Relief: Approach Behavior and Avoidance Goals.

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Table of Contents

Introduction

"And now, what days are these? Baffled and fearful, he mostly thinks when he takes time from his weekly round to consider." (McEwan, 2006, p. 4)

In Ian McEwan's novel Saturday, the neurosurgeon Perowne, still in the dark of a February morning, witnesses the accident of a burning airplane coming down to a London airport. For a great part of the novel, it is not clear if the accident was in fact caused by a terrorist attack. Is the city under terrorist attack or was it just an accident? Is Perowne under threat or can he be relieved?

In the beginning of the 21st century, Western civilization lives in an environment of fear. But this does not mean that we live in fear all the time. It rather means that we live in a fear-laden surrounding, experiencing many fear warnings (e.g., terrorism, diseases), which are often cancelled afterwards. How does living in such an environment affect us? How does anticipating and experiencing relief influence people's motivation? This is the question that this dissertation wants to shed light on. I specifically ask what influence relief has on approach and avoidance orientations, which are considered by many motivation researchers to be the basic dimension of motivation and behavior.

The theory section will review two classes of theories dealing with approach and avoidance motivations. According to valence theories (e.g., Gray, 1987; Lang, 1995), affective valence determines approach avoidance orientations. Accoding to goal theories (e.g., Carver, 2001; Higgins, 1997), active goals determine approach avoidance orientations. These two theory classes make similar predictions in many cases.

I will make the point that the emotion of relief is very well suited to test the two theory classes against each other. Relief is a situation where the two theory classes make different predictions: Valence theorists predict an approach orientation, while goal theorists predict an avoidance orientation.

The next sections review the literature on relief and the empirical evidence for the specific predictions made by valence and goal theories. Based on a two-system model of behavior (the reflective-impulsive model, RIM, Strack & Deutsch, 2004), I will finally outline an integration of the existing theories in one model. Based on this model, two theoretical hypotheses are derived: Relief is predicted to elicit approach orientation on distance orientation, which concerns the actual change in distance to a specific stimulus. At the same time, relief is predicted to elicit an avoidance orientation on goal orientation, which concerns the attainment of positive and the prevention of negative end states.

The empirical section tests these hypotheses and one methodological hypothesis in seven experiments. Experiment 1 prepares the following experiments by making sure that the paradigm elicits relief, as predicted. Experiments 2 to 4 deal with the impulsive, distance orientation level of approach avoidance. Findings indicated that relief elicits an approach distance orientation. This is found for both classically associated and self-induced relief. Experiments 5 to 7 test predictions regarding the reflective, goal orientation level of approach avoidance. Results indicated that relief elicits an avoidance goal orientation, but only if relief is self-induced and uncertain.

In the general discussion I will present the implications of the current findings for research on relief and safety and on approach avoidance in general. Further, I will discuss the implications for research on affective learning, including the use of a recently developed indirect measure of affect (the affect misattribution procedure, AMP, Payne, Cheng, Govorun, & Stewart, 2005). The thesis ends with a discussion of the implications for pain research.

Theoretical Part

Relief

Is relief related to approach or to avoidance? Before the existing evidence on the theoretical predictions on relief will be reviewed, the following paragraphs define relief as an emotion.

In basic affective research, relief appears – if at all – as "filler emotion" used to make the model complete, and safety signals are used as control stimuli in order to calculate effect sizes for fear stimuli (e.g., in bio-psychological research, Lovibond, Saunders, Weidemann, & Mitchell, 2007; Phelps et al., 2001). This is surprising, given the importance of safety and relief cues in applied psychological areas, such as clinical psychology (e.g., Rachman, 1984; Wiers, Houben, Smulders, Conrod, & Jones, 2006) and persuasion research (e.g., Dolinski, Ciszek, Godlewski, & Zawadzki, 2002; Dolinski & Nawrat, 1998; Rossiter & Thornton, 2004).

Appraisal. Of appraisal perspectives on emotions, Roseman's theory (e.g., Roseman, 2008; Roseman, Antoniou, & Jose, 1996; Roseman & Evkodas, 2004) is clearest regarding the underlying processes of relief. According to Roseman, relief is a motive-consistent positive emotion caused by avoiding aversive circumstances. The outcome is certain, and the emotion can be either weak or strong. In their empirical research, Roseman and Evkodas (2004) found support for this hypothesis. Their participants were told that they were to experience positive or negative states (drink pleasant or unpleasant beverages) and after that, they rated their emotions. As predicted, participants in the Avoid Unpleasant Certain group indicated the emotion relief significantly more often than participants in any other group (Roseman & Evkodas, 2004). Besides other effects of relief, the authors argue that the emotion has specific effects on motivation: Relief as a "terminating emotion" induces the individual "stop moving away from it" (Roseman & Evkodas, 2004, p. 5), in order to "rest" (Roseman, 2008, p. 355). In Roseman's view, relief is connected with reduced avoidance behavior. It is, however, unclear whether this effect is caused by reduced activation of the avoidance system or by increased activation of the approach system.

Lazarus (1991) offered a similar conceptualization of relief, but he emphasized goals more than Roseman. Lazarus described relief as stemming out of a two-step appraisal process. Goal relevance is high and negative goal incongruence is stopped (Lazarus, 1991, p. 280f.). Lazarus stresses that relief "depends on an unfolding event" (Lazarus, 1991, p. 180), hence relief is dependent on change in a goal-incongruent state over time. With respect to motivation, Lazarus, too, states that relief's main function is to make people "slump down visibly", connected to a "loss of tension, (and) wariness of the whole body" and a cessation of vigilance (Lazarus, 1991, p. 281).

Motives. Feather (1963), in contrast to appraisal theorists, describes relief from a motive-expectancy perspective. He based his theory on Mowrer (1939), who stated that relief is caused by an un-anticipated reduction of fear. Feather states that "motivational relief" (Feather, 1963, p. 507) occurs when the expectation of punishment is not, or only partially, confirmed. Relief in this sense forms a "pair" with fear (Feather, 1963, p. 507), because both share the expectation of punishment. According to Feather, relief occurs when a weak expectation of failure is not confirmed.

Arousal. Relief is usually felt as an emotion of low arousal. Derryberry and Rothbart (e.g., 1988) showed that relief is positively linked to central arousal, but not to peripheral arousal. This research indicates that although an emotion of low intensity, relief may have the same motivational effects as other, more intensive positive emotions.

Expression. Further evidence for relief's positive valence comes from facial expression studies. Fogel, Nelson-Goens, Hsu, & Shapiro (2000) investigated the facial expression connected to relief (for an overview of emotional facial expressions see Ekman, Friesen, & Ellsworth, 1996). They observed and rated children's facial expressions during different kinds of positive emotions and found that children's experience of relief is connected to simple smiles (Fogel et al., 2000), like other positive emotions.

Neurophysiology. The few neurophysiological studies on safety signals and relief support the notion of relief as a positive affective state. For instance, Thomas, Strickland, Yadin, & Burock (2005) used Pavlovian conditioning in rats to produce relief. They found that relief is partly mediated by the lateral septum, which was activated by the application of fear-inhibiting drugs (see also Grauer & Thomas, 1982; Thomas, 1988). Bender, Hellwig, Resch, and Weisbrod (2007), in a contingency-reversal learning paradigm with humans, showed that the absence of unpleasant stimuli lead to the activation of the ventrolateral prefrontal cortex (VLPFC, indicated by a N700 component in the EEG). They interpreted this activation as a correlate of detecting the absence of negative stimuli. Finally, Seymour and colleagues (2005) found that relief from pain (operationalized as the offset of pain stimulation) is mediated by cortical areas that are also involved in appetitive learning, the lateral orbitofrontal cortex and the anterior cingulated cortex.

When reviewing the literature on relief and safety states, some commonalities become visible. The definition of relief used in this thesis is thus the following:

Relief is a positive, low-arousal emotion, and is caused by an expected or non-expected, motive-consistent change for the better. Relief is caused by the absence of an aversive stimulus, hence by a fear motivation.

Approach Avoidance

Many motivation researchers consider approach versus avoidance as the most basic dimension of behavior. In recent years, the concept of approach avoidance has been a highly cited and researched concept. This statement is, for instance, evidenced by the recent publication of the *Handbook of Approach and Avoidance Motivation* (Elliot, 2008; for a historical overview see Elliot & Covington, 2001). Recent research makes it clear that the importance of approach avoidance is not restricted to basic research. It is also prevalent in relation to "real-life" phenomena. Examples can be found in the literature on social domains (e.g., Butz & Plant, 2006; Elliot, Gable, & Mapes, 2006; Gable, 2006; Kawakami, Phills, Steele, & Dovidio, 2007; Nussinson et al., 2010; Park & Hinsz, 2006; Strachman & Gable, 2006; Van Prooijen, Karremans, & Van Beest, 2006), in self-regulation research (e.g., Fishbach & Shah, 2006; Robinson, Wilkowksi, & Meier, 2007; Strachman & Gable, 2006), in the achievement personality domain (e.g., Bartels, 2007), in clinical psychology (e.g., Dickson & MacLeod, 2004; Wiers, Rinck, Kordts, Houben, & Strack, 2010), in fairness evaluations (e.g., Van Prooijen et al., 2006) and in relation and sexual behavior research (e.g., Hofmann, Friese, & Gschwendner, 2009; Impett et al., 2010; Impett, Peplau, & Gable, 2005). Likewise, emotion researchers state that affect is an integral part of action control—and approach avoidance one of the most important dimensions hereof (e.g., see the recent review by Reis & Gray, 2009).

What is approach and avoidance? Elliot (2008) defines approach avoidance as follows:

Approach motivation may be defined as the energization of behavior by, or the direction of behaviour toward, positive stimuli (objects, events, possibilities), whereas avoidance motivation may be defined as the energization of behaviour by, or the direction of behaviour away from, negative stimuli (objects, events, possibilities). (Elliot, 2008, p. 8)

Several things become clear in this definition. First, it describes the "energization" or the "direction" (Elliot, 2008) of behavior. Approach avoidance is thus at the core of the question of motivation (cf. Elliot & Fryer, 2008).

Second, most researchers understand approach avoidance as "systems" that entail motivations across several domains. Evidence for this notion in personality research has been found by Gable, Reis, and Elliot (2003; cf. Elliot & Covington, 2001). These authors found that different measures from several research fields assessing the sensitivity to positive outcomes or reward loaded on one common factor; while measures assessing the sensitivity to negative outcomes or punishment loaded on another common factor (Gable et al., 2003).

Third, the definition does not state if approach avoidance is one bipolar scale. It could be that approach avoidance is in fact made up of two unipolar scales. Neurophysiological studies imply that approach avoidance is rather made up from two physiologically separated systems. Harmon-Jones and colleagues (e.g. Harmon-Jones & Allen, 1998; Harmon-Jones, Harmon-Jones, Abramson, & Peterson, 2009) argue that approach avoidance systems are located in a specific cortical hemisphere. Similar arguments have been made by Davidson and colleagues (e.g., Davidson, 1992; Davidson, Ekman, Saron, Senulis, & Friesen, 1990; Sutton & Davidson, 1997). Further empirical evidence for this can be found in a study by Robinson and colleagues (2007). They examined people who were high in both approach and avoidance (approach being operationalized as extraversion and avoidance as neuroticism).

Affect and Goals as Determinants of Approach Avoidance

Affect and goals are among the most often discussed variables that are thought to influence approach avoidance (e.g., Higgins, 1997; Solarz, 1960; Strack & Deutsch, 2004).

Reviewing the literature on approach and avoidance, two classes of theories can be grouped together. Some theories state that affective valence determines approach avoidance (named *valence theories* hereafter). Other theories stress the influence of goals on approach avoidance (named *goal theories* hereafter). These latter theories rather assume that approach avoidance processes can cause affect. Interestingly, to date there has been little integrative effort to reconcile both approaches. Before discussing an integrative approach, the following paragraphs discuss the valence and the goal theories and their predictions for relief in detail.

Valence theories. The following theories are unified by the idea that approach avoidance is determined by the valence of the experienced affect (the experiential "feeling") or of the experienced stimuli (the more cognitive valence information). In this view, positive valence leads to approach, negative valence leads to avoidance.

Schneirla (1959) described “approach-withdrawal” as “coming near” (approach) to an object versus “increase(s) its distance from” an object (withdrawal; Schneirla, 1959, p. 2). He states that positive valences are connected to special modes of approach behavior (“towardness”, Schneirla, 1959, p. 1), while negative valences are connected to special modes of escape behavior, withdrawal (“awayness”, Schneirla, 1959, pp. 1, 30). He stated that approach avoidance was basic to all animal species, from the sea-anemone to humans. Schneirla supported the view that approach avoidance (withdrawal) becomes visible on the distance-changing behavior.

Lewin (1935) described “the positive valences (+), those effecting approach; and the negative (-), or those producing withdrawal or retreat” (Lewin, 1935, p. 81). The way Lewin describes the valences—possessed by the objects (Lewin, 1935, p. 51)—could elicit the assumption that the person can hardly influence the valence. This is, however, not true: Persons’ needs and goals cause valences in goals, on the other hands, these valences are the causes for behavior. In Lewin’s view, approach avoidance can entail different specific behaviors: From simple moving towards versus away to longer-termed circumventing of obstacles.

Gray (e.g., 1987), in his reinforcement sensitivity theory (RST; later: revised RST, e.g. Gray & McNaughton, 2000), stressed the evolutionary function of approach avoidance. The revised theory states that there are three behavioral systems, a behavioral approach system (BAS), a behavioral inhibition system (BIS) and a fight-flight freezing system (FFFS). The BAS guides behavior toward positive stimuli (e.g., positive reinforcers and the omission of negative reinforcers). The FFFS guides behavior away from threatening, negative stimuli (e.g., negative reinforcers and the omission of positive reinforcers). The BIS is connected to both the BAS and the FFFS, and can deactivate both systems in case of a system conflict. Importantly, the affective valence is, in Gray’s view, the determinant of approach avoidance. With respect to approach avoidance, he stated two famous formulae: “frustration = fear” (Gray, 1987, p. 184), and “hope = relief” (Gray, 1987, p. 248). Frustration (omission of positive reinforcers) belongs to the same FFFS as fear; relief (omission of negative reinforcers) belongs to the same BAS as hope.

Based on Konorski’s (1967) defensive fear relief system, Lang and his colleagues (e.g. Bradley, Codispoti, Cuthbert, & Lang, 2001; Bradley & Lang, 2007; Lang, 1995) proposed two opposing motivational systems. These systems are inherent parts of emotional states and that are implemented as two different subcortical (e.g. Lang, 1995; Lang, Bradley, & Cuthbert, 1998) or cortical circuits (e.g. Davidson, 1992; Davidson et al., 1990; Sutton & Davidson, 1997; Maxwell & Davidson, 2007). These two are: “The appetitive system (consummatory, sexual, and nurturant), prototypically expressed by behavioral approach, and the aversive system (protective, withdrawing, and defensive), prototypically expressed by behavioral escape and avoidance” (Lang, 1995, p. 372). The aversive system received most of Lang’s empirical attention. For instance, he found that negative stimuli elicited a stronger reflex magnitude of the human startle reflex, which he interpreted as an index of the strength of an aversive (protective) reaction (e.g., Bradley, Codispoti, & Lang, 2006; Hamm & Weike, 2005; Lang, 1995; Lipp, Siddle, & Dall, 2003; Melzig, Weike, Zimmermann, & Hamm, 2007). Importantly, Lang conceptualizes appetition and aversion as psycho-physiological systems.

As can be seen so far, researchers propose valence theories with a focus on physiological (Schneirla, 1959; Gray, 1987), reflex-like (Lang, 1995), or at least very basic (Lewin, 1935) processes. They focus less on higher-order psychological processes such as goals, intentions, consciousness etc.

Interestingly, with the advent of research on automatic processes (e.g., Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Greenwald, McGhee, & Schwartz, 1998; Klauer & Teige-Mocigemba, 2007; Payne et al., 2005; Russell, 2003), social psychological researchers, too, focus more on these simple, reflex-like behavioral reactions. Several researchers found that positive stimuli facilitate the execution of approach behaviors, and that negative stimuli facilitate the execution of avoidance (withdrawal) behaviors (e.g., Alexopoulos & Ric, 2007; Cacioppo, Priester, & Berntson, 1993; Solarz, 1960; Grégoire & Dardenne, 2004). Evidence for this link also comes from studies on facial muscle activation (e.g., Strack, Martin, & Stepper, 1988) and body feedback (e.g., Foerster & Strack, 1996; Stepper & Strack, 1993).

For instance, R. Neumann and Strack (e.g., 2000) focused on basic approach avoidance tendencies. They describe approach and avoidance as “movement that regulates the distance toward important objects” (R. Neumann & Strack, 2000, p. 40). The “motivational orientations” (R. Neumann, Förster, & Strack, 2003) are connected to valence and act “like a behavioral catalyst” (Strack & Deutsch, 2004, p. 222). Motivational orientations are closely connected to behavior, they predispose approach and avoidance behaviors. R. Neumann and Strack (e.g., 2000) stressed the point that the link between motivational orientation and valence is bidirectional. People in an approach orientation (e.g., elicited by flexor muscle activation) are predisposed to process positive stimuli, whereas people in an avoidance orientation (e.g., elicited by extensor muscle activation) are predisposed to process negative stimuli (e.g., R. Neumann & Strack, 2000). It is further important that the link between approach avoidance and valence is rather at “a representational level” than at “the level of overt behavior” (R. Neumann et al., 2003, p. 373). Motivational orientations describe behavioral predispositions that can be assessed with behavioral tasks.

With respect to the methods used, social cognition researchers (and more recently, also neurophysiologists, e.g., Coombes, Cauraugh, & Janelle, 2007) most often use simple behavioral tasks. Participants either approach (move toward) a stimulus or avoid (move away from) a stimulus. Several versions of the lever or joystick task have been used (e.g., Chen & Bargh, 1999; Duckworth, Bargh, Garcia, & Chaiken, 2002; Eder & Klauer, 2009; Eder & Rothermund, 2008; Eder, Rothermund, & Proctor, 2010; Fishbach & Shah, 2006; Heuer, Rinck, & Becker, 2007; Marsh, Ambady, & Kleck, 2005; R. Neumann, Hülsenbeck, & Seibt, 2003; Rinck & Becker, 2007; Schnabel, Banse, & Asendorpf, 2006; Solarz, 1960; Staats & Burns, 1982). Other methods include isometric muscle activation (e.g., Cacioppo et al., 1993; Gawronski, Deutsch, & Strack, 2005; R. Neumann & Strack, 2000), different versions of button press tasks (e.g., Alexopoulos & Ric, 2007; Bamford & Ward, 2008; Roelofs, Elzinga, & Rotteveel, 2005; Rotteveel & Phaf, 2004; Seibt, Häfner, & Deutsch, 2007), tasks during which verbal stimuli (e.g., Brendl, Markman, & Messner, 2004) or manikin figures move (e.g., De Houwer, Crombez, Baeyens, & Hermans, 2001; Krieglmeyer & Deutsch, 2010; Krieglmeyer, Deutsch, De Houwer, & De Raedt, 2010). Recently, researchers also investigated whole-body locomotion as approach avoidance variable (e.g., Koch, Holland, Hengstler, van Knippenberg, 2009). Some researchers created visual impressions of varied physical proximity (e.g., Adams, Ambady, Macrae, & Kleck, 2006; van Dantzig, Pecher, & Zwaan, 2008; Wentura, Rothermund, & Bak, 2000) or of the self moving toward or away from a stimulus in the participants (e.g., R. Neumann & Strack, 2000). Tasks that work more on the abstract verbal level include, for instance, the approach avoidance Implicit Association Test (IAT, Greenwald et al., 1998; McGregor et al., 2010; Wiers et al., 2010). Taken together, studies employing these measures show strong evidence that approach is connected to positive stimuli and avoidance is connected to negative stimuli.

In sum, researchers in the tradition of valence theories have made the strong point that the affective valence determines approach avoidance: Positive valence activates an approach orientation, negative valence activates an avoidance orientation. This prediction has especially found evidence on a behavioral level. Research has shown that these specific bidirectional approach avoidance links are processed in a reflex-like manner and, as behavioral tendencies, can be assessed with reaction time tasks. It is important that the researchers in the valence theory tradition conceptualize approach avoidance as the actual *change in distance toward or away from a specific stimulus*. This concept of approach avoidance will be taken up in the integrative theory as "distance orientation".

Which prediction do valence theories make for relief? The following paragraphs derive the prediction and review the existing evidence on this question.

Valence theories and relief. According to valence theories, affective valence determines approach avoidance. Relief is a positive emotion (e.g., Lazarus, 1991, p. 280), thus, valence theories predict *that relief is associated with an approach distance orientation*. Some studies supporting this prediction will be reviewed below.

Animal research. Animal conditioning researchers a long time ago examined about the motivational qualities of safety signals. They use classical and operant conditioning paradigms in their research. Within conditioning theory, relief is usually operationalized as a safety stimulus. In aversive classical conditioning, safety stimuli equal aversive CS- (conditioned stimuli); safety stimuli predict the non-occurrence of a negative consequence (unconditioned stimulus, US). The aversive CS+ predicts the occurrence of the negative US, and it is usually called the fear stimulus. Valence theories predict that fear stimuli (aversive CS+) elicit avoidance, and relief stimuli (aversive CS-) elicit approach reactions.

Two-process learning theorists Rescorla and Solomon (1967) argued that classically conditioned aversive CS- enhance reactions to instrumental appetitive stimuli, whereas relief stimuli enhance approach reactions. Several studies in this tradition found that safety stimuli enhanced approach reactions (e.g., Ray & Stein, 1959). Haraway, Maples, and Cooper (1984), for instance, trained rats to associate shock-free periods to a light signal. After the training, these rats approached the light faster than rats that did not learn this association.

Other studies operationalized relief as conditioned inhibition of a fear response (e.g., Rescorla, 1969a, 1969c; for a recent review Savastano, Cole, Barnet, & Miller, 1999). In conditioned inhibition studies, participants learn that the presentation of one conditioned stimulus (CS, e.g., A) leads to the presentation of the unconditioned stimulus (US). Importantly, if the CS+ (A) is combined with another stimulus (e.g., A+B) then the US is not shown. After several repetitions in a learning phase, B became a conditioned inhibitor of the US. Dickinson and Pearce (1977) concluded that "the reinforcing properties of an aversive inhibitor, established by associating a stimulus with the omission of an aversive event, appear to parallel those of an appetitive excitor" (Dickinson & Pearce, 1977, p. 707). Other research supports this idea: Weisman and Litner (1969, 1971; see also Rescorla, 1969a, 1969c; Rescorla & LoLordo, 1965) observed that the safety signal caused reactions opposite to the reactions caused by aversive CS+. In their studies, rats showed less frequent reactions in an avoidance test after being presented with the safety signal than in a neutral baseline condition. They concluded that the safety signal, as an "inhibitor of fear was also a conditioned positive reinforcer" (Weisman & Litner, 1972, p. 266; for a revised two-process theory of avoidance behavior; see also Bolles, 1970; Cándido, Maldonado, Rodríguez, & Morales, 2002; Cole & Miller, 1999; Maldonado et al., 2007; McAllister & McAllister, 1991).

Further evidence of relief as approach comes from interactions between inhibitors of shock and appetitive stimuli, e.g. CS+ for food. Dickinson found "superconditioning" of aversive CS- in addition to appetitive CS+ (e.g., Dickinson, 1977; Dickinson & Pearce, 1977), which can be interpreted as functional similarity between approach and relief. In superconditioning studies, known effects of appetitive CS+ on instrumental behavior are enhanced by aversive CS- (or vice versa), which is interpreted as functional similarity of the CS+ and CS- of the opposite motivational quality. Other studies, however, did not find this similarity between relief and approach stimuli (e.g., Martinez & Aguilar, 1988; see also Rand, Sloane, & Dobson, 1971).

There is also empirical evidence from animal studies on backward-conditioned aversive CS+. Usually, conditioning paradigms present first the CS and then the US (with or without a time lag between the stimulus onsets; forward conditioning). In backward conditioning, participants learn that the CS follows the US. Using this paradigm, Grelle and James (1981) showed that backward-conditioned aversive CS+ can function as appetitive CS+. They showed that backward-conditioned CS reduced the ratio with which rats suppressed a behavior that was associated with electric shock (aversive conditioning; similar Cole & Miller, 1999). This same reduction of the suppression ratio was found with appetitive stimuli. A classic study by Amsel and Maltzman (1950) found that post-aversive relief periods led to stronger drinking intake by rats. This result can also be interpreted as appetitive (approach) system activation (cf. Cain & LeDoux, 2007).

Still further evidence comes from Tortora (1983) who found that a safety training significantly reduced avoidance-motivated aggression in dogs (see also Denny, 1983). Boyd, Callen, and House (1989) found specific links between safety and alcohol. Rats that learned a connection between post-shock relief and alcohol drank more alcohol afterwards, as compared to those who did not receive any shock. This finding, too, can be interpreted as approach orientation connected to the relief experienced after the shock.

Human research. Human conditioning studies are also informative regarding the present question. Lovibond and colleagues (e.g., Lovibond et al., 2007) found that safety stimuli (aversive CS-) can elicit the expectation in humans that the US will not occur. Likewise, they can inhibit the physiological reactions that are caused by aversive CS+, e.g. skin conductance changes. The conditioned inhibition paradigm has also been used in humans (e.g., Chan & Lovibond, 1996; Grillon & Ameli, 2001; LoLordo, 1969; D. L. Neumann, Lipp, & Siddle, 1997). For example, Migo and colleagues (2006) found that the ratio of conditioned inhibition reactions in an aversive conditioning procedure with humans was positively associated with scores on the behavioral activation system (BAS, approach system) by Carver and White (1994), but not to the behavioral inhibition system (BIS, avoidance system). The higher the score on the BAS, the stronger participants inhibited the reaction to the negative US (i.e., the stronger the relief conditioning).

The prediction that relief sparks an approach orientation has also been tested with more subtle measures, such as the startle reflex (e.g., Lang, 1995). In an aversive conditioning study, Grillon and Ameli (2001) observed that conditioned inhibitors reduced the magnitude of the startle reflex and the skin conductance reaction (Grillon & Ameli, 2001). These data indicate that the conditioned inhibitor reduced the aversive (avoidance) system (e.g., Lang, 1995) and give strong evidence for the valence theories' prediction that relief is associated with an approach distance orientation.

Research on persuasion and marketing strategies also speaks to the validity of valence theories. Rossiter and Thornton (2004) examined the influence of safety stimuli on advertisement success. They found that a fear-then-relief temporal pattern during the presentation of anti-racing advertisements led drivers to drive more slowly, whereas an ad that used only fear actually increased driving speed. One could interpret the findings of this study as demonstrating that relief elicits a stronger approach orientation than fear (cf. Shen & Price Dillard, 2007; Werth & Foerster, 2007a). Additional evidence for the prediction that relief enhances an approach motivation comes from studies on clinical phenomena. Rachman (1984; cf. Himadi, 1987) proposed that safety signals, like staying at home or being accompanied by husband or wife, are important in the maintenance of agoraphobia. As several studies have shown since, agoraphobics approach safety signals, while they strongly avoid fear signals (e.g., Salkovskis, Clark, Hackmann, Wells, & Gelder, 1999; Sloan & Telch, 2002). Regarding general anxiety disorders, Turnage and Wenrich (1974) have demonstrated that anxiety relief conditioning strongly reduced anxiety (cf. Dickson & MacLeod, 2004). Their phobic participants stronger approached fear-eliciting stimuli (snakes) more if they were conditioned to relief. The association of fear-eliciting stimuli with relief, thus, led to a weaker avoidance or stronger approach.

Interim conclusion. Taken together, the animal and the human studies suggest two things: First, relief stimuli (operationalized as predicting the absence of negative stimulation, CS-, conditioned inhibitors, or backward conditioned CS+) can reduce the effects of the avoidance system (e.g., forward conditioned CS+). Second, relief stimuli also enhance the functioning of the approach system. It is, however, unclear, what affect the participants felt (strength of positive valence and of arousal). If it was indeed relief they experienced, then the cited studies are informative of the research question; if other positive emotions, like happiness, were experienced, then the studies are not informative. Further, it is unclear what levels of approach avoidance (concrete behavioral level, goal level) were affected.

Goal theories. In contrast to valence theories, goal theories stress the point that approach avoidance is determined by the goals that an individual pursues. Among the goal theories, the self-regulation approaches by Carver (e.g., 2001) and by Higgins (e.g., 1997) are the most prominent. Approach avoidance—according to Carver and Higgins—is determined by goals. Importantly, these authors also include several levels of processing in their theories.

Self-regulation theory. Carver and colleagues expanded Gray's theory of a behavioral inhibition system (BIS) and a behavioral approach system (BAS, e.g., Gray, 1987). Carver proposed two independent bipolar motivational systems: an approach system (BAS) and an avoidance system (BIS; e.g., Carver, 2001, 2003, 2004, 2006; Carver, Avivi & Laurenceau, 2008; Carver & Scheier, 1990, 2008; Carver, Sutton, & Scheier, 2000). According to this model, an approach process works to reduce distance from positive end states, an avoidance process works to increase distance from negative end states. Affect is a consequence of the self-regulation processes of BIS and BAS. Affect is produced by an affect feedback loop, a secondary regulation process that monitors the discrepancy toward the approach or avoidance goal and the speed with which the individual approaches this goal, the "effectiveness" or the "error rate" (Carver, 2003, p. 243). Recent papers by Carver locate the BIS and BAS in a "lower-order", associative system, thereby integrating the approach avoidance systems in a general two-system model (e.g., Carver, 2009; Carver, Johnson, & Joormann, 2008, 2009; following this model, the "higher-order" system's task is to exercise effortful control over the lower-order reactive tendencies). BIS and BAS are conceptualized as "reactive approach avoidance tendencies" (Carver et al., 2008, p. 914), although they are typically assessed with questionnaires (e.g., Carver & White, 1994; Fellner, Holler, Kirchler, & Schabermann, 2007; Smillie & Jackson, 2005; Summerville & Roese, 2008).

Carver sorted several emotions into the BIS-BAS-system, including fear and relief (e.g., Carver, 2001). Importantly, he grouped emotions together according to their motivational systems, but not by their valence. So, joy (elation, eagerness) and sadness (depression) are grouped together in the approach process, and relief (calmness) and fear (anxiety) are grouped together in the avoidance process. Thus, Carver would predict that the valence of emotions does not determine the motivational system it belongs to: Positive emotions, such as relief, can be elicited by the avoidance system; negative emotions, such as anger and sadness, can be elicited by the approach system.

Evidence for negative approach emotions was obtained in several studies. For instance, Carver found that sadness and anger was positively related to BAS (approach system) activity, but not BIS (avoidance system) activity (Carver, 2004; Carver & Harmon-Jones, 2009). Another study examined the positive avoidance emotions (Carver, 2009), but this will be discussed in more detail in a later section. However, contrary to Carver's predictions, other researchers demonstrated that the BAS is specifically linked to positive (and the BIS to negative) affective events (e.g., Gable, Reis, & Elliot, 2000). These findings give raise to doubt about Carver's predictions on relief.

Regulatory focus theory. Higgins proposed a self-regulation approach resembling Carver's theory. Higgins, too, disentangled affective valence from motivational systems, thereby going "beyond the hedonic principle" (Higgins, 1997; reviews see Molden, Lee, & Higgins, 2008; Werth & Förster, 2007). In regulatory focus theory (RFT), Higgins distinguished two basic motivational orientations, each with broad implications: promotion focus and prevention focus. The promotion focus is engaged by nurturance needs and ideals, whereas the prevention focus is engaged by security needs and oughts (e.g., Higgins, 1997). Promotion-focused individuals guide their attention towards the presence and the absence of positive events (gains and non-gains); prevention-focused individuals attend to the presence and absence of negative events (losses and non-losses, e.g., Higgins, 1997). Importantly, RFT does not treat gains and non-losses (and non-gains and losses) the same—unlike valence theories (e.g., Gray, 1987). According to RFT, gains and non-gains are processed in one system (promotion focus), and losses and non-losses, together, are processed in another system (prevention focus). Higgins originally described promotion and prevention focus as chronic personality traits (e.g., Higgins, 1997). Recent research, however, demonstrated that they can also be induced by situational variables, such as flexor versus extensor muscle activation (e.g, Foerster, Higgins, & Idson, 1998) or task instruction wordings (e.g., Grimm, Markman, Maddox, & Baldwin, 2008).

Extensive research has demonstrated the influence of promotion and prevention focus on a plethora of psychological processes, among them attention (e.g., de Lange & van Knippenberg, 2007; Foerster, Friedman, Özelsel, & Denzler, 2006; Foerster & Higgins, 2005; Foerster & Stepper, 2000; Foerster & Strack, 1996; Friedman & Foerster, 2005), creativity (e.g., Baas, De Dreu, & Nijstad, 2008; Kuschel, Förster, & Denzler, 2010), preferences and decision making (e.g., Bryant & Dunford, 2008), self-control (e.g., Dholakia, 2006; Freitas, Liberman, & Higgins, 2002), decision values (e.g., Avnet & Higgins, 2003; Higgins, 2000), self-evaluation (e.g., Leonardelli, Lakin, & Arkin, 2007), and motivational strength (e.g., Higgins, 2000; Shah & Higgins, 1997; Spiegel, Grant-Pillow, & Higgins, 2004; Werth & Foerster, 2007a; Zhou & Tuan Pham, 2004).

Importantly for the integrative model of relief, RFT distinguishes between several levels of processing, orthogonally to promotion vs. prevention focus. There is a system level that depends on the current relevant end state that the individual pertains; a strategic level that depends on the more abstract strategies (e.g., approaching matches to desired end states vs. avoiding mismatches to desired end states); a tactical level, i.e., the more concrete behavioral activities that serve the goals (e.g., conservative vs. risky response biases); and a behavioral level (e.g., concrete behaviors). Whereas RFT explicitly addressed the system, the strategic and the tactical levels, the behavioral level has not been addressed so far (e.g., Scholer & Higgins, 2008, p. 493).

Several studies have adduced evidence for the promotion versus prevention focus distinction. For instance, Idson, Liberman, and Higgins (2000) observed that promotion and prevention cause different emotions: Promotion focus was associated with cheerfulness- and quiescence-emotions (e.g., happy, discouraged) and prevention focus was stronger associated with agitation- and dejection-emotions (e.g., relaxed, tense; cf. Foerster, Higgins, & Strack, 2000; Higgins, Shah, & Friedman, 1997; Roney, Higgins, & Shah, 1995; Sassenberg & Hansen, 2007; Shah, Brazy, & Higgins, 2004; on the underlying appraisals, e.g., Shah & Higgins, 2001; on neurophysiological correlates, e.g., Cunningham, Raye, & Johnson, 2005). Shah, Higgins, and Friedman (1998) found that promotion-ideal strength only influenced performance in a gain versus non-gain framed task. Prevention-ought strength only influenced performance in a loss versus non-loss framed task. Importantly, there were no relations between gain versus non-gain and prevention or between loss versus non-loss and promotion (Shah et al., 1998; cf. Brendl, Higgins, & Lemm, 1995).

Other studies have investigated the distinction between the different processing levels of RFT. Higgins, Roney, Crowe, and Hymes (1994) found relations between promotion, ideal self strength (vs. prevention, ought self strength) and approach matches strategies (vs. avoid mismatches strategies; Higgins et al., 1994, Exp. 2). This research indicates that the processing levels are functionally connected to each other. In contrary, Scholer, Stroessner, and Higgins (2008; cf. Scholer, Zou, Fujita, Stroessner, & Higgins, 2010) found evidence for the dissociation between two levels, the strategic and the tactical level. In their studies, a prevention focus on the strategic level produced a (promotion focus-like) risky bias in a memory signal-detection task. This risky bias was interpreted as an approach orientation on the tactical level (e.g., Higgins, 1997). The authors interpret this observation as dissociation between the strategic and the tactical level of processing, which indicates that every level can entail a regulatory focus independent of the other levels.

A critical review of RFT reveals two major drawbacks in the theory and related research. First, the relation between promotion and prevention focus and approach avoidance is not clear. Molden and colleagues (2008) claimed that approach towards positive end-states versus avoidance of negative end-states is orthogonal to the promotion prevention distinction (Molden et al., 2008, p. 171). Threat (losses, related to anxiety), for instance, belongs to prevention concerns and also to an avoidance orientation. In contrary, security concerns (non-losses, related to calmness), for instance, belong to prevention concerns, but at the same time they belong to an approach orientation (Molden et al., 2008). Molden and colleagues do not, however, clarify on which level (system, strategic, or tactical) they predict approach avoidance. Thus, it is difficult to derive predictions regarding the relation between regulatory foci and approach avoidance. Nonetheless, several studies have nevertheless investigated this relation. Foerster, Grant, Idson, and Higgins (2001), for instance, found that promotion focus is enhanced when participants execute a pull behavior (isometric flexor muscle activation; after success feedback), whereas prevention focus is enhanced when participants execute a push behavior (isometric extensor muscle activation; after failure feedback). Regulatory focus was assessed using promotion versus prevention anagrams. Participants had to solve either promotion type or prevention type anagrams. For promotion anagrams, participants received points for the correct solution, but did not gain or lose anything if they did not find the solution. For prevention anagrams, they did not gain or lose anything for the correct solution, but they lost points if they did not find the solution (cf. Foerster et al., 1998; Freitas & Higgins, 2002; Van-Dijk & Kluger, 2004). In a further study, Foerster (2003) showed that isometric flexor muscle activation led to an increased consumption of a delicious drink. He explained the finding with a generalized promotion focus (approach). These studies show that approach avoidance is examined on a very basic, behavioral level in some studies (as by Foerster, 2003), whereas it is examined on a goal-level in other studies (as by Foerster et al., 1998).

Second, it is unclear how RFT processing levels should be operationalized. In several studies (e.g., Foerster et al., 1998, 2001), researchers assessed the prevailing focus by counting the number of correctly solved winning- and losing-points anagrams, or by measuring participants' persistence in working on them (cf. Shah et al., 1998). This operationalization has, however, been argued to work on the strategic level in another source (Scholer & Higgins, 2008, p. 493). Level operationalization difficulties also obscure interpretation of work by Crowe and Higgins (1997) and Scholer and colleagues (2010). Both studies assessed vigilant versus risky response biases in signal detection tasks. Whereas Crowe and Higgins (1997) interpreted this task as operating on the strategic level (cf. Higgins & Spiegel, 2004), Scholer and colleagues (2010; cf. Scholer & Higgins, 2008) interpreted the same task as operating on the tactical level. These two drawbacks illustrate the difficulties to derive clear hypotheses regarding approach avoidance from RFT. By contrast, the integrative theory that is developed below also differentiates several processing levels, but it makes explicit predictions about approach avoidance on every level.

Summing up, the goal theories reviewed herein are unified by the definition of approach avoidance as *the attainment of positive end-states vs. the prevention of negative end-*

states[1]. We now turn to the predictions goal theories make for relief and the existing evidence regarding this question. The goal theory concept of approach avoidance will be referred to in the integrative theory as “goal orientation”.

Goal theories and relief. Whereas valence theories tie approach avoidance to outcome valence, in goal theories, approach avoidance is determined by goals. Recall that relief is an emotion caused by an avoidance goal. Thus, goal theories predict that relief is associated with avoidance. There is empirical evidence to support this prediction.

Participants in a recent study by Carver (2009) reported their relief after an imagination task. The intensity of relief correlated positively with the strength of the avoidance system (BIS), but also with one subscale of the approach system (BAS), reward responsiveness. One could interpret the correlation between relief and the BIS as evidence for Carver’s notion that relief is an emotion involved in avoidance processes. Nevertheless, relief correlated positively with both the BIS and BAS scales. It is possible that this relation is due to the specific scenarios used. For instance, the participants were induced to imagine that they had participated in a class where their presentation skills had been heavily criticized and that this class was over. They then had to indicate their intensity of relief. Carver admitted that participants may have withdrawn their attention from aversive goals and have broadened their attention to new “possibilities for goal pursuit” (Carver, 2009, p. 133). This kind of “coasting phenomenon”—the phenomenon that people chose new positive, approach goals when they experience positive emotions—resembles the broaden-and-build theory by Fredrickson (1998). So far, we do not know the strength of approach coasting in relation to the avoidance system. Taken together, the Carver (2009) study shows that relief is involved in an avoidance process—the goal theory put forward by Carver—, on the hand the data indicate that relief is associated with BAS activity—thereby supporting valence theories. Consequently, the Carver (2009) study does not allow a decision about the goal theories’ prediction on relief. Moreover, Carver’s correlational design is not free from the influence of third variables. For instance, differences in general arousal from imagining different fearful stimuli could have caused the correlation between relief and the BAS subscales. Experimentally inducing relief in a controlled environment would overcome these issues.

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[1] Craig (1918), for instance, describes appetite as “state of agitation which continues so long as the (…) appeted stimulus is absent” (Craig, 1918, p. 91), whereas an aversion “continues as (…) the disturbing stimulus is present” (Craig, 1918, p. 91).

According to RFT (e.g., Higgins, 1997; Scholer & Higgins, 2008), relief is an emotion associated with prevention focus emotion and avoidance orientations (e.g., “calmness”, Molden et al., 2008). Some evidence supports these predictions.

Regarding the relation between relief and prevention focus, Roney and colleagues (1995) found that participants in a prevention focus indicated stronger quiescence-agitation emotions, including relief (“relaxed”) after performance feedback than participants in a promotion focus. Higgins and colleagues (1997) found that the stronger participants’ prevention focus while pursuing a goal, the stronger they experienced calm emotions like relief. This relation was not found for the strength of promotion focus. Furthermore, Shah and Higgins (2001) found that participants in a prevention focus needed less time to decide whether they experienced relief than participants in a promotion focus. These findings indicate that prevention focus specifically relates to relief.

Regarding the relation between relief and avoidance behavior, Werth and Foerster (2007a) investigated advertisements that focused on safety (prevention focus) or comfort aspects (promotion focus). Prevention-oriented participants valued the safety-advertised products higher than promotion-oriented participants. Based on regulatory-fit theory (Higgins, 2000)—that states that the compatibility between a person’s motivation and the situational framing of a choice option leads to higher value of this option—one can conclude that relief is related more to prevention focus than to promotion focus. Further evidence comes from studies by Foerster and colleagues (1998). They assessed pressures of flexing versus extending arm muscles as measures of regulatory focus. Then participants solved anagrams in one of four ways: Participants could either gain or not gain extra money (focus on positive end state, promotion framing) or they could lose or not lose money (focus on negative end state, prevention framing). The authors found that the prevention framing facilitated prevention focus processing, as indicated by arm pressure (stronger arm extensor muscle activation was interpreted as stronger prevention focus), task persistence (time participants worked on the not-losing-money anagrams), and number of correct solutions (number of not-losing-money anagrams). Most importantly, the prevention framing caused a steeper goal gradient in arm muscle extension than the promotion framing: Participants with a prevention framing put more strength into the extension (“pushing”) task over the course of several anagrams than they put into the flexor (“pulling”) task or than did participants with a promotion framing. These effects were found both in the prevention not working (fear) situation and in the prevention working (relief) situation. This result can be interpreted as evidence that participants in a relief situation executed an avoidance behavior (extensor muscle activation) stronger than an approach behavior (flexor muscle activation). In addition, the researchers found effects on a strategic level of motivation: Prevention-oriented participants persisted longer on tasks when they could prevent losing points (Foerster et al., 1998, Exp. 3). In a follow-up study, Foerster and colleagues (2001) found that successful prevention behavior (relief) had an inhibiting, although not significant, effect on strategic approach behavior, the performance in gaining-points anagrams. Importantly, successful prevention behavior did not influence strategic avoidance behavior. The results of Foerster and colleagues (1998) can thus be interpreted as facilitating effects on avoidance goals or as inhibiting effects on approach goals.

Interim conclusion. Taken together, several studies support the idea that relief is associated to avoidance, on a behavioral, strategic, and goal level. The evidence, however, is far from conclusive. Carver's (2009) data indicate that relief relates to both BIS and BAS, and the approach reduction by relief in Foerster and colleagues' (2001) study was not significant. The inconclusiveness in these data may be caused by different moderating factors that will be discussed below.

So far, I have reviewed two groups of theories and the evidence in favor of each of them. Despite the clear predictions each group makes regarding relief, there is inconclusive evidence for either prediction. I will argue that this confusion of evidence is due to variables which moderate the relation between affective states and approach avoidance: the psychological system which produced relief, and the psychological level on which approach avoidance is measured. For this endeavor, I will draw upon a recently developed two-system model of behavior (RIM, Strack & Deutsch, 2004). The RIM will be used for the development of specific hypotheses.

Integrative Two-System Model

Several levels of approach avoidance. Elliot, in his definition of approach avoidance (Elliot, 2008), laid the foundation for a distinction between two levels of approach avoidance. Approach avoidance can either be directed towards "objects" or towards "events" or "possibilities". Approaching/avoiding an object implies a *behavior*, whereas approaching/avoiding an event or a possibility implies a *goal*. In the integrated theory outlined below, behavior and goals are considered two distinct levels of processing that follow their own processing rules. These will now be reviewed.

In the personality domain, Elliot (2006; cf. Elliot & Church, 1997; Elliot & Pekrun, 2007) distinguished goals from underlying motivations, such as motives and temperaments. He explicitly states that “for example, approach goals may be adopted in the service of underlying avoidance motivation” (Elliot, 2006, p. 114). The empirical data for this assumption are, however, missing.

Higgins, in the formulation of regulatory focus theory (RFT, Higgins, 1997) presented the two foci of RFT as if they entailed a general state of several levels. For instance, promotion focus is connected to approach on all levels: to a sensitivity to positive stimuli, to approach means on the strategic level and to compatible tactics. In contrast, Scholer and Higgins (2008) argued that levels can dissociate. Scholer and colleagues (2010) found a dissociation between an avoidance strategic level (vigilance) and an approach tactical level (risky bias) in a signal-detection paradigm. Yet, it is unclear where the risky bias in a strategic avoidance situation comes from: Is it caused by the more basic behavioral level or by some other process? Which level described by Scholer and Higgins (2008) is influenced by their experimental manipulations and—more importantly—which is not? Perhaps the independence question can be more parsimoniously explained by a two-system model of behavior. This model allows specific predictions for each level (see below).

Ariely and Norton (2009) recently proposed an interesting level differentiation, using a consumer psychological perspective. They argued that “conceptual consumption” (e.g., goals, regulatory fit) has to be separated from physical consumption. Further, there are cases when people forgo the latter for the sake of the former (e.g., charity giving, Ariely & Norton, 2009). In approach avoidance terms, one could interpret this idea as the activation of an approach goal (e.g., helping others) which requires, as a means, behavior that avoids something (e.g., money). The model outlined below resembles this idea, but allows for more detailed predictions.

Reflective-impulsive model of behavior. Several recent models proposed by social psychologists explicitly incorporated dissociations between separate levels or systems. One very prominent exemplar is the Reflective-Impulsive Model of Behavior (RIM, Strack & Deutsch, 2004; for discussions of the model see Deutsch & Strack, 2006a, 2006b, 2010; Strack, 1999; Strack, Deutsch, & Krieglmeyer, 2009).

According to the RIM, human behavior is regulated by two separate, but intertwined psychological systems: the *impulsive system* and *reflective system*. These two systems are comprised of distinct psychological mechanisms. The impulsive system consists of a storage space for long-term memory concepts (nodes). It contains both perceptual schemata and behavioral schemata, which are connected by bidirectional links. It follows basic associative rules, such as the spreading of activation to linked concepts. By linking perceptual nodes directly to behavioral nodes (schemata), the impulsive system serves the task of quickly reacting to situations. The impulsive behavioral schemata can be influenced by simple conditioning procedures (e.g., Olson & Fazio, 2001) that build associations with repeated pairings (e.g., Rydell & McConnell, 2006; Rydell, McConnell, Mackie, & Strain, 2006). The impulsive system is the default system, it is always active, independent of capacity or time resources (see below).

The reflective system, in contrast, is a capacity-consuming system. It contains propositional processes, including noetic decisions, goals, and logical reasoning (e.g., negation, Deutsch et al., 2006, 2009). In contrast to the impulsive system, the reflective system is well suited to flexibly react to new situations that have not been encountered before (for a similar distinction between emotion behavior and emotivational goals, see Roseman, 2008). Importantly, the reflective system is only active when a) there is sufficient motivation to process reflectively, and b) there are sufficient cognitive resources available (Strack & Deutsch, 2004, p. 223, Thesis 2). Importantly, both systems can cause emotions: Smith and Neumann (2005), for instance, found that emotions can be elicited both by associative processes (impulsive system of the RIM) and by rule-based processes (reflective system).

Application to relief. The RIM predicts that two moderating variables are of supreme importance in terms of determining reactions to relief and safety signals.

First, it matters which psychological system is in focus: the impulsive or the reflective system. Each psychological system involves a specific kind of approach avoidance motivation. For the impulsive system, approach avoidance is a simple behavioral tendency (behavioral preparedness): Is an individual prepared to approach a given stimulus at a certain time, i.e. to reduce the distance between her body and the stimulus? Alternatively, is she prepared to avoid the stimulus, i.e. to increase the distance between herself and the stimulus? R. Neumann and colleagues termed this dimension “motivational orientation” (e.g., R. Neumann et al., 2003). In order to distinguish it from the reflective system, the *change in distance toward or away from a specific stimulus* will be named *distance orientation* throughout this dissertation. Distance orientation resembles other approach avoidance conceptualizations, such as Chen and Bargh’s (1999) “motivational tendencies”. Chen and

Bargh (1999) conceptualized approach avoidance as “immediate behavioral predisposition(s)” (Chen & Bargh, 1999, p. 215). Importantly, the distance orientation follows a basic valence principle: It is determined by affective valence. Positive valence leads to an approach distance orientation, while negative valence leads to an avoidance distance orientation (e.g., R. Neumann et al., 2003).

For the reflective system, the approach avoidance motivation expresses itself as the direction of behavioral decisions (“intending”, Strack & Deutsch, 2004). Does an individual *intend* to reach a positive state (approach goal), or does she intend to avoid the existence of a negative state (avoidance goal)? The *attainment of positive end-states vs. the prevention of negative end-states* in the reflective system will be named *goal orientation* throughout this dissertation. Goal orientation resembles other goal-like conceptualizations, such as Higgins' promotion versus prevention focus orientation (Higgins, 1997), and Carver's behavioral approach versus avoidance process (e.g., Carver, 2001[2]). Goal orientation follows a goal principle: It is influenced by the current noetic behavioral decisions made by an individual. If a person makes a decision to experience a positive state, then the compatible goal orientation will be an approach goal. In contrast, if she makes a decision to not experience a negative state, then the compatible goal orientation will be an avoidance goal.

Importantly, the RIM predicts that the two systems will work in relative independence from each other. Specifically, reflective intending is independent from impulsive processes (Strack & Deutsch, 2004, p. 231, Fig. 4), at least, until both processes end in a “final common pathway” (Strack & Deutsch, 2004, p. 229) affecting behavior. This means that reflective intending processes can work in parallel with very different impulsive behavioral orientations.

Second, the RIM predicts that the systems are not equally responsible for a particular outcome. Specifically, the impulsive system acts like a default system that is always active, whereas the reflective system is only active under certain circumstances. One important determining factor is whether behavioral goals are active (e.g., Denzler, Foerster, & Liberman, 2009; Foerster, Liberman, & Higgins, 2005; Liberman, Förster, & Higgins, 2007). Making a decision in the reflective system activates behavioral schemata in the impulsive system, a process that is named intending in the RIM (Strack & Deutsch, 2004, p. 222). Once

[2] However, there is one difference between the RIM and Carver's theory: Carver recently stated that BIS and BAS are located in the more basic, “lower-order” system (Carver et al., 2008), whereas the reflective system that entails the goal orientation can be conceptualized as the “higher-order” system (Strack & Deutsch, 2004).

the goal is fulfilled, intending will be terminated (Strack & Deutsch, 2004, p. 230). When there is an impulsive-reflective conflict (i.e. when opposing behavioral schemata are activated by the two systems), reflective processes are thought to override impulsive processes, so long as sufficient time, motivation, and cognitive capacity are available (e.g., Hofmann, Rauch, & Gawronski, 2007).

An important implication of the RIM is that the same behavioral outcome on the surface can result from processes in either the impulsive or reflective system. In terms of relief, the RIM implies that relief states can be attained by either system. First, relief can be obtained via the "impulsive way": If one experiences situations when no negative stimulation is experienced (e.g., no fear), this can lead to relief—especially in an environment full of negative stimuli. Relief can then associatively connect to safety stimuli by classical conditioning. Second, relief can be obtained via the "reflective way": If one pursues the goal of controlling a threat, this can also lead to relief. For example, if one tries new medication in order to end pain, one has experienced reflective relief. This form of relief is produced by an active behavioral decision in the reflective system (Strack & Deutsch, 2004). Given that the reflective and impulsive systems moderate relief, it is important to look at both of them. The central theoretical point in this dissertation is that it is necessary to integrate both moderators *together at one time*. Depending on which system is responsible for relief, each approach avoidance system will react differentially to the relief situation. Table 1 presents the cells that are made up by the two moderators.

Table 1

Hypotheses and Experiments

	Impulsive Relief[3]	Reflective Relief[4]
Goal Orientation[5]	Relief elicits no orientation *Experiment 5*	Relief elicits avoidance *Experiments 6-7*
Distance Orientation[6]	Relief elicits approach *Experiments 2-3*	

Now we turn to descriptions of the specific reasoning and predictions for the distance and goal orientations.

Distance orientation. The RIM predicts an approach distance orientation for relief. The perception of relief stimuli activates a positively valenced node in the impulsive system (e.g, Strack & Deutsch, 2004; cf. Lovibond et al., 2007). This positive core affect (Russell, 2003) is independent of the active goal. It prepares the execution of approach (distance-reducing) behavioral schemata as action tendencies (e.g., R. Neumann & Strack, 2000; R. Neumann et al., 2003). Thus, relief will facilitate the execution of compatible behavior, approach behavior, in the impulsive system (e.g., Chen & Bargh, 1999).

Importantly, relief can be elicited by both the impulsive and the reflective system. Relief's positive valence will active an approach distance orientation in both cases, independent of which system caused relief. Thus, both relief states that are caused by the impulsive and relief states that are caused by the reflective system ought to elicit positive valence and an approach distance orientation.

What factors in the relief situation influence the distance orientation? Research indicates that the *change* in affective states is important in determining the strength and the direction of affect (e.g., Russell, 2003). Relief can be defined as the non-occurrence of

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[3] Impulsive relief: Relief is caused by impulsive processes.
[4] Reflective relief: Relief is caused by reflective processes.
[5] Goal orientation: the attainment of positive end-states vs. the prevention of negative end-states.
[6] Distance orientation: the change in distance toward or away from a specific stimulus.

negative stimulation (e.g., punishment). Russell's notion of change implies that the degree of change toward the relief state should determine the strength of relief's positive affect. If there is a large positive change toward relief, then the affect should be very positive. This should be particularly true the more negative the starting point from which an individual gains relief. However, when the positive change is small, then the affect should be less positive. This should be particularly the case when the starting point is less negative or neutral. Thus, the starting point from which an individual tries to gain a relief state should influence the affect that is experienced when the individual finally reaches the relief state. If one connects this "change idea" to the idea that the affective valence determines the distance orientation, then one may predict that the affective starting point determines distance orientation. When starting from a neutral baseline and then experiencing the non-occurrence of a negative stimulation, then relief should elicit a weak approach distance orientation. However, when starting from a negative baseline and then experiencing the non-occurrence of a negative stimulation, then relief should elicit a strong approach distance orientation.

Goal orientation. The RIM predicts an avoidance goal orientation (BIS, prevention focus) for relief stimuli. However, this will be the case only under two conditions. First, the avoidance goal will only be elicited when the relief situation is caused by self-induced, goal-directed behavior (e.g., Carver, 2001; Higgins, 1997). Only in this case will reflective processing occur. By contrast, when the relief state is caused by simple associative learning (classical association) or when the goal is not active anymore, then there will be no active goal (e.g., Foerster et al., 2005; Foerster, Liberman, & Friedman, 2007; Goschke & Kuhl, 1993). When there is no active goal, measures of goal orientation should not show any effects.

Second, the avoidance goal will only be elicited when the self-induced relief state is uncertain. This proposition can be derived from the principle of the "default system" embedded in the RIM. The reflective system is only active when there is both motivation and capacity to engage in reflective processing (Strack & Deutsch, 2004, p. 223). When relief can be obtained with certainty—when the individual is definitely sure that she can obtain relief with her simple behavior—there is no motivation for reflective functioning. This certainty can be obtained after undergoing several repetitions of the same situation, e.g. after the learning of relief-eliciting behaviors (operant conditioning). If the individual is certain, then eventually the impulsive system will process the stimuli, and the reflective system will be less and less involved (Strack & Deutsch, 2004). This reasoning implies that there will be only strong reflective goal activity when the relief state is obtained with an uncertain subjective probability. Only in these cases should the reflective system activate an avoidance goal.

Taken together, these two lines of reasoning imply that avoidance goals should only be active when the relief state is self-induced (induced by one's own behavior) and when the self-induced relief is subjectively uncertain. Only in this case should relief elicit an avoidance goal orientation. In all other cases—when self-induced relief is certain or when relief is not caused by one's own behavior—there will be no avoidance goal orientation.

How can goal states be assessed? Research on goal activation indicates that trained goal states can be elicited very quickly (e.g., Aarts, Custers, & Holland, 2007; Custers & Aarts, 2007; Moors et al., 2005; although they still require working memory capacity, e.g., Hassin, Aarts, Eitam, Custer, & Kleiman, 2009). Further research indicates that goals are organized into systems: Compatible goals are linked to each other more strongly than they are to incompatible goals (e.g., Kruglanski & Kopetz, 2009; Kruglanski et al., 2002; Shah, Friedman & Kruglanski, 2002; Shah & Kruglanski, 2002, 2008). For instance, Shah and colleagues (2002) found evidence of *goal shielding* where alternative, incongruent goals were less accessible than focal goals (i.e., required longer reaction times in a lexical decision task). Thus, a task that assesses goal strength could look like this: Participants have to quickly execute behaviors, either in order to fulfill an approach goal, or to fulfill an avoidance goal. These secondary "task goals" are irrelevant to the general, primary goal orientation, yet they are either compatible or incompatible to the primary goal. One can predict that the behavior of the compatible secondary goals will be executed faster than the behavior of the incompatible secondary goals. If this is true, then one can assess the activation of active primary goals with this goal compatibility task (for a similar persistence measure, see Foerster et al., 2001).

Interim conclusion. To sum up, I have argued that there are two different levels of approach avoidance, based on the RIM (Strack & Deutsch, 2004): a distance orientation in the impulsive system and a goal orientation in the reflective system. Importantly, each of these levels is based on different psychological mechanisms. They react differentially to moderating variables, such as affective valence and goals. Relief, in this model, is predicted to evoke an approach distance orientation, but at the same time an avoidance goal, given that relief is self-induced and uncertain.

Predictions and Overview of the Experiments

Predictions. Based on what was said above, the following predictions were deduced and put to test in six of the seven experiments of this thesis.

Prediction A: Relief will elicit positive affective valence and an approach distance orientation. This should be true for both relief that is caused by the impulsive system and for relief that is caused by the reflective system (Experiments 2-3).

Prediction B: More positive valence of relief—caused by a larger change of affective states—will elicit a stronger approach distance orientation (Experiment 4).

Prediction C: Relief caused by the impulsive system will not elicit a specific goal orientation (Experiment 5).

Prediction D: Uncertain self-induced relief—caused by the reflective system—will elicit an avoidance goal orientation (Experiments 6-7).

In addition, Experiment 1 validated the conditioning paradigm used for the elicitation of relief (see below).

Methodological approach. In order to test the predictions made in the paragraphs above, I selected a conditioning paradigm.

Aversive conditioning. An aversive conditioning paradigm was selected as the method for producing relief and fear (for overviews of human conditioning research, see De Houwer & Beckers, 2002, and for animals, see Pearce & Bouton, 2001; for an overview of Pavlovian conditioning in humans, see Martin & Levey, 1988). Aversive conditioning, especially within the field of fear and phobia research, has proven to be an effective way of eliciting relief feelings toward previously neutral stimuli (e.g, Hamm, Vaitl, & Lang, 1989; Hamm & Weike, 2005; Lang, 1995; Lejuez, O'Donnell, Wirth, Zvolensky, & Eifert, 1998; Lipp, 2006; Lipp, Sheridan, & Siddle, 1994; Lovibond & Shanks, 2002). Aversive conditioning allows for testing the dependent variables before the actual relief state occurs, i.e. before the person experiences relief, which allows for testing predictions made by goal theorists (see above). At the same time, in aversive conditioning, all participants interpret the stimuli the same way and thereby the influence of possibly infering variables is reduced to a minimum. These are, in my view, large advantages compared to using natural occurring relief situations (e.g., Carver, 2009).

Authors in the conditioning literature have employed several ways of associating a fear or safety quality to stimuli (see overview in Gray, 1987, p. 217). There are at least three different general ways of conditioning a safety stimulus:

First, one could use a backward conditioning procedure that has proven effective in both animal and human conditioning research (e.g. Andreatta, Mühlberger, Yarali, Gerber, & Pauli, 2010; Cole & Miller, 1999; Tanimoto, Heisenberg, & Gerber, 2004). The presentation of Stimulus A is conditioned to the occurrence of the US—though, not preceding it or parallel with it, but rather following it.

Second, one could use a conditioned inhibition procedure (e.g, Chan & Lovibond, 1996; Grillon & Ameli, 2001), where stimulus A is conditioned to fear, and stimuli A and B presented together are conditioned to the absence of fear (e.g., the non-presentation of a negative US). In this case, A is a fear stimulus and B is a relief stimulus.

Third, one could use a differentiation procedure: Stimulus A is conditioned to fear, and Stimulus B is conditioned to the absence of fear. Again, A is a fear stimulus and B is a relief stimulus (for versions of this idea, see Arcediano, Ortega, & Matute, 1996; D. L. Neumann, 2007).

Differentiation paradigm. In this dissertation, a differentiation paradigm was selected for most of the experiments for several reasons.

First, the differentiation paradigm has proven successful in associating both differential affective qualities and behavioral qualities to the specific stimuli (e.g., Custers & Aarts, 2005, 2007; LoLordo, 1969; Veltkamp, Aarts, & Custers, 2009). Rescorla (1969b) went even so far to claim that "the critical operation for setting up an inhibitor is that the CS predicts the *nonoccurrence* of shock, rather than its termination" (Rescorla, 1969b, p. 260).

Second and very importantly, the differentiation paradigm allows for equality in timing parameters. This point is important because studies have shown that affective qualities of the same CS change over time (e.g., Mauro, 1988). When one compares fear and safety stimuli that are conditioned backwards to a negative US, there is always the confound of the temporal development. Andreatta and colleagues (2010; cf. Tanimoto et al., 2004) showed that even a backward conditioned fear stimulus can acquire positive affective qualities, given enough time. Further, studies by Brodscholl, Kober, and Higgins (2007) demonstrated that goal maintenance over time is specifically associated with an avoidance orientation (prevention focus), whereas goal attainment is associated with an approach orientation (promotion focus). If one compares relief stimuli and fear stimuli with different time periods, it could be, then it could be that the relief stimuli elicit or increase an avoidance orientation (goal) just because of the longer timing. The differentiation conditioning paradigm controls for this confound, because it keeps the timing parameters of the dependent variables (DV) constant. In addition, the exact mechanisms underlying the backward conditioning are not known: Long-latency (muscle) relaxation and short-latency relief processes may play an important role (e.g., Denny, 1976, 1991). The differentiation paradigm thus allows for concentrating on cognitive factors such as spreading activation and goals, rather than physiological features.

Third, the differentiation paradigm enables researchers to keep the stimulus context equal during a conditioning (or test) trial when comparing safety to fear stimuli. This point is important because studies have demonstrated that impulsive processes are influenced by contexts. Barden, Maddux, Petty, and Brewer (2004), for instance, demonstrated that impulsive racial associations differ when racial stimuli are presented in different contexts.

Finally, research has demonstrated that conditioned inhibition can be relatively weak in humans. Lipp (2006, p. 42) went even so far to state that stimulus competition learning (such as conditioned inhibition) was not reliably observed in humans so far.

Taken together, past research suggests the differentiation paradigm will be optimal for examining relief. Nevertheless, in order to establish learning outcomes, one experiment will use a combined conditioned inhibition and differentiation paradigm (see Experiment 2).

Evaluative learning. In the learning literature, there has been a recent discussion about the differentiation of expectancy learning from evaluative learning. Expectancy learning is conceptualized as relatively slow and capacity consuming, whereas evaluative learning is quicker and capacity-independent (e.g., De Houwer, Thomas, & Baeyens, 2001; Lipp, Oughton, & LeLievre, 2003; Vansteenwegen, Crombez, Baeyens, & Eelen, 1998). To date, data indicate that both learning mechanisms may occur simultaneously in conditioning set-ups, so that often they cannot be distinguished from one other in conditioning paradigms (e.g., Lipp & Purkis, 2005). To avoid the possible confounding of expectancies and time, the experiments throughout this dissertation are set up in such a way that both evaluative conditioning and expectancy-learning can occur. In addition, the learning procedures allowed for conscious processing (e.g., Purkis & Lipp, 2001).

Operationalization of reflective relief. A further issue warrants discussion: How to operationalize reflective relief that is methodologically comparable to impulsive (classically associated) relief?

A first clue comes from conditioning research: Recent studies have shown that active avoidance learning—learning during which participants can control a negative stimulus with their own behavior—is mediated by higher-order cognitions to a greater extent than by classical associative learning. Declercq and De Houwer (e.g., Declercq & De Houwer, 2009, in press; cf. Dickinson & Dawson, 1987; Lovibond, 1983, 2006) found that active avoidance learning was based on a combination of classical and operant learning. Furthermore, it was mediated by expectancies regarding whether the negative stimulus will or will not occur (cf. Lovibond's model of expectancy-mediated conditioning, Lovibond, 2006; Lovibond et al., 2007; Lovibond & Shanks, 2002). According to the RIM, these higher-order cognitions are processed by the reflective system (Strack & Deutsch, 2004).

A second line of motivation research supports the use of an active avoidance paradigm. Studies have indicated that goals (goal-relevant information) were more accessible when the goal-relevant behavior has to be executed by the person herself (e.g., Goschke & Kuhl, 1993). In addition, other research has shown that goal fulfillment led to a reduction of goal accessibility (e.g., Denzler et al., 2009; Foerster et al., 2005; Liberman et al., 2007). This means that only self-induced behaviors are associated with active goals. The active-avoidance paradigm pertains to self-induced behaviors, so this paradigm is suited to elicit goals.

Finally, goals are processed in the reflective system (Strack & Deutsch, 2004). Studies show that goal pursuit consumes mental resources (Kruglanski et al., 2002) and is closely linked to conscious processing (Bongers & Dijksterhuis, 2009), both of which are features of reflective processes.

Based on these lines of research, the reflective, goal-induced relief in the current experiments was produced via an avoidance learning paradigm (see details in the Methods section). First, this paradigm ensured that a behavioral goal was active, until the point in time when the participant had executed the US controlling behavior. Second, the avoidance learning paradigm employs the same procedural parameters as classically associated relief. For instance, during the active avoidance learning, the DV can be measured at the same stage within the trial, including: after the CS, but ahead of the US. In this way, nearly all methodological confounds between impulsive and reflective relief are avoided, the only difference being the goal: It was either active (active avoidance paradigm, named self-induced relief hereafter) or not active (named classically associated relief hereafter). Whereas self-induced relief is caused by the reflective system, classically associated relief is caused by the impulsive system.

Empirical Part

Experiment 1

Experiment 1 was designed to test the basic methodological paradigm, the conditioning procedure. The main research question was: Does the conditioning paradigm elicit relief and fear as predicted? This question is important because the conditioning paradigm served as the basic methodological paradigm for producing relief and fear for this thesis.

Experiment 1 tested an active avoidance paradigm, during which relief and fear were artificially created via a learning procedure. For this, all participants were confronted with an aversive stimulus, a negative sound that served as the US (D. L. Neumann & Waters, 2006, see below). They also experienced the CSs, which were simple geometric shapes in these experiments squares and triangles. During the learning phase in Experiment 1, the participants learnt the meaning of two CSs in relation to the US. One of the two figures predicted the occurrence of the US, its presentation was always followed by the US presentation, so it is called the *fear stimulus*. The other one of the two figures predicted the US non-occurrence (hence relief), but only if the participant—directly after the stimulus presentation—performed a specific behavior. In all experiments reported here, the participant had to push the space bar in order to control the US. If the participant did not react within a certain time frame, then the US was presented. This relief stimulus is called *self-induced relief stimulus* hereafter.

The DV was the strength of relief and happiness, indicated on rating scales. The specification of the concrete emotion of relief is important, because positive emotions are typically experienced as “rather diffuse” (Fredrickson, 1998, p. 300; for more information on how to distinguish positive emotions, see de Rivera et al., 1989; Ellsworth & Smith, 1988). If not tested, it could be argued that the stimuli used in this thesis in fact elicit happiness or other positive emotions, but not relief.

In order to further validate the conditioning paradigm, I also compared subjects’ experience on two negative emotions, fear and anger. I expected that the relief stimulus would elicit few negative emotions, particularly in contrast to fear stimuli that predict that something negative will occur. Furthermore, I expected the fear stimulus to elicit more fear (avoidance motivation) than anger (an approach emotion, e.g., Carver, 2001; Harmon-Jones & Allen, 1998; Harmon-Jones et al., 2009).

Hypotheses. Based on the conditioning literature and the definition of relief provided in the Theory section, I predict the following hypotheses:

H1.1: Relief stimuli elicit stronger relief than happiness.

H1.2: Fear stimuli elicit stronger fear than anger.

Design. The design was a 2(stimulus category: fear vs. self-induced relief) X 4(emotion rating: happiness vs. relief vs. fear vs. anger), with both variables manipulated within subjects.

Method. ***Participants.*** Seventy-five participants (61 female, 14 male) with a mean age of 23.21 years (*SD* = 4.07) took part in sessions up to three people at a time. They were students of the University of Würzburg enrolled in various majors (excluding psychology), and received € 6 as compensation.

Procedure. Upon arrival in the lab (department of social psychology of the University of Würzburg), participants were seated at one of three computers and informed that they would participate in a study about the influence of negative sound stimulation on memory and movement tasks. They were also informed that, therefore, they would listen to a very negative sound several times. Then they were asked to give their consent to participate in the study by clicking on one designated screen button with the mouse. The experiment consisted of the following phases: the US pretest, the habituation phase, the learning phase, the manipulation check, the emotion ratings, and demographic and control questions. The whole experiment took about an hour and was run via the Media Lab and Direct RT software package (© Empirisoft).

US pretest. After giving consent, participants were instructed to listen to the US and to rate the US on a scale. They were told to put on the headphones and listened to the US which took approximately 3,000 ms. Then they indicated how unpleasant the sound was by clicking on a 7-point scale from -3 (*very unpleasant*) to +3 (*very pleasant*).

Habituation phase. The US pretest was followed by the habituation phase, which consisted of pre-rating the CS, geometric shapes. Participants were instructed that it was necessary to obtain their evaluations of two figures on two scales. The two scales were presented one at a time below each shape on the screen. On two trials, a triangle stimulus appeared in the middle of the screen, on the other two trials, a square stimulus appeared at the same location. Two of the four trials contained a 9-point valence scale (ranging from 1 [*very* *disagreeable*] to 9 [*very agreeable*]) and the other three trials contained a 9-point arousal scale (ranging from 1 [*very relaxed*] to 9 [*very exciting*]). The participants indicated their judgments by pressing one of 9 designated keys (the number keys on the keyboard from 1 to 9). The order of trials was randomized.

Learning phase. After the habituation phase, participants went through the learning phase. At the beginning of the learning phase, the participants were instructed that there would be a combination of the two geometric shapes with the negative sound (the US). They were instructed to determine the effects of each geometric shape. Specifically, they were told to find out which one of the two shapes predicts the occurrence of the negative sound. One of the two shapes would always predict the negative sound (the US). The other shape would always predict that the participant could control the negative sound by immediately hitting the space bar when the geometric shape appeared on the screen. The instructions were explicit to ensure that participants really learned the associations to the stimuli, as Arcediano and colleagues (1996) found that explicitly instructed participants learned better (cf. Lovibond & Shanks, 2002).

Participants were reminded that their task was to determine which geometric shape predicted the US controllability and which one predicted the uncontrollable US occurrence. Then they were again instructed to put on the headphones (in case they had taken them off).

The learning phase consisted of 12 trials, divided into two different kinds of trials. At the beginning of each fear stimulus trial (6 trials), fixation crosses (X X X) were displayed in the center of the screen for 500 ms. Directly afterward, one of the two shapes appeared in the center of the screen, together with the presentation of the US over the headphones, which took approximately 3,000 ms. Then the next trial started.

During the trials of the self-induced relief stimulus (6 trials), the following happened: After the fixation crosses (500 ms), the geometric shape not presented in fear trials was presented for 3,000 ms. If participants pressed the space bar during the presentation of the self-induced relief geometric shape, no further stimulus occured. If they did not press the space bar within this time period, the US occured over the headphones, together with the presentation of the self-induced relief shape (3,000 ms).

The intertrial interval (ITI) of all trials was 1,000 ms and the order of the trials was randomized for each participant. In addition, the assignment of geometric shape to stimulus category (fear vs. self-induced relief) was counterbalanced between participants: Each geometric shape was assigned to each stimulus category equally often.

Expectancy rating. Immediatly after the learning phase, participants were instructed to indicate how probable they expected the US to follow each of the two geometric shapes, as recommended in the conditioning literature (e.g., Lovibond & Shanks, 2002). They were instructed to do so on a percentage scale ranging from 0 (*negative sound will definitely not appear*) to 100 (*negative sound will definitely appear*). For a similar procedure, see Lipp and Purkis (2006). Each participant rated both CS. To do so, they were presented with the geometric shapes one at a time in the center of the screen and typed in their subjective expectancy in whole numbers from 0 to 100. The order of geometric shape appearance was randomized for each participant.

Emotion ratings. The test phase consisted of rating of several emotions. Participants were instructed to indicate the strength of their feelings when they saw each geometric shape by pressing one of seven buttons.

The rating consisted of eight trials that presented one of the two geometric shapes (triangle or square) in the center of the screen. In the upper part of the screen, participants were presented with the name of a specific emotion (happiness [Freude], fear [Angst], relief [Erleichterung], anger [Ärger]). Below the geometric shape were the seven buttons of the rating scale, ranging from *not at all* (1) to *very strongly* (7). Each of the geometric shapes was presented once in combination with each of the emotions. The order of presentation was randomized.

Demographic and control questions. After other questionnaires, participants were asked to answer several demographic and control questions. They were asked to indicate their motivation during the experiment on a 5-point scale from *not at all motivated* to *strongly motivated*, if their vision was normal or corrected to normal, if they had problems with hearing, their sensitivity to noise on a 9-point scale from *extremely sensitive* to *not at all sensitive*, their gender, their age, mother tongue, study subject, semester and whether they had ever participated in an experiment like the present one before. After filling out these questions on the screen, the participants were thanked and paid.

Materials. *Unconditioned stimulus.* As US, all experiments used a very unpleasant sound created by David Neumann and colleagues (D. L. Neumann & Waters, 2006; D. L. Neumann, Waters, & Westbury, 2008). The sound was described by the authors as “an unmodulated 3 s recording of a fork scraped quickly over slate" (D. L. Neumann & Waters, 2006, p. 177; cf. Halpern, Blake, & Hillenbrand, 1986). The sound lasted about 3 seconds and was presented with a volume of maximum 80dB[7].

Conditioned stimuli. Throughout all experiments reported here, simple geometric shapes were used as CS (for similar procedures, see Lipp et al., 2003; D. L. Neumann et al., 1997). The shapes used in Experiment 1 were a triangle and a square figure. Both figures were in white and presented against a black background. All figures had a size of approximately 150 X 150 pixels and were presented as a Bitmap file on the screen during the phases (for more details see the Appendix).

Results. ***Expectancy rating.*** It was important that the participants learned the meaning of the CS. If they succeeded in learning this, they would know that the US occured more frequently after the fear stimulus (fear stimulus expectancy) than after the self-induced relief stimulus (relief stimulus expectancy). Accordingly, participants rated fear stimulus expectancy (M = 87.83%, SD = 27.71) as significantly higher than relief stimulus expectancy (M = 24.60%, SD = 32.42), $F(1,74) = 120.07$, $p < .001$, $\eta^2_p = .62$. Of the 75 participants, 62 (82.7%) rated the fear stimulus expectancy as descriptively higher than the relief stimulus expectancy, which means that these 62 participants successfully learned the meaning of the stimuli. The following analyses only include these participants.

Relief and happiness ratings. The most important analysis tested whether relief stimuli elicited stronger relief than happiness. A 2(emotion rating: relief vs. happiness) X

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[7] Sound was chosen for the experiments in this dissertation because of several advantages compared to visual or electrical stimuli: Visual stimuli elicit unconditioned reactions (UR) only inconsistently (Lipp, 2006). D. L. Neumann and Waters (2006) demonstrated that the sound employed in the current experiments elicited equal or stronger unconditioned reactions on several measures in participants as electric stimulation or loud (white) noise on several measures, including expectancy ratings, unpleasant ratings, skin conductance responses, and heart rate. Moreover, I did not expect that using the unpleasant sound would lead to negative long-term consequences, which makes using it less ethically problematic than using, for instance, very loud noise (although this argument has not been empirically verified over the long term. Using unpleasant sounds makes it easy to adjust the negativity of the US by adjusting the volume. So, if a participant with a low pain threshold experiences the same volume as more negative or even not endurable, then the experimenter always has the opportunity to adjust the volume. Finally, sound requires relatively little technical effort: only a computer and headphones.

2(stimulus category: fear vs. relief) repeated measures ANOVA was conducted on the ratings of relief and happiness.

First and most importantly, the relief and the fear stimuli differentially elicited relief and happiness, as indicated by a significant interaction of stimulus category and emotion rating, $F(1,61) = 8.73$, $p = .004$, $\eta^2_p = .13$ (see Figure 1). Second, a main effect of stimulus category emerged: $F(1,61) = 42.39$, $p < .001$, $\eta^2_p = .41$. This effect indicated that the relief stimulus ($M = 4.18$, $SD = 1.67$) elicited stronger relief and happiness ratings than the fear stimulus ($M = 2.25$, $SD = 1.33$). Third, the main effect of emotion rating was not significant, $F(1,61) = 1.94$, $p = .17$, $\eta^2_p = .03$.

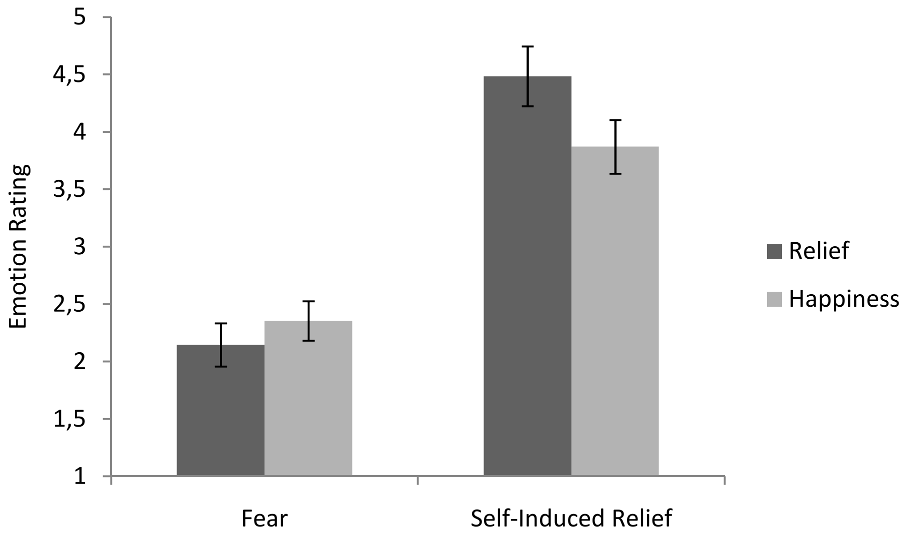


Figure 1. Emotion ratings by stimulus category and emotion rating of Experiment 1. Higher numbers indicate higher emotion ratings. Error bars indicate standard errors of the mean.

Importantly, planned comparisons show that relief stimuli elicited stronger relief ($M = 4.48$, $SD = 2.05$) than happiness ($M = 3.87$, $SD = 1.84$), $F(1,61) = 5.76$, $p = .02$, $\eta^2_p = .09$. Fear stimuli elicited happiness ($M = 2.35$, $SD = 1.34$) marginally significantly stronger than relief ($M = 2.15$, $SD = 1.48$), $F(1,61) = 2.85$, $p = .10$, $\eta^2_p = .05$. Further comparisons demonstrated that relief stimuli elicited stronger relief than fear stimuli, $F(1,61) = 44.21$, $p < .001$, $\eta^2_p = .42$. Similarly, relief elicited stronger happiness than fear stimuli, $F(1,61) = 25.46$, $p < .001$, $\eta^2_p = .29$.

Fear and anger ratings. It was also expected that fear stimuli would elicit stronger fear than anger. A 2(emotion rating: fear vs. anger) X 2(stimulus category: fear vs. relief) repeated measures ANOVA was conducted on the ratings of the specific negative emotions fear and anger.

First and most importantly, fear and relief stimuli differentially elicited fear and anger, as indicated by a significant interaction of stimulus category and emotion rating, $F(1,61) = 6.82$, $p = .01$, $\eta^2_p = .10$ (see Figure 2). Second, a main effect of stimulus meaning emerged: $F(1,61) = 28.16$, $p < .001$, $\eta^2_p = .32$, indicating that the fear stimulus ($M = 3.39$, $SD = 1.64$) was elicited stronger negative emotions, both fear and anger, than the relief stimulus ($M = 1.93$, $SD = 1.21$). Third, there was a main effect of emotion rating: $F(1,61) = 8.23$, $p = .01$, $\eta^2_p = .12$. This effect indicated that, over both stimuli, anger emotion ratings ($M = 2.89$, $SD = 1.18$) were higher than the fear emotion ratings ($M = 2.43$, $SD = 1.10$).

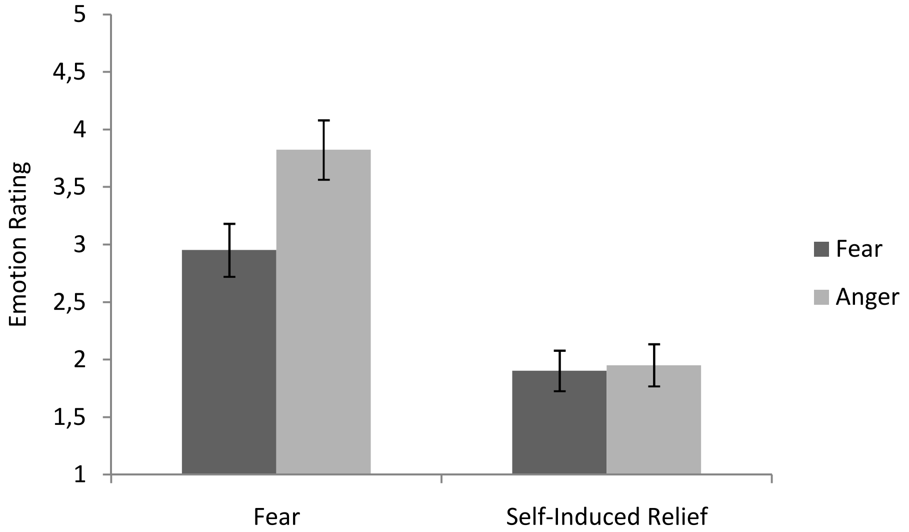


Figure 2. Emotion ratings by stimulus category and emotion rating of Experiment 1. Higher numbers indicate higher emotion ratings. Error bars indicate standard errors of the mean.

Surprisingly, planned comparisons showed that fear stimuli elicited stronger anger ($M = 3.82$, $SD = 2.04$) than fear ($M = 2.96$, $SD = 1.81$), $F(1,61) = 11.34$, $p = .001$, $\eta^2_p = .16$. Relief stimuli did not elicit a difference between fear ($M = 1.90$, $SD = 1.39$) and anger reactions ($M = 1.95$, $SD = 1.44$), $F(1,61) = 0.07$, $p = .79$, $\eta^2_p = .001$. Further contrasts showed that fear stimuli elicited stronger fear than relief stimuli, $F(1,61) = 12.27$, $p = .001$, $\eta^2_p = .17$.

Fear stimuli also elicited stronger anger than relief stimuli, $F(1,61) = 31.45$, $p < .001$, $\eta^2_p = .34$. The data indicated that fear stimuli elicited stronger anger than fear, although they elicited stronger fear than the relief stimuli.

Discussion. The data indicated that relief stimuli elicit stronger relief than happiness (H1.1). This result is particularly important, because it is more difficult to distinguish positive emotions than to distinguish negative emotions (e.g., de Rivera et al., 1989; Ellsworth & Smith, 1988; Reisenzein & Hofmann, 1993). The fact that participants indicated more relief than happiness for relief stimuli supports the validity of the present learning paradigm. It is especially important because this finding is inconsistent with the argument that the conditioning paradigm as a whole elicited a general approach orientation.

Second and somewhat surprisingly, fear stimuli elicited stronger anger than fear reactions (contradicting H1.2). This result is particularly interesting because researchers have usually assumed that anger was an approach-related (appetitive) emotion (e.g., Carver, 2001; Harmon-Jones & Allen, 1998; Harmon-Jones et al., 2009). If this reasoning is correct, then the expectation of an unpleasant sound led to approach goals in the current paradigm. This seems implausible. There is another possibility. Recent research has demonstrated that anger is connected to an avoidance motivation (e.g., Krieglmeyer, 2007), but not to an approach orientation. In the light of these studies, it is possible that the fear stimulus in the current study elicited an avoidance distance orientation, but a same time elicited an approach goal orientation, due to the controllability of obstacles. Further research is needed to verify this hypothesis. Because the theoretical issues about anger and fear are not clarified yet, the term "fear stimulus" will be kept in this thesis for the sake of consistency.

In any event, the current experiment supports the use of the active avoidance learning paradigm for examining relief. In spite of the anger and fear findings, the relief findings of Experiment 1 show that the current conditioning paradigm is very well suited to experimentally elicit relief. Learning about the relief stimulus leads to self-induced relief, so it is justified to contrast it with a fear stimulus.

This procedure is better controlled than the imagination method used by Carver (2009), and is therefore preferred in this thesis. The following experiments will use the conditioning paradigm. They will not, however, assess the specific emotions again. Rather, they will assess the affect associated with the relief and fear stimuli on a positive-negative scale, directly within the learning trial, not as a summative judgment on scales as in Experiment 1.

Experiment 2

As outlined in the Theory section, I hypothesize that relief elicits positive affective valence and an approach distance orientation. This is true for both relief that is caused by the impulsive system and for relief that is caused by the reflective system (Prediction A). The second experiment tested these two hypotheses. The hypotheses were deduced from a general two-system model of approach avoidance (RIM, Strack & Deutsch, 2004). Impulsive distance orientation (approach vs. avoidance distance orientation) is determined by affective valence: Positive valence elicits an approach, negative valence elicits an avoidance distance orientation.

Relief and fear were manipulated with the conditioning paradigm presented in Experiment 1. There was one addition to the learning paradigm, however. Experiment 2 used two different relief stimuli: the self-induced relief stimulus (as in Experiment 1), and a classically associated relief stimulus. The classically associationed relief stimulus was learned in two different ways: It was either presented alone to predict the US non-occurrence (differentiation paradigm) or it was presented together with the fear stimulus to predict the US non-occurrence (conditioned inhibition paradigm). These two different learning paradigms were used to maximize the learning effect for the classically associated relief.

Affective valence and distance orientation were assessed as DV in a blocked design. In order to test both valence and distance orientation in a parallel way—that is, at the same time during the trial and with a similar amount of directness—participants in Experiment 2 used a joystick online measure to indicate the affect associated to the CS. The participants were instructed to move the joystick as long and as intensively as they had positive or negative feelings when they saw the CS. Importantly, this valence measure was used at the exact same time within the trial procedure as the distance orientation measure. This way, timing parameters were kept constant for the different stimuli.

I tested the distance orientation to the learned stimuli with a modified version of the affective Simon task (De Houwer et al., 2001, Experiment 4). This task was chosen because research has demonstrated several advantages compared to joystick measure (Krieglmeyer & Deutsch, 2010). For instance, the manikin task is more sensitive than the joystick and the feedback-joystick task (e.g., Rinck & Becker, 2007). During the manikin task, participants have to move a manikin toward or away from a central located visual stimulus. De Houwer and colleagues (2001) found that moving toward positive words was done faster and with fewer errors than moving away from them, and vice versa for negative words. This was found even if participants reacted to another, (task-) irrelevant feature (e.g., grammatical category of words). I used a relevant-feature version of the task that asked participants to react to the stimulus category they had learned before (e.g., approach the stimulus that predicts the US occurrence). The reaction time (RT) data of the manikin task were aggregated for each stimulus category (e.g., fear, classically associated relief, self-induced relief) and each movement direction (