attack, global warming) can trigger feelings of uncontrollability and chaos as well as thoughts about mortality and death. It is therefore perhaps not surprising that death reminders and threatened feelings of control both can lead to similar compensatory strategies (e.g., bolstering one's religious belief system,

defending or investing in one's ingroup)³. On the other hand it can also be argued that the need for control and the need for existential meaning are, to a certain level, different motivations. Being able to control events or perceive order in situations does not necessarily imply experiencing some deeper purpose or existential meaning. Just as control and order in itself do not guarantee meaning and purpose in life, the experience of profound meaning does not necessarily imply that one feels to be in control over events. Control-threat primarily clashes with our preference for order and therefore intensifies the need to perceive order and predictability. Existential threat clashes with our desire to believe that we live purposeful lives in a meaningful world, and thus prompts us to restore perceptions of meaning (for more discussion on the distinction between these two fundamental motivations, see Rutjens & Loseman, 2010; Shepherd et al., 2010). In short, the present dissertation views control-threat and existential threat not as two dichotomous categories, but rather as two constructs that partially overlap but have distinct and unique characteristics as well. I will return to this issue in the general discussion of this dissertation. In the next paragraph, I present an overview of the theory that has sparked a large body of research on how people deal with existential threat; terror management theory (TMT). After that overview, I introduce my own research that investigates the terror management functions of belief in progress.

Existential threat and meaning motivation

In the last two chapters of this dissertation the focus remains on belief in progress as compensation for psychological threat. However, in these two

³ For recent debates on the uniqueness versus similarity of different types of psychological threat and the underlying motives, see Fritsche et al., 2008; Heine et al., 2006; McGregor, 2006; Pyszczynski, Greenberg, & Solomon, 1997; Shepherd et al., 2010; van den Bos, 2009).

chapters I primarily focus on existential threat as the motivational trigger to bolster and defend this belief. More than a decade of research inspired by TMT has yielded considerable evidence for the motivational consequences of death awareness (i.e., mortality salience). According to TMT (Greenberg, Solomon, & Pyszczynski, 1997; Pyszczynski, Solomon, & Greenberg, 1999), all human motivation is ultimately rooted in the awareness of the inevitability of death combined with the desire for self-preservation. The core premise of TMT, based on the writings of Becker (1962; 1973) and Rank (1936/1950) is that human beings have developed a psychological anxiety buffer to cope with the paradoxical fact that they are, like any other animal, biologically predisposed toward survival, and yet at the same time are the only animal aware of their own mortality. As human beings evolved, environmental demands led to the development of enhanced cognitive abilities, including the ability to self-reflect and to place the self in a symbolic and temporal universe. Put differently, humans became aware of their selves, of the past and of the future, and consequentially also of the concept of mortality. The paradox of mortality awareness and the self-preservation motive engenders feelings of anxiety, or ‘terror’, in the individual. This anxiety relates to what Heidegger called ‘Angst’, which is different from ‘Furcht’, in other words the fear that stems from, for example, the perception of a concrete danger (Heidegger, 1927). Anxiety as in ‘Angst’ refers to the existential meaninglessness and lack of significance that might arise when the individual contemplates how all life is meant to come to an end. The anxiety buffer that humans beings have evolved to cope with this mortality awareness comprises a psychological system consisting of sustaining faith in one’s cultural worldview and contributing to its values. Investing in and contributing to a cultural

worldview is argued to imbue life with meaning, permanence, and stability (Pyszczynski et al., 2003). Conversely, it has been shown that threatening such worldviews reduces perceptions of meaning in life (Juhl & Routledge, 2011). Cultural worldviews can be described as symbolic and socially constructed beliefs that provide people with the notion that they are part of something meaningful and more enduring than their own physical existence. Examples of worldviews that help people to transcend their own existence through affirming their significance in an enduring world (Greenberg, 2008) can be found within religion (e.g., afterlife beliefs), but also in more secular beliefs and behaviors (e.g., leaving behind a legacy or serving one's country).

Ample research has shown that existential threat (i.e., reminders of death) is associated with the motivation to seek such meaning-providing compensation (for an overview, see Hayes, Schimel, Arndt, & Faucher, 2010; Solomon, Greenberg, & Pyszczynski, 2004). This research can broadly be defined along the lines of three hypotheses that the theory has generated. The first, and most widely tested one, is the mortality salience hypothesis (Rosenblatt et al., 1989), which posits that if maintaining faith in cultural worldviews protects against death-related concerns, then making mortality salient should motivate people to uphold, defend, and adhere to their worldviews. In line with this hypothesis, numerous studies have shown that mortality salience (e.g., writing about one's own mortality, passing a funeral home) engender a multitude of behaviors that appear to be designed to uphold, defend, and bolster faith in the values that make up the person's worldview (i.e., their religious beliefs, moral convictions, national identities, etc.). A second hypothesis, the anxiety-buffer hypothesis, holds that if a certain psychological structure functions to buffer against existential anxiety, then

bolstering this structure will attenuate the need for other psychological defenses when people are reminded of death. For instance, following from the prediction that religious belief helps manage anxiety, religious faith and belief in an afterlife help mitigate the effects of mortality salience (e.g., Dechesne et al., 2003; Jonas & Fischer, 2006). Thirdly, the death-thought accessibility hypothesis proposes that if a psychological construct buffers against death awareness, undermining it will increase the accessibility of death-related cognitions (see Hayes et al., 2010 for a review). This hypothesis has been assessed with a variety of beliefs pertaining to such domains as nationalism and religious belief. In one such study (Schimel, Hayes, Williams, & Jahrig, 2007), participants presented with a challenge to their nationalistic beliefs subsequently evidenced increased accessibility of death-related thought relative to those not confronted with such a worldview threat. Thus, TMT-inspired research has documented compelling evidence for the idea that existential anxiety triggers the need to bolster meaning-providing belief systems that help to buffer death-related concerns.

