Chapter 5. Cancer and Death-Related Thoughts: The Influence of Different Perceptions of the Severity of Cancer and Self-Affirmation on Death-Thought Suppression

Cancer is a leading cause of death worldwide (World Health Organization, 2007). It is a disease frequently mentioned in health campaigns and is portrayed as a potential lethal consequence of many unhealthy habits, from insufficient fruit and vegetable intake to smoking tobacco. On average about 40% of the people who are diagnosed with cancer do not survive the disease (Dutch Cancer Society, 2007; National Cancer Institute, 2004). Thus, there is a strong objective link between cancer and death. This is reflected in the perception of people; thinking about cancer is associated with fears of death (e.g., Ferrell, Grant, Funk, Otis-Green, & Garcia, 1998).

In examining some of the cognitive and motivational dynamics involved with the association between cancer and death-related cognition, Arndt, Cook, Goldenberg, and Cox (2007) initially found that priming the thought of cancer did not lead to an increase but to a decrease in the accessibility of death-related thoughts. Subsequent studies in this series suggested that this was due to active attempts to suppress the association with death. Such processes were suggested to occur because people are often motivated to avoid thinking about their mortality. Indeed, a number of studies derived from Terror Management Theory have indicated that reminders of one’s own death lead to suppression of death-thoughts to remove them from focal awareness (e.g., Greenberg, Solomon, & Pyszczynski, 1997). However, people may differ in the extent to which they associate cancer with death. One factor that may drive such differences is the perceptions people have about the severity or preventability of cancer. Some people perceive cancer as a treatable disease or as a disease they can somehow control, while others perceive it as a death penalty (Powe, 1995). Thus, people’s personal perceptions of cancer may determine the extent to which they link cancer to death, and thus the level of psychological threat that the topic of cancer presents. This suggests that, depending on the severity of perceived threat, self-regulatory processes like suppression may be differentially effective in lowering the threat of cancer and thus its capacity to trigger thoughts of death.

To find out to what extent people suppress death-related thoughts we apply self-affirmation. This involves making people think
about cherished values or attributes (Steele, 1988). Self-affirmation has been shown to result in open-mindedness towards an array of threats, including those pertaining to health and physical well-being (for overviews, see McQueen & Klein, 2006; Sherman & Cohen, 2006). By applying self-affirmation and thus encouraging an open-minded approach to a threat like cancer, we can potentially better understand the defensive dynamics by which people manage the threat of cancer and its capacity to trigger death-related cognition. In sum, the purpose of the current study is to illuminate how people’s personal perceptions of cancer influence the extent to which they experience death-related thoughts. One main explanatory perspective on the underlying processes is that quantitative differences in the experience of death-related thoughts are due to differences in suppression of these thoughts.

Cancer and Terror Management Research
With regard to cancer in general, research has shown that thinking of cancer can be distressing and can arouse feelings of vulnerability (Bowen, Helmes, Powers, & Andersen, 2003). Consequently, people may cope with the threat by minimizing estimates of personal risks (e.g., Croyle, Sun, & Hart, 1997). In addition, the threatening nature of cancer seems to motivate people to suppress death-related thoughts associated with cancer (Arndt et al., 2007; Erblich, Montogomery, Valdimarsdottir, Cloitre, & Bovbjerg, 2003). The reasons why people are so motivated to suppress death-related thoughts generally, and in health contexts particularly, is described by Terror Management Theory (for an overview, see Solomon, Greenberg, & Pyszczynski, 2004) and its more recent application to health in the terror management health model (Goldenberg & Arndt, 2008). Terror Management Theory (derived from the work of Ernest Becker, 1971, 1973) is based on the premise that humans are in a precarious position due to the conflict between biological motives to survive and the cognitive capacity to realize life will ultimately end. This generally unconscious awareness that death is inevitable, coupled with the proclivity for survival, creates potential paralyzing anxiety. However, Terror Management Theory
suggests that people have defense mechanisms that prevent them from experiencing the anxiety that this awareness might be expected to engender. Different defenses have been shown to deal with both conscious and unconscious mortality awareness (for reviews, see Goldenberg & Arndt, 2008; Pyszczynski, Greenberg, & Solomon, 1999).

Traditionally, Terror Management Theory has focused on the effects of unconscious concerns with mortality, showing that people manage this awareness by investing in a meaningful conception of the world (cultural worldview) and maintaining a sense of self-worth (for a review, see Greenberg et al., 1997). However, more recently research has also examined the ways in which people manage conscious concerns with death. Specifically, when such thoughts are in conscious awareness they trigger responses aimed at removing death from consciousness. For example, Greenberg, Pyszczynski, Solomon, Simon, and Breus (1994) found that immediately after contemplating mortality, levels of death-thought accessibility were low, but increased when a time interval was introduced (e.g., reading a short message). In sum, people respond to confrontations of explicit reminders of death with efforts to get rid of these thoughts from conscious awareness.

Recently Arndt et al. (2007) focused on the link between cancer and death. They showed that participants’ reactions to reminders of cancer are not simply the same as reminders of mortality. Replicating prior research (e.g., Arndt, Greenberg, Solomon, Pyszczynski, & Simon, 1997; Greenberg et al., 1994), they found that priming mortality increases death-related thoughts when a delay was introduced between the death-prime and the accessibility measures. However, the effects of a cancer prime differed from the effects of a mortality prime. The cancer prime did not produce elevated levels of death-accessibility after the delay. In additional studies Arndt et al. (2007) showed that the low levels of death-related thoughts were due to an even fiercer suppression of death-thoughts. Why would the thought of cancer instigate stronger suppression tendencies of death-related thought than the thought of death itself?

The commonly used mortality salience manipulation makes people think about their emotions when considering their own death
and what will happen to them once they physically die or are dead. As Arndt et al. (2007) speculated, this is an abstract referral to death. However, when asking people about getting or having cancer they can have many associations (e.g., Whitaker, Brewin, & Watson, 2008). Cancer could be linked to the process of saying farewell to friends and family, anxiety for a painful death, embarrassment for being the person who is dying, suffering, uncertainty of death due to different beliefs in the treatability etc. All these associations related to cancer, in turn, have their association with death. That is, activation of the concept of cancer activates broader associative memory networks that are all to a certain degree associated with death. Thus, a cancer prime may lead to a more widespread activation of the concept of death than a mortality prime.

These associations pertaining to cancer provide some insight into why cancer may arouse an especially robust suppression of death-related thoughts as it spreads to implicate strongly the network related to death. However, this may be more or less threatening to people depending on people’s perceptions of cancer (i.e., the treatability of cancer and response efficacy in preventing cancer). We propose that such differences in the beliefs about the severity of cancer will influence the level of threat that is induced by the cancer prime. This level of threat will determine the amount to which people display defensive or suppressive tendencies with regard to death-related thoughts.

**Personal Perceptions of Cancer**

Cancer is a very prevalent disease. Many people know someone who has been diagnosed with some type of cancer. Some of these people have experienced that cancer can be treated, while others have experienced that cancer is fatal (National Cancer Institute, 2004). In addition, many health campaigns emphasize that people can influence whether or not they get cancer (e.g., eat healthy, exercise regularly), while we are also presented with messages that stress the importance of genetic aspects in cancer (Ugalde, Martin, & Rees, 2008); a breast cancer gene that influences the risk of getting cancer irrespective of health habits. All these experiences and messages may influence
people’s perceptions concerning cancer. Some people may come to the conclusion that there is the possibility that cancer can be cured or that they can perform behaviors that lower their risk of getting cancer (Powe, 1995); thus that cancer is not necessarily connected to death. Others may develop beliefs that being diagnosed as having cancer is equivalent to a death penalty. Thus, although cancer is portrayed as a very serious disease with potential lethal consequences, people will differ in how strongly they cognitively link cancer and death with each other. The accessibility of the memory network of death will influence the level of threat associated with cancer. We propose that participants who perceive cancer as somehow under personal control experience the threat as less severe than people who see cancer as uncontrollable and lethal. This level of threat will determine to what extent people are motivated to suppress death-related thoughts and thus how many death-related thoughts they will experience when primed with cancer.

Self-Integrity Threat and Suppression
The self-regulatory action of suppression is central in predicting the extent to which the concept of death is activated in people with different perceptions of cancer. Research in persuasive health communication has provided a wealth of data on suppressive or defensive responses towards threatening information. On the basis of these findings we propose that at least four subsequent states of threat and suppression are possible. First, when the level of threat is low, people may not be motivated to suppress. The threat is simply too small to generate any response. Second, when the level of threat increases, people may become motivated to suppress death-related thoughts in order to down-regulate the threat. Suppression mechanisms may do their job adequately, like is found in many studies in the field of health communication. For example, Morris and Swann (1996) showed that sexually active students who saw an AIDS educational message responded by lowering their perceived risk for sexually transmitted diseases, which is a defensive response. Third, when the threat further increases, the suppression of the threat may not be completely successful and may start leaking, so to speak. Although the suppression
is still “on,” the threat may be experienced; the threat is too potent to be completely suppressed and people have to tolerate the threat (see Ruiter, Abraham, & Kok, 2001; Witte, 1992). Fourth, when the threat further increases it leads to an overload and another more effective way of coping with the threat is activated. Na (1999) found this shift in regulatory strategies; when people become too involved a threshold is passed and objective processing is hindered. Thus, a threat that is too overwhelming forces a next level of defense (i.e., renewed defenses) (see also, Block & Williams, 2002). As research has shown there are many different types of defensive responses (e.g., Good & Abraham, 2007). In the current research it is not necessary to define which type of defensive response is exactly into play. So when we refer to “renewed defense” we do not refer to any defensive response in particular. In sum, we propose that there is an inverted u-shaped relation between the level of threat and the amount of death-related thoughts people experience (i.e., we formulate four states; no defenses, effective defenses, leaking defenses, and next level defenses). In all states, except the first one, people display regulatory attempts.

This sequence of reactions to a threat may be observed in many situations. Imagine an employee receiving feedback. When the feedback is not very negative, this person may be able to face it, listen open-minded to it. There is no need to get defensive because there is no pertinent negative implication for the self. When the feedback becomes more negative, the employee may start to use rational (or pseudo-rational) strategies of doubting the feedback and questioning the source of the feedback. At this point, these defenses are adequate in protecting the self. When the feedback becomes even more negative, the employee may get angry and defensive, still doubting and questioning the feedback. The defenses start leaking although they are still activated. The person experiences a more severe threat, in this case to their self-worth or self-integrity, despite active defenses. When the negative feedback further increases, the employee may no longer want to communicate, he gets mute or walks out of the room. A next level of defense is mobilized. Thus, different subsequent defensive
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reactions may serve the same goal and when one defensive reaction fails, another may be activated. In the above example, the increasing negative feedback motivates a further engagement of the employee’s defensive maneuvers. In this study on the confrontation with the concept of cancer, the threat and defensive maneuvers are primarily caused by the increasing association of cancer with death. In sum, we propose that the associations pertaining to cancer determine the level of threat and this dictates the regulatory attempts that people employ. To find out whether these regulatory processes are operative we apply self-affirmation. Research has shown that self-affirmation eliminates defensive or suppressive tendencies (e.g., Sherman & Cohen, 2002, 2006). By comparing the presence and absence of self-affirmation we can see whether people are somehow regulating death-related thoughts.

Self-Integrity Maintenance Options and Self-Affirmation

In seeking to understand how self-affirmation can be used to unravel the underlying processes involved when people are primed with cancer, we first discuss the theoretical basis of self-affirmation. According to Self-affirmation Theory, people have a fundamental need to maintain a positive global self-image, to maintain a sense of self-integrity (Steele, 1988). This sense of self-integrity in turn enables people to confront and withstand a variety of forms of threatening information. For example, when encountering vulnerability to illness, people may better tolerate the vulnerability by more globally affirming their self-concept; a process referred to as self-affirmation. Self-affirmation involves thinking about cherished values or attributes. In essence, self-affirmation refers to the generation of positive self-images which are unconnected with the threatening event. People can do things to affirm themselves, but in psychological research people can also be affirmed using experimental manipulations. An example of a self-affirmation manipulation is providing participants with very positive feedback on a bogus questionnaire about their social skills before having them read a threatening health message (Cohen, Aronson, & Steele, 2000). Self-affirmation should make people realize that their self-worth is not
determined by the evaluative implications of the immediate situation. The result of self-affirmation is that people become open-minded towards the threatening information and no longer react defensively to the threatening information (e.g., Sherman & Cohen, 2002, 2006). In other words, self-affirmation allows people to adopt a more open-minded approach to considering health threats.

Self-affirmation prevents people from displaying defensive information processing. This does not mean, however, that the self-threat is trivialized or that people simply become very agreeable (Correll, Spencer, & Zanna, 2004). Instead, there are strong indications that self-affirmation makes people painfully aware of the threat. For example, Harris and Napper (2005) found that self-affirmation increases the negative emotions people feel when thinking about the risks of alcohol consumption, instead of lowering these emotions. In addition, Harris, Mayle, Mabbott, and Napper (2007) showed that self-affirmation increases participants’ negative thoughts and emotions about smoking. These findings indicate that self-affirmation forces people to acknowledge the threat, causing negative emotions. Thus, self-affirmation makes people increasingly aware of the threat that is present in a health message by weakening all initial attempts to process health messages in a defensive manner. As Harris and Napper (2005) state, self-affirmation leads not to threat reduction but to threat acceptance.

These effects of self-affirmation are not under personal control and when exposed to a self-affirmation, people’s suppressive or defensive self-regulations are weakened. People become involuntarily confronted with the threatening information. Applying self-affirmation may therefore present a means to find out whether participants are displaying defensive tendencies; when self-affirmation has an effect it can be inferred that people, in the absence of self-affirmation, were displaying some regulatory processes that were prevented after self-affirmation. Which regulatory processes are engaged, we suggest, will depend on the level of the threat that is induced and more openly acknowledged in light of the self-affirmation. On the one hand, it may be that with self-affirmation a person is forced to open-mindedly
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acknowledge the threat; the threat does not activate renewed defenses. On the other hand, the threat may be so strong that renewed defenses are mobilized. It is an empirical matter what level of threat will induce the defenses.

On the basis of earlier studies on death-related thoughts and cancer, we formulate the following expectations. People who experience a moderate threat from thinking about cancer (i.e., cancer is seen as treatable or preventable) are expected to react with effective defenses (i.e., suppression) and, therefore, experience few death-related thoughts. Adding a self-affirmation forces people to tolerate the threat (i.e., leaking defenses), which results in more death-related thoughts. People who experience a strong threat from thinking about cancer (i.e., cancer is seen as poorly treatable or preventable) are expected to attempt to unsuccessfully suppress the threat (i.e., leaking defenses). Because self-affirmation forces people to be open-minded, it will facilitate a more stark confrontation with the topic of cancer. Consequently, cancer will be seen as more threatening, (the threshold is passed) and this results in the activation of a next level of defense and, therefore, to less death-related thoughts. In sum, by including self-affirmation into the current studies we induce open-mindedness and depending on the initial level of threat, this will lead to more or to less death-related thoughts.

The Present Research

The aim of the current research is to show that individual differences in people’s perceptions of cancer, and the availability or use of self-affirmational resources, influence the extent to which the concept of death is accessible when confronted with the topic of cancer. Each study was conducted to examine a different facet of these relationships. Study 5.1 was designed to assess the general effect of self-affirmation when participants are primed with cancer, and to relate our procedures and materials to earlier studies. No individual differences were included or considered in this study yet. Study 5.2 considered the influence of individual differences in the perceptions of curability of cancer. Study 5.3 aimed to replicate Study 5.2 by manipulating perceptions of
treatability. In addition, we also assessed the influence of individual differences in the perceptions of preventability of cancer. In these three studies, the cancer prime was supraliminal, allowing conscious regulatory processes to be mobilized. In contrast, Study 5.4 tested what happens when participants are subliminally primed with the topic of cancer and how the perception of treatability influences the accessibility of the concept of death.

**Study 5.1**

Study 5.1 was designed to assess the general effect of self-affirmation when participants were primed with cancer and to relate our procedures and materials to earlier studies. As in Arndt et al. (2007), we asked participants to think about either their own mortality, or about contracting cancer or about having dental pain. The group participants who thought about dental pain was the control group. For participants who were not affirmed we expected to replicate the effects of Arndt et al. (2007); a death prime should result in more death-related thoughts in comparison to both the cancer prime and the dental pain prime. In addition, by looking at the effects of self-affirmation in combination with a mortality prime we can see whether we can replicate the findings of Schmeichel and Martens (2005). They found that when participants are affirmed, a mortality prime leads to a low level of death-related thoughts. Schmeichel and Martens (2005) indicated that when participants are confronted with a mortality salience prime, self-affirmation of important values functions to bolster participants’ faith in their worldview as a meaning system and thus better insulates people from accessible death-related cognition. Thus, according to Schmeichel and Martens, their results with regard to self-affirmation can be explained by the worldview-boost it provides and the lowering effect of this on the accessibility of the concept of death.

However, what could we expect from self-affirmation when people are primed with cancer? We do not expect that self-affirmation will facilitate this reduction in death-related cognition. From studies on persuasion it has become clear that; 1) people raise defenses when confronted with health topics such as cancer and; 2) self-affirmation
induces open-mindedness. In this light, whereas reminding people of death in the way that has been done in most terror management studies leads to more abstract associations with death, reminding people of cancer leads to broader and more affectively oriented associations with death and, consequently, more suppression of death-related cognitions. Thus, the starting point of a death prime and a cancer prime are expected to be different and, therefore, the effects of self-affirmation may also be different.

Method

Participants
One-hundred and twenty-seven students from the University of Groningen participated in exchange for partial course credit. The study was part of a number of online studies that first-year psychology students had to complete in the first months of the academic year. In an online system they could click on a link that brought them to the study. The participants were randomly distributed to one of three conditions (mortality salience prime vs. cancer salience prime vs. dental pain prime) of a between subjects design.

Procedure
The students were told that they were going to participate in several different studies. To provide the participants with a reason for completing these different studies it was said that all studies concerned topics in which the responsible researcher was somehow involved. Participants were first asked to complete the cognitive self-affirmation scale. Previous research showed that this individual tendency has the same effects as self-affirmation procedures; cognitive self-affirmation inclination induces open-mindedness when people experience a self-integrity threat (Pietersma & Dijkstra, 2007). Next, participants were instructed to think about their own mortality, about contracting cancer, or about an aversive control topic (i.e., dental pain). Dental pain was selected as control condition because it is an aversive topic that may elicit general negative affect. The inclusion of an aversive topic rather than a neutral topic allows us to control for this general negative affect.
The cognitive self-affirmation scale and the salience manipulation were presented as a study on thoughts and feelings. Participants subsequently completed some delay tasks. This delay was included, because previous research indicates that a mortality salience induction only increases death-thought accessibility after a delay. This delay makes it possible for death-thoughts to get outside focal attention (Arndt et al., 1997). Next, participants completed the measurement of death-thought accessibility, which was said to be a study to language use.

Materials and Measurements

Pretest measurements. We measured participants’ self-affirmation tendency. Participants were presented with six statements and were asked to indicate whether or not they had the specific thoughts (endpoints 1 [never] and 5 [very often]). The following statements were presented: “I notice that I did some things very well,” “When I feel bad about myself, I think about all the things that I can be proud of,” “I think about past and all the things that I did well,” “I think about all the things that I successfully completed,” “When I have done something wrong that made me feel dissatisfied with myself, I say to myself that I do not do everything wrong,” and “I realize that besides all the ‘stupid’ things I do, I also do some things very well.” The questions were averaged to create a composite measurement ($\alpha = .89$, $M = 2.96$, $SD = 0.81$). We also added some filler questions, which concerned health and illness.

Salience manipulation. The different primes were induced by presenting participants with two open-ended questions used in prior research (e.g., Arndt et al., 2007; Rosenblatt, Solomon, Pyszczynski, & Lyon, 1989). The open-ended instructions for the mortality salience condition were as follows: “Please briefly describe the emotions that the thoughts of your own death arouse in you,” and “Jot down, as specifically as you can, what you think will happen to you as you physically die and once you are physically death.” Resembling questions were asked in the cancer and dental pain salience conditions: “Please briefly describe the emotions that the thoughts of cancer/dental pain
arouse in you,” and “Jot down, as specifically as you can, what you think will happen to you as you physically get cancer/experience dental pain and once you are physically gotten cancer/experienced dental pain.”

**Delay tasks.** The first delay task consisted of a self-report mood scale (PANAS; Watson, Clark, & Tellegen, 1988). Subsequently, participants were presented with a neutral text about the history of mustard. The article was supposedly published in a Dutch journal. The participants were told that the aim of the study was to determine their opinion about the article. Participants were presented a text of 620 words and the text also contained some pictures of mustard seeds and mustard plants.

**Death accessibility.** All the participants were presented with a word completion task that was designed to measure the accessibility of death-related thoughts, based on those developed in previous research (e.g., Greenberg et al., 1994). They were asked to rely on their first thoughts. Participants were presented with 15 word fragments, 6 could be completed as a death-related or neutral word. The completion of the word fragments could result in the following death-related words: cremation, pass away, corpse, heritage, funeral, and grave (i.e., these words are translations of Dutch words). A rater coded these 6 completed word fragments. The words which were death-related were coded as “1,” while all other words were coded as “0”. Next we added the scores of these six measurements ($M = 0.65, SD = 0.72$).

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19 This measurement of death-thought accessibility is designed by Fransen, Fennis, Pruyn, and Das (2005). In this original scale they used 10 word fragments to map death-related thoughts. However, we eliminated 4 word fragments. Two word fragments were eliminated because they referred to ceremonies related to peoples dead and these words do not occur in the English measurement (Arndt et al., 2007). Two other word fragments were eliminated because the inclusion of both prevented a significant main effect of the salience manipulation. And previous research indicated that such a main effect should be present (e.g., due to the strong difference between the mortality salience condition and the control condition). Thus, by eliminating 4 word fragments we were able to create a measurement that conceptually and statistically fitted the English measurement of death-thought accessibility.
Results
A two-way analysis of variance (ANOVA) was conducted to test whether the effect of the salience manipulation on death-related thoughts depended on individual differences of cognitive self-affirmation inclination. Salience manipulation was included as a factor, and cognitive self-affirmation inclination as a continuous variable. As predicted, a significant interaction was found, $F(2, 121) = 3.70, p < .05, \eta_p^2 = .06$. The complete data set was used to model participants scoring low or high on self-affirmation inclination by, respectively, subtracting one standard deviation (1 SD below the mean) from the standardized scores and adding one standard deviation (1 SD above the mean) to the standardized scores (Cohen, Cohen, West, & Aiken, 2003).

For participants with a low self-affirmation tendency we found a significant effect of the salience manipulation, $F(2, 121) = 4.37, p < .01, \eta_p^2 = .08$. The contrast analysis showed that for people with a low self-affirmation tendency a death salience manipulation led to significantly more death-related thoughts ($M = 1.16$) compared to thinking of cancer ($M = 0.56$), $F(2, 121) = 7.96, p < .01, \eta_p^2 = .06$. Thinking of death also resulted in significantly more death-related thoughts than thinking of dental pain, ($M = 0.57$), $F(2, 121) = 8.67, p < .01, \eta_p^2 = .07$. No significant difference was found between the cancer salience condition and the control condition, $F(2, 121) = 0.02, p = .90, \eta_p^2 < .001$. These findings replicate the outcomes of Arndt et al. (2007) and indicate that thinking of cancer leads to a robust suppression of death-related thoughts.

For participants with a high self-affirmation tendency we also found a significant effect of the salience manipulation, $F(2, 121) = 3.59, p < .05, \eta_p^2 = .06$. The contrast analysis showed that the death salience condition resulted in significantly more death-related thoughts ($M = 0.68$) than the cancer condition ($M = 0.27$), but did not differ significantly from the control condition ($M = 0.83$), respectively $F(2, 121) = 4.26, p < .05, \eta_p^2 = .03$, and $F(2, 121) = 0.35, p = .56, \eta_p^2 = .003$. In addition, thinking of cancer did result in significantly less death-related thoughts than thinking of dental pain, $F(2, 121) = 6.29, p$
This suggests that participants with high affirmational tendencies may have approached the topic of cancer with a more open-minded orientation and been especially motivated to actively lower the accessibility of the concept of death. Thus, cancer primed participants appeared to differ from mortality primed participants in their need to suppress death-related thought (Schmeichel & Martens, 2005).

The results also showed that in the death salience condition a strong self-affirmation tendency was related to significantly less death-related thoughts ($r = -.31$, $p < .05$). This replicates the findings of Schmeichel and Martens (2005). In contrast, in the cancer prime condition and in the dental condition the relation between self-affirmation tendency and death-related thought was not significant, respectively $r = -.25$, $p = .10$, and $r = .21$, $p = .19$ (see Figure 5.1).

**Figure 5.1** Death-thought accessibility as a function of salience manipulation and self-affirmation tendency, Study 5.1.

Besides the moderating effect of self-affirmation inclination, we also found a significant main effect of the salience manipulation, $F(2, 121) = 5.88$, $p < .01$, $\eta_p^2 = .09$. Participants who thought about death reported significantly more death-related thoughts ($M = 0.92$) than participants who thought about cancer ($M = 0.42$), $F(2, 121) = 11.75$, $p < .01$, $\eta_p^2$
We found no difference between the death salience condition and the control condition ($M = 0.67$), $F(2, 121) = 2.69$, $p = .10$, $\eta^2_p = .02$. In addition, we found a marginally significant difference between thinking about cancer and thinking about dental pain, $F(2, 121) = 2.93$, $p = .09$, $\eta^2_p = .03$. Thinking of cancer resulted in somewhat less death-related thoughts than thinking of dental pain. These results also suggest that thinking of cancer leads to stronger suppression.

**Study 5.2**

In Study 5.2 we looked at the influence of participants’ perceptions concerning the treatability of cancer as assessed at pretest on death-related thoughts. Level of threat is thought to be related to how treatable people perceive cancer; the more treatable people think that cancer is, the less cancer should be associated with the concept of death, and thus the less threat thinking of cancer should induce. In case of high treatability, the threat is thought to be substantial, but because the link between cancer and death is not very strong, it can be averted adequately with self-regulatory suppression (i.e., effective defenses). When this suppression is prevented by self-affirmation, the resulting threat increases and the defenses are no longer effective in averting the threat (i.e., leaking defenses). Thus, for participants who believe cancer is treatable we expected that adding self-affirmation would lead to significantly more death-related thoughts when they contemplate the disease.

In the case of low treatability, however, the threat is sufficiently stronger such that people’s effort to suppress its connection death-related thought may be ineffective and thus increased accessibility of death-related cognition should be observed (i.e., leaking defenses). Moreover, when suppression is weakened because of the openness produced by self-affirmation, the resulting threat becomes overwhelming (passing a self-regulation threshold), leading to the mobilization of a next level of defense. Thus, for participants who believe cancer is poorly treatable we expected that adding a self-affirmation procedure should lead to less death-related thoughts due to the mobilization of renewed defenses.
Method

Participants and Design
Forty-seven students from the University of Groningen and the Hanze University Groningen participated in exchange for partial course credit or 5 euros. Participants were randomly assigned to one of two conditions (no self-affirmation vs. self-affirmation) in a between subjects design. All participants were asked to think about cancer.

Procedure
The procedure was similar to that of Study 5.1. However, during this study the students were invited to participate in the laboratory (individual cubicles). The same cover story was presented to them. We added the question about treatability at the pretest. Self-affirmation was manipulated this time; participants were asked to complete a short questionnaire about their values. The cancer salience prime, delay tasks and death-thought accessibility measure were identical to Study 5.1. All the measurements were conducted by computer. Afterwards the experimenter carefully debriefed the participants.

Materials and Measurements
Pretest measurement. Participants were asked about the treatability of cancer: “How treatable is cancer according to you?” (with endpoints 1 [not well treatable at all] to 7 [very well treatable]) ($M = 3.91$, $SD = 1.14$). We also added some filler questions, which concerned health and illness.

Self-affirmation manipulation. All participants were asked to complete a short questionnaire about life domains (Steele & Liu, 1983; Tesser & Cornell, 1991). They were presented with six values: theory, economics, esthetics, social aspects of life, politics, and religion. All participants were asked to select a domain which they valued most, and a domain which they valued least. Next, all participants were presented with a questionnaire that consisted of 10 questions and participants could each time choose between two answers. In the self-affirmation condition participants could choose between an answer concerning their most important value versus an answer that was unrelated to their
most important value. In the no-affirmation condition participants could choose between an answer that was associated with their least important value versus an answer unrelated to their least important value.

**Death accessibility.** The same word completion task was administered as used in Study 5.1. Again, we added the scores on these six word fragments ($M = 0.45$, $SD = 0.62$).

**Results**

**Self-Affirmation Manipulation**

To check whether the self-affirmation manipulation was used by the participants as planned, we looked at participants’ responses to the 10-item questionnaire. A one-way ANOVA was performed with self-affirmation manipulation as factor. The results showed a significant main effect, $F(1, 45) = 95.95$, $p < .01$, $\eta_p^2 = .68$. Participants in the self-affirmation condition chose significantly more the answer that matched their most important value ($M = 7.17$) compared to how often participants chose their least important value in the no-affirmation condition ($M = 2.75$).

**Moderating Role of Treatability on Death-Related Thoughts**

A two-way ANOVA was conducted to test whether perceptions of treatability of cancer influenced the relationship between the cancer prime and the self-affirmation manipulation. Self-affirmation manipulation was included as a factor and perceived treatability of cancer as a continuous variable. A significant two-way interaction was found on death-related thoughts, $F(1, 43) = 6.00$, $p < .05$, $\eta_p^2 = .12$. We computed the simple slopes separately for low (-2 SD below the mean) and high levels (+2 SD above the mean) of treatability (Cohen et al., 2003). For participants who perceived cancer as rather poorly treatable we found a significant effect of self-affirmation, $F(1, 43) = 7.00$, $p < .05$, $\eta_p^2 = .14$. Self-affirmation led to significantly less death-related thoughts ($M = 0.20$) compared to the no-affirmation condition ($M = 1.14$) (see Table 5.1). Our interpretation is that the induced open-
mindedness led to such a strong threat that was, subsequently, dealt with using renewed defenses.

**Table 5.1** Cell means as a function of a cancer prime, self-affirmation, and participants’ ideas about the extent to which cancer can be treated on death-thought accessibility, Study 5.2.

<table>
<thead>
<tr>
<th>treatability low</th>
<th>treatability high</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>no SA</strong></td>
<td></td>
</tr>
<tr>
<td>$M = 0.20$</td>
<td>$M = -0.20$</td>
</tr>
<tr>
<td><strong>SA</strong></td>
<td></td>
</tr>
<tr>
<td>$M = 0.20$</td>
<td>$M = 0.50$</td>
</tr>
</tbody>
</table>

*Note.* Higher numbers reflect more death word completions.

For participants who perceived cancer as rather well treatable we found the opposite effect of self-affirmation; participants who were affirmed reported more death-related thoughts ($M = 0.50$) than participants who were not affirmed ($M = -0.20$), although the difference only approached significance, $F(1, 43) = 3.14$, $p = .08$, $\eta_p^2 = .07$. This pattern is consistent with the idea that the induced open-mindedness increased the threat to a level that could be tolerated.

**Study 5.3**

In Study 5.3 we presented participants with a text about cancer that stressed how difficult it is to treat cancer. We chose to use a text on the low treatability of cancer. The aim of Study 5.3 was not merely to replicate the findings of Study 5.2 by manipulating treatability this time, but to take it one step further. We also looked at the role of participants’ preventive associations related to cancer (as assessed at pretest); whether they think they can prevent the occurrence of cancer (i.e., response efficacy in preventing cancer).

The intent was to first lead participants to believe that cancer is relatively untreatable so as to induce a potent threat. However, the potency of this threat may be lower among those who think that the risk of contracting cancer is small because they have strong preventive control. Thus, treatability concerns the seriousness of cancer while preventive control may concern the probability that one will get the
serious cancer. Thus, the association with death (i.e., the level of threat) is expected to be moderate when preventive control is high and severe when the preventive control is perceived to be low.

As outlined in Study 5.2, the moderate threat (in the case of high preventive control) can be averted adequately with self-regulatory defenses (i.e., effective suppression) and consequently participants should evidence low death-thought accessibility. Because adding a self-affirmation manipulation should induce open-mindedness (and a weakened suppression), an opportunity to self-affirm should, as it did in Study 5.2, result in participants reporting more death-related thoughts. In the case of low preventive control, the more substantial threat presented by the salience of cancer should mobilize defensive reactions that, however, will not be completely successful in blocking the threat (i.e., leaking defenses). Because adding a self-affirmation manipulation promotes open-mindedness, this may render the threat overwhelming (passing the self-regulation threshold) and motivate the use of a next level of defense, resulting in a decrease in death-related thoughts.

**Method**

**Participants and Design**
Seventy-two students from the University of Groningen and the Hanze University Groningen participated in exchange for partial course credit or 5 euros. All participants read a text about cancer, which emphasized the difficult treatability of cancer. Participants were randomly assigned to two different conditions (no self-affirmation vs. self-affirmation) of a between subjects design.

**Procedure**
After being welcomed to the laboratory (individual cubicles), the participants were told they were going to participate in supposedly several different studies that all revolved around the themes of health/illness and lifestyle/personality. First, some pretest measurements were taken, followed by the same self-affirmation procedure as used in Study 5.2. The threat manipulation consisted of a text about the severity and treatability of cancer. Afterwards some
delay tasks were presented. Just like in the previous studies participants were presented with the PANAS questionnaire, but instead of reading the neutral mustard text they were asked to draw a neutral object (i.e., a tree). Next, a death-thought accessibility measurement was presented. However, instead of completing word fragments participants were asked to read some words and write down the thoughts that came to mind. All the measurements were conducted by computer (i.e., except for the drawing exercise). Finally, the experimenter carefully debriefed the participants.

**Materials and Measurements**

**Pretest measurement.** To assess participants’ thoughts about the possibility of preventing cancer we asked participants: “To what extent can you control whether you get cancer?” (endpoints 1 [totally no control], to 9 [a little control]) ($M = 4.28$, $SD = 2.10$). We also added some filler questions, which concerned health and illness.

**Salience manipulation.** Participants were presented with a text about the severity and treatability of cancer. The article was supposedly published by the Royal Dutch Cancer Society. The participants were told that the aim of the study was to determine their opinion about the article. Participants were presented with a text of one page, with a total of around 270 words. First, it was stated that cancer is the second leading cause of death in the Netherlands and soon will be the leading cause of death. Second, different kinds of cancer were mentioned. Third, the cause and treatability were addressed; it was said that “a maximum of 30% of the people, who are diagnosed with cancer, are cured.”

**Delay tasks.** Just like in the previous studies participants completed the PANAS questionnaire. In addition participants were asked to draw a tree. They were given a white A4 sheet and twelve color pencils. It was stated that they could draw the tree however they wanted and they were given 5 minutes. On the computer screen they could see a little clock that showed how much time they had left and they were told that a soft bell-like-sound would indicate when there time was over.
Death accessibility. All the participants were presented with a word association task that was designed to measure the accessibility of death-related thoughts. Participants were presented with 15 words and were asked to write down the first thoughts that came up in their mind. Of the 15 presented words, 4 words could refer to death or to a neutral or happy event. For example the word “floral wreath,” which could be seen as part of a funeral or as part of home decoration. The other three ambiguous words were: procession (e.g., this could refer to people who attend a funeral but also to people who are part of a carnival parade), case (e.g., in Dutch this could refer to a coffin or to a box for vegetables), and ashes (e.g., this could refer to cremation or to cigarette ashes). A rater coded the thoughts participants reported concerning these 4 ambiguous words. The thoughts which were exclusively related to death were coded as “1,” while all other thoughts were coded as “0”. Next we added these scores on all four measurements ($M = 1.08, SD = 1.04$).  

Results

Self-Affirmation Manipulation

Just like in Study 5.2 we checked whether participants performed the self-affirmation manipulation as intended. A one-way ANOVA was performed with self-affirmation manipulation as factor. The results showed a significant main effect, $F(1, 70) = 193.29, p < .01, \eta_p^2 = .73$. Participants in the self-affirmation condition choose significantly more the answer that matched their most important value ($M = 7.41$) compared to how often participants choose their least important value in the no-affirmation condition ($M = 2.74$).

20 We did not include two additional ambiguous words in the final death-thought accessibility measurement. The word ‘church bells’ was excluded, because participants hardly mentioned any dead-related thoughts. In addition, the word ‘black’ was eliminated because it resulted in thoughts that were difficult to interpret, like ‘dark’ or ‘dreary’.

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Moderating Role of Perceived Preventive Control on Death-Related Thoughts

A two-way ANOVA was conducted to test whether the effect of self-affirmation on death-thought accessibility depended on participants’ perception of control over getting cancer. Self-affirmation manipulation was included as a factor and perceived preventive control as a continuous variable. As predicted, a significant interaction was found, $F(1, 68) = 7.41$, $p < .01$, $\eta^2_p = .10$. We computed simple slopes separately for low (-2 SD below the mean) and high levels (+2 SD above the mean) of response efficacy in preventing cancer (Cohen et al., 2003).

For the participants who perceived cancer as poorly preventable, we found that those who were affirmed had fewer death-related thoughts ($M = 0.43$) than participants who were not affirmed ($M = 1.41$). This effect of self-affirmation approached significance, $F(1, 68) = 3.02$, $p = .07$, $\eta^2_p = .05$. Again, this suggests that the induced open-mindedness increased the threat which, in turn, was averted by a next level of defense. For the participants who perceived cancer as somewhat preventable we found that self-affirmation led to significantly more death-related thoughts ($M = 2.25$) compared to no self-affirmation ($M = 0.51$), $F(1, 68) = 9.42$, $p < .01$, $\eta^2_p = .12$. This suggests that the induced open-mindedness led to a tolerable level of threat.

Study 5.4

Thus far, the current research focused on the connection between conscious reminders of cancer and death-related thoughts. However, in day to day life people will not always be explicitly confronted with cancer; most times people will not pay full attention to health messages on bill boards or ads in magazines that, for example, underline the importance of self-screening to detect cancer at an early state. Thus, messages are also often unconsciously or preconsciously perceived (Dehaene, Changeux, Naccache, Sackur, & Sergent, 2006; Kouider, Dehaene, Jobert, & Le Bihan, 2007). Therefore, in Study 5.4 we looked at the effect of unconscious cancer primes; do subliminal cancer primes
also engender suppressive reactions that are moderated by self-affirmation?

Until now, terror management research has found that mortality and cancer primes only result in suppression when people are aware of the threat (Arndt, Allen, & Greenberg, 2001; Arndt et al., 2007). A subliminal prime should therefore bypass this need for suppression and lead to the distal, symbolically oriented defenses typically found in terror management research (for a review, see Greenberg, Solomon, & Arndt, 2007). However, it is unclear whether this potential bypass of suppression from unconscious primes is independent of participants’ personal associations pertaining to the threat (i.e., the treatability of cancer). When people perceive the treatability of cancer as low, do subliminal primes still not activate defensive self-regulations (like suppression of death-related thoughts or renewed defenses)? Previous research shows that differences in threat sensitivity strongly influence the way unconscious threats are processed (for an overview, see Li, Zinbarg, & Paller, 2007; Mathews & MacLeod, 1994), and consequently determine people’s conscious experiences (Li, Paller, & Zinbarg, 2008). Thus, rather then expecting that subliminal primes do not lead to a threat that might motivate suppressive responses, we expect that they may do so for certain individuals in certain situations. In the present context, we expect that the level of suppression depends upon individual differences in perceived treatability of cancer.

In Study 5.4 we included both supraliminal cancer primes and subliminal primes in one design. Just like in Study 5.2 we measured people’s perception of treatability of cancer. Self-affirmation manipulation was again used to induce open-mindedness. Although we predict that after both unconscious and conscious cancer primes, suppressive tendencies may be displayed, we do not simply expect the same outcomes for both types of cancer primes. Research has shown that the effects of subliminal and supraliminal primes can differ in strength with subliminal primes at times being more subtle (Higgins & King, 1981). Subliminal primes may prevent conscious associations that might increase the threat. In sum, it could be expected that subliminal primes result in a weaker level of threat.
Therefore we expected that for participants who perceive cancer as rather well treatable the level of threat induced by subliminal cancer primes may be sufficiently subtle that there is little need to display suppressive tendencies. Consequently, self-affirmation should have no effect on the level of death-related thoughts. For participants who perceive cancer as poorly treatable, however, we expected that activating thoughts of cancer outside of conscious awareness (i.e., the subliminal cancer) may lead to a moderate threat. This should result in the engagement of a suppression reaction, which given the moderate level of threat, should effectively reduce death-thought accessibility. However, providing an opportunity for self-affirmation may weaken the suppressive tendency and thus lead to higher death-thought accessibility (i.e., leaking defenses). For the supraliminal cancer primes we expected to replicate the findings of Studies 5.2 and 5.3.

Method

Participants and Design
Ninety-five introductory students from the University of Missouri-Columbia participated in exchange for partial course credit. Participants were randomly assigned to one of four conditions of a 2 (no self-affirmation vs. self-affirmation) x 2 (supraliminal cancer prime vs. subliminal cancer prime) between subjects design.

Procedure
After being welcomed to the laboratory (individual cubicles), the participants were told they were going to participate in several different studies on personality traits and decision making. First, participants were presented with a self-affirmation manipulation that concerned writing about one's most important value. Next, the cancer prime manipulation followed; either cancer was supraliminal primed by asking students to write about cancer, just like in Studies 5.1 and 5.2, or cancer was subliminally primed. Next, a word completion exercise was presented to measure the death-related thoughts. All the measurements, except the self-affirmation manipulation, were conducted by computer. The stimuli involved in the subliminal prime
task were presented on a 15-inch color monitor controlled by an IBM-compatible computer equipped with MediaLab (Empirisoft Corporation, 2002) display software. Within the MediaLab interface, DirectRT software synchronized the timing of the stimuli. Once all participants were finished the experimenter thoroughly debriefed them.

Materials and Measurements

Self-affirmation manipulation. All participants were asked to rank a list of 12 values and characteristics in order of personal importance (Cohen, Aronson, & Steele, 2000; Schmeichel & Martens, 2005). The list consisted of the following values and characteristics: artistic skills/aesthetic appreciation, sense of humor, relations with friends/family, spontaneity/living life in the moment, social skills, athletics, musical ability/appreciation, neatness/tidiness, physical attractiveness, creativity, business/managerial skills, and romantic values. After ranking these values in order of importance, participants completed a brief writing assignment that composed the self-affirmation manipulation. Participants in the self-affirmation condition first indicated their most important value from the value-ranking form and then wrote a brief essay explaining why this value is important to them and described a time in their lives when it was particularly important. Participants in the no-affirmation condition indicated their ninth most important value and wrote a brief essay explaining why the value might be important to the average student. Participants were instructed to write for 5 minutes before moving on; the computer was programmed to automatically continue to the next item after 5 minutes.

Cancer manipulation. Next, the participants were exposed to the supraliminal or the subliminal cancer prime manipulation. The supraliminal prime consisted of the same two open-ended questions concerning participants’ feelings and thoughts about cancer as posed in Studies 5.1 and 5.2. The subliminal prime consisted of a word relationship task. First it was explained that the word relation program would present two words on the computer screen and participants are to indicate whether the words are related by pressing the right or the left shift key. For example, if they saw the words rose and flower, they
were asked to press the right shift key to indicate that they are related, but if they saw the words sneaker and fajita, they were asked to press the left shift key to indicate they were not related. Four practice trails allowed participants to familiarize themselves with the procedure. All primes were presented on Times New Roman 14-point font in the center of the computer screen. The first and the third stimuli were the words for which participants were to judge the presence or the absence of a relationship. These words were provided with a forward and a backward mask, respectively, and were each displayed for 356 ms. The critical subliminal primes were presented between two mask words for 28 ms as in previous research (e.g., Arndt et al., 2007; Arndt, Greenberg, & Cook, 2002). In the subliminal prime condition, participants were exposed to 20 such trials and the word cancer presented between the two masks.

To provide the appropriate delay between the supraliminal prime and the dependent measures we also asked participants in this condition to complete the word relationship task after the open-ended questions about cancer. However, this time the words, intense pain were presented between the two masks. In addition, in the subliminal prime condition we asked participants to complete a writing assignment before completing the word completion task; participants were asked the same two open-ended as posed in the supraliminal prime condition, but the questions concerned intense pain instead of cancer. By adding the word completion task to the supraliminal prime condition and the open-ended questions to the subliminal prime condition we rule out the possibility that differences in tasks or in time explain the effects on the dependent variable.

*Death accessibility*. We used the word stem completion task to measure the accessibility of death-related thoughts. Participants are presented with 28 word fragments, 6 of which could be completed as a neutral or death-related word. This measure has been used successfully in many terror management studies (e.g., Greenberg et al., 1994). The death completions were BUR _ _ D (buried or burned), DE _ _ (dead or deed), M _ R _ ER (murder or marker), GRA _ _ (grave or grape), SK _ LL (skull or skill), and COFF _ _ (coffin or coffee). Death accessibility
scores were the total number or death-related word completions ($M = 1.75$, $SD = 0.83$).

_Treatability of cancer._ Just as in Study 5.2 we asked about the treatability of cancer; “How treatable do you think cancer is?” This time the items were not rated on a 7-point scale but on a 9-point scale and ranged from 1 (_totally not treatable_) to 9 (_very treatable_) ($M = 5.53$, $SD = 1.67$). We did not pose this question at pretest because of the sensitive nature of the subliminal primes.21

_Manipulation check._ During the debriefing participants were asked some questions to check their awareness of the subliminal prime in the word relationship task. They were asked to indicate how many words they saw on each display (each trial for which they were to make a relationship judgment). In addition, when they indicated that they saw more than two words, it was asked what word this might have been. Six participants indicated seeing three words, but only 1 participant guessed that the word was cancer. All other participants did not list any guesses. Thus, it seems that there was at least no retrospective awareness of the masked prime for all but 1 participant. In the following analyses we excluded this 1 participant who was aware of the masked prime. Thus the analyses are based on the responses of 94 participants.

**Results**

A three-way ANOVA was conducted to test whether perceptions of treatability of cancer influenced the relationship between the salience manipulation and the self-affirmation manipulation. Prime manipulation and self-affirmation manipulation were included as a factor and perceived treatability of cancer as a continuous variable. As predicted, a significant three-way interaction was found on death-related thoughts,

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21 To check whether the manipulations did not affect the answers of participants on the treatability question we conducted a two-way ANOVA. Prime manipulation and self-affirmation manipulation were included as a factor and treatability was the dependent variable. The results showed that both main effects and the interaction effect were not significant ($F < 2.6$, n.s.). Thus, we did not indicate any problem in including treatability as moderator in the analyses.
For supraliminally primed participants we found a significant two-way interaction between self-affirmation and treatability, $F(1, 40) = 4.31, p < .05, \eta_p^2 = .10$. We computed the simple slopes separately for low (-2 SD below the mean) and high levels (+2 SD above the mean) of treatability (Cohen et al., 2003). The contrast analysis showed the same pattern as found in Studies 5.2 and 5.3; for participants who perceived cancer as poorly treatable we found that self-affirmation led to (marginally) less death-related thoughts ($M = 0.74$) compared to the no-affirmation condition ($M = 1.69$), $F(1, 40) = 3.58, p = .07, \eta_p^2 = .08$. This suggests the activation of the next level of defense. For participants who perceived cancer as rather well treatable we found the opposite pattern; self-affirmation led to (marginally) more death-related thoughts ($M = 2.74$) compared to the no-affirmation ($M = 1.68$), $F(1, 40) = 3.36, p = .07, \eta_p^2 = .08$ (see Table 5.2). This suggests that the induced open-mindedness led to a higher but tolerable level of threat.

### Table 5.2

<table>
<thead>
<tr>
<th>supraliminal cancer prime</th>
<th>subliminal cancer prime</th>
</tr>
</thead>
<tbody>
<tr>
<td>treatability</td>
<td>treatability</td>
</tr>
<tr>
<td>low</td>
<td>high</td>
</tr>
<tr>
<td>no SA</td>
<td></td>
</tr>
<tr>
<td>$M = 1.69$</td>
<td>$M = 1.68$</td>
</tr>
<tr>
<td>SA</td>
<td></td>
</tr>
<tr>
<td>$M = 0.74$</td>
<td>$M = 2.74$</td>
</tr>
</tbody>
</table>

Note. Higher numbers reflect more death word completions.

For subliminally primed participants we found no significant two-way interaction between self-affirmation and treatability, $F(1, 46) = 2.40, p = .13, \eta_p^2 = .05$. However, we did compute specific contrasts. For participants who saw cancer as poorly treatable, we found that a self-affirmation procedure led to more death-related thoughts ($M = 2.07$) compared to the no-affirmation condition ($M = 0.98$). This effect approached significance, $F(1, 46) = 3.85, p = .06, \eta_p^2 = .08$. This is
consistent with the idea that, even when participants are unaware of the cancer prime they engage suppression which is then weakened following self-affirmation. In addition, for participants who believed that cancer is rather well treatable we found no difference between self-affirmation ($M = 1.86$) and no affirmation ($M = 2.22$), $F(1, 46) = 0.54$, $p = .47$, $\eta^2_p = .01$. Thus, it seems that the threat was so low, that no defenses were in action and inducing open-mindedness had no effect at all.

The results also showed a significant main effect of treatability on death-related thoughts, $F(1, 86) = 5.07$, $p < .05$, $\eta^2_p = .06$. Participants who perceived cancer as poorly treatable reported significantly less death-related thoughts ($M = 1.37$) than participants who perceived cancer as rather well treatable ($M = 2.13$).

**Discussion**

*Cancer and Death-Related Thoughts*

The aim of the current research was to show that people’s self-affirmational resources and perceptions about cancer influence the experienced threat (i.e., death-related thoughts) caused by thinking about cancer and the subsequent defensive efforts to cope with the threat. We focused on two specific kinds of perceptions, treatability of cancer and preventive control over contracting cancer, and reasoned that these associations determine how strongly cancer and death are linked and, thus, how strong the resulting threat is when a person is confronted with thoughts of cancer. The level of the threat, in turn, was posited to influence the suppressive or defensive self-regulatory actions taken. We proposed four subsequent states of self-regulatory defense; no defenses, effective defenses (i.e., suppression), leaking defenses, and the next level of defenses. We used self-affirmation to determine whether defensive regulatory processes came into play, with the premise that self-affirmation weakens initial suppressive tendencies (Steele, 1988). Thus, by comparing the presence or absence of self-affirmation we were able to see whether people were regulating death-related thoughts.
Before focusing exclusively on cancer primes and the role of individual beliefs concerning cancer, we compared thoughts about cancer in Study 5.1 with a general mortality prime and a control group. We focused in this study on understanding the general effects of cancer primes, and not yet on the specific effects of participants’ personal beliefs about cancer. As in prior research (Arndt et al., 2007), the results showed that thinking of cancer resulted in fewer death-related thoughts compared to the death prime and the dental pain prime. This is consistent with the notion that the prospect of cancer arouses an especially robust suppression effort that persists beyond an initial delay, and motivates defensive self-regulatory actions to cope with the threat. However, self-affirmation did not have a significant effect in the cancer salience condition. We believe this may be because different processes come into play depending on the severity of peoples’ beliefs about cancer. People who believe that cancer is moderately severe versus very severe display different levels of suppressive tendencies; combining the results for both groups could simply even out the effects and obscure detection of the influence of self-affirmation.

The findings of Studies 5.2, 5.3, and 5.4 supported the importance of including participants’ beliefs about cancer in order to understand the underlying processes. Studies 5.2 and 5.4 showed that participants who believed cancer could be treated reacted with effective defenses (i.e., suppression) and, therefore, experienced few death-related thoughts. Self-affirmation weakened the defenses, and forced people to tolerate the threat (i.e., leaking defenses), as indicated by the increase in death-related thoughts. Participants who perceived cancer as poorly treatable could not successfully suppress the threat; the threat was simply too strong to be completely suppressed, which resulted in leaking defenses. Because self-affirmation forced people to be open-minded, it facilitated a more stark confrontation with the topic of cancer. The subsequent increase of the threat resulted in the activation of the next level of defense and, therefore, fewer death-related thoughts. The same pattern of results was found in Study 5.3 when we examined participants’ beliefs about preventive control over cancer. Thus, although participants were provided with the information
that cancer is poorly treatable, their belief in the existence of effective preventive actions elicited an effect similar to that of believing that cancer can be cured. In sum, participants’ beliefs about cancer are crucial to an understanding of the underlying processes.

The findings of Study 5.4 showed, in addition, that people’s attempts to regulate death-related thoughts remained present even when participants were unaware of the cancer prime. All these results indicate that cancer and death-related thoughts are closely associated. However, strong motivational processes aim at keeping the resulting death concerns out of conscious awareness. Even when people are not explicitly aware of the cancer threat, they appear to display defensive tendencies to cope with the potential threat.

**Self-Affirmation and Understanding Defensiveness**

Use of self-affirmation enabled us to learn more about the underlying defensive tendencies. Self-affirmation has been shown to inhibit self-regulatory attempts to compensate for a threat by maintaining self-integrity through biasing information processing. This can result in painful awareness of threats associated with one’s health (Sherman & Cohen, 2002, 2006). Whether people can tolerate this awareness or need the next level of defense depends on the initial level of threat. Below, we give an example which illustrates that use of self-affirmation provided information and insights that directed and even changed our interpretation of the results presented in the current manuscript.

The findings of Study 5.1 show that cancer primes result in suppressive tendencies. However, the different individual beliefs about cancer appear to elicit differential effectiveness of that suppression. For example, participants who perceived cancer as not so severe (owing to beliefs that cancer is somehow treatable or preventable), but who were not affirmed, reported low levels of death-related thoughts. This outcome could have led to the conclusion that participants were not threatened at all, and that there was no link in their minds between cancer and death. However, the use of self-affirmation suggests that this would be an incorrect conclusion; the addition of self-affirmation led to more death-related thoughts by forcing participants to be open-
minded. One plausible explanation for this is that participants who did not self-affirm were effectively suppressing death-related thoughts.

For participants who experienced a strong health threat (owing to beliefs that cancer is poorly treatable or preventable), we found high levels of death-related thoughts when they were not affirmed. Without applying self-affirmation, we might have concluded that the participants were simply accepting the threat. However, addition of self-affirmation decreased the number of death-related thoughts. This suggests that these participants were still displaying some (partly ineffective) defensive tendencies (i.e., leaking defenses); otherwise, self-affirmation should not have had any effect, and certainly not a lowering effect, on death-related thoughts.

In sum, self-affirmation proved a useful tool in unraveling whether and to what extent suppressive processes were engaged when participants were confronted with the thought of cancer. Self-affirmation even made it possible to infer that defensive tendencies still occurred when participants were unaware of a cancer prime. However, despite the very informative nature of self-affirmation, a potential shortcoming of the current research is that we did not directly measure the underlying defensive or suppressive tendencies. Future research should be aimed at explicitly measuring these suppressive tendencies.

Individual Beliefs About Cancer: The Underlying Concept
A central claim in the current research is that cancer may, perhaps ironically, spark a stronger need to suppress thoughts of death than the concept of death itself. We suggested that this may be the case because of the many different associations that people can have with cancer (Whitaker et al., 2008), making cancer a less abstract threat of death than the concept of mortality. We tested two specific associations in the current research, the treatability of cancer and the perceived preventive control over cancer. The distinction between the two associations is in line with theories on risk perception (Rogers, 1975); the threat of an illness depends on the seriousness of the condition (e.g., treatability) and the chances of contracting the illness (susceptibility, vulnerability, or, as in the present study, preventive
control). Perceptions of high treatability and strong preventive control both lower the perceived chances that the person will die from cancer. These beliefs pertaining to cancer determine the association between cancer and death. That is, believing that cancer can not be prevented or handled activates broader associative memory networks that are closely associated with death. Believing that cancer can be handled, however, does not activate people’s associative network so strongly. Thus, the risks associated with cancer determine the extent to which death-related thoughts are activated.

In the domain of cancer, a lot more associations might influence the perceived threat associated with cancer. Possible associations are saying farewell to friends and family, anxiety for a painful death, and embarrassment at being the person who is dying. These associations may also determine the link between cancer and death-related thoughts. Cancer may also be related to suffering from cancer and anxiety for aversive medical procedures. These associations do not directly concern the link between cancer and death; they link cancer to a more general aversive state that is not necessarily connected with death. The question, therefore, remains which associations determine the link between cancer and death-related thoughts.

**Subliminal Cancer Prime**

Until now, findings on the priming of thoughts of death have suggested that mortality and cancer primes only result in suppression of death-related thought when people are aware of the threat (Arndt et al., 2001; Arndt et al., 2007). For example, in Arndt et al. (2007), subliminal primes for cancer led to immediate increases in death-related thoughts, suggesting the absence of initial suppression. The findings of Study 5.4, however, showed that when participants’ personal beliefs about cancer were included they displayed suppressive tendencies when unaware of the cancer prime. As found in previous research, the results of Study 5.4 showed that participants’ sensitivity to threats (e.g., cancer is seen as poorly treatable) influenced the way unconscious threats were processed (Li et al., 2007; Mathews & MacLeod, 1994). That is, when cancer was perceived as quite well treatable, we found no
effect of self-affirmation. This could induce the conclusion that the threat bypassed the need for suppression. The effects found for participants who perceived cancer as poorly treatable prevents this conclusion; we found that adding self-affirmation did have an effect: participants reported more death-related thoughts (i.e., self-affirmation weakened defensive efforts). This indicates that the need for suppression was not bypassed. Thus, the absence of an effect of self-affirmation when participants perceived cancer as poorly treatable is likely due to the fact that the threat was too subtle to activate the defenses. In sum, for certain individuals, suppression can occur for both subliminal and supraliminal cancer primes, and subliminal primes do not completely bypass the need for suppression. What could this mean?

Subliminal priming research is closely connected with automaticity research; this research indicates that the effects of subliminal primes signal the occurrence of automatic effects (Bargh & Chartrand, 2000). When this reasoning is applied to the current research, it may be stated that, when people are confronted with the prospect of cancer, the suppression of death-related thoughts tends toward an automatic process that is driven by individual differences in beliefs about the severity of cancer. Thus, while suppression generally seems to require mental effort and resources (e.g., Wegner, 1994), it appears that if the threat is severe enough (e.g., cancer is seen as poorly treatable), even unconscious elicitation of the threat may engage suppression efforts. The prospect of cancer, with all its terrifying implications, may present an example of such a threat. To our knowledge, no research until now has included individual beliefs about cancer in the examination of associations triggered by the priming of cognitions about cancer, and in general few researchers have looked at the link between cancer and death. Replication of the current findings and more thorough research on the automaticity and cognitive effort in the field of regulatory attempts are necessary to further understand these possibilities.
Future Research: Implications for Health Threats

Research in the domain of persuasive health communication suggests that an open-minded approach towards information facilitates behavior change (e.g., Harris, et al., 2007). However, Arndt et al. (2007) showed that suppression of death-related thoughts led to increased intentions to conduct self-screening; removing the potential source of anxiety (i.e., death) may help to facilitate a more productive response. Thus, it remains unclear what the link is between death-related thoughts and intentions to engage in health-related behaviors, such as getting screened for cancer. On the one hand, the idea exists that open-mindedly acknowledging a threat, in this case death-related thoughts, motivates people to change their behavior. On the other hand, the idea exists that experiencing more death-related thoughts disrupts the formation of intentions to act healthy. In sum, additional research is needed to show the implications of reminders of cancer (both conscious and unconscious), and consequently the acknowledgment of death-related thoughts, for people’s actions and intentions to act healthy or to participate in screening.