Overview of part III of the dissertation

In Chapters 5 and 6, I describe research that tests a novel and thus far untested existential anxiety-buffer: belief in progress. The general idea behind the studies presented in these chapters is that belief in progress can serve as a meaning-providing construct. This idea is primarily based on the theoretical links between belief in progress and religious belief. As I described earlier in this introduction, Spilka et al. (1985) argued that two of the core psychological functions of religious belief are that they provide in our need for control and meaning (see also Becker, 1962). Malinowski wrote that “Death... is perhaps the main source of religious belief,” (1972, p. 71). British philosopher John

Gray (2004; 2007) argued that belief in progress is not only similar to religious belief; it actually is part of the religious heritage of the Western world and now functions as a secular version of religion: “We seek in the idea of progress what theists found in the idea of providence: an assurance that history need not be meaningless” (2005, p. 1). In other words, where religion offers the promise of a literal afterlife, belief in progress offers the promise of, ultimately, reaching a utopian society: this means that the course of human history, with all its flaws and evils, is justified and meaningful because it progresses in a linear, upward fashion. Humanity learns from the past so that “things will get better”. This belief forges a meaningful link between the past and the future and as such provides a form of symbolic immortality; the engines of progress are believed to continue when the individual itself is no longer around.

If belief in progress indeed has an existential function, then it can be concluded that this belief, like religion, harbors at least two important psychological functions: it helps to meet perceptions of order when control is threatened, and it provides existential meaning. The extent to which it is a similar aspect, or that it are different qualities, of belief in progress that make it a potent compensatory belief against different threats will be discussed more extensively in the general discussion of this dissertation.

Chapter 5 describes three studies in which the existential functions of belief in progress are investigated. In these studies, I tested whether belief in progress protects against mortality concerns, by utilizing belief in progress in all three hypotheses that are employed within the TMT paradigm. A first study followed the mortality salience hypothesis and tested whether mortality reminders would lead participants to defend the notion of progress.

Participants were instructed to think about their mortality or about something else, after which they were asked to rate an essay, which basically argued that progress is an illusion. A second study followed the death-thought accessibility hypothesis by testing whether questioning the existence of human progress would increase the accessibility of death-related cognitions. Finally, in a third study, I more directly tested the anxiety-buffering potential of belief in progress (i.e., the anxiety-buffer hypothesis). Belief in progress was bolstered, after which mortality was made salient (or not) and death-thought accessibility as well as cultural worldview defense reactions were measured. If belief in progress functions as an existential anxiety buffer, then mortality salience following the bolstering of belief in progress would not increase death-thought accessibility nor would it engender worldview defense reactions to a relevant worldview-threatening message.

Of course, progress is a broad concept that entails more than one dimension. The description of Chapter 3 of this dissertation already mentioned belief moral and societal progress versus scientific and technological progress, and how these relate to control-threat and order motivation. Chapter 6 follows up on Chapter 5 by looking more closely at these distinct types of belief in progress, more specifically the belief that “*things* will improve” and the belief that “*we* will improve”. Over the last century, there has been much discussion about the distinction between the advancement of human products and institutions, such as knowledge, technology, and prosperity, on the one hand and the advancement of the moral nature of humanity itself (Brunner, 1972; Bury 1955; Comte, 1988; Gray, 2004, 2007). The central tenet of Chapter 6 is that a belief in technological progress (things will improve) in itself does not provide an existential anxiety-buffer. Rather, in

order for progress to imbue the world with meaning, it should concern human morality and entail more than mere material or scientific advances (we will improve). To test this idea, which is more extensively discussed in Chapter 6's introduction and discussion, two studies were conducted. The first study utilized TMT's death-thought accessibility hypothesis and assessed whether questioning moral versus technological progress increases the accessibility of death-related cognitions. A second study, which was conducted among a large representative sample of the Dutch population, investigated the effect of mortality salience on belief in moral versus technological progress. Here, instead of giving participants the option to defend the notion of progress (as was the case in Study 5.1), I devised a simple graphic task that allowed participants to indicate the extent to which they believe in moral as well as technological progress. Moreover, this study also investigated the role of religiosity. If belief in moral progress should primarily be seen as a secular substitute for religious belief (Gray, 2005), then the effect of mortality salience on belief in moral progress should be moderated by religiosity, i.e., be primarily observed among secular participants (see also Jonas & Fischer, 2006; Norenzayan, Dar-Nimrod, Hansen, & Proulx, 2009 for similar moderation effects of religious belief).

In sum, the research that I will describe in Chapters 5 and 6 investigates how existential threats related to mortality lead to the motivation to bolster and increase belief in progress as a meaning providing construct that helps to buffer against existential anxiety. I expected that belief in progress, more specifically belief in the progress of *mankind*, will be found to constitute a meaning providing construct, similar to religious belief, that helps people cope with mortality concerns.

Summing up

In parts I and II of the dissertation I will present research that focuses on how threats to control influence preference for religious versus scientific belief systems (presented in Chapter 1), preference for different types of scientific theories (Chapter 2), and belief in societal and scientific progress (Chapters 3 and 4). Part III of the dissertation consists of two chapters that focus on the effects of existential threat on belief in societal and scientific progress, as well as on the buffering function of these beliefs (Chapters 5 and 6)⁴. In the General Discussion I will summarize my research, discuss the relation between the needs of control and meaning, focus on the similarities and differences of different compensatory belief systems, and provide suggestions for future research.

⁴ Because Chapters 1-6 were written as separate research articles, they can be read independently. Readers will notice some overlap between the theoretical introductions and method sections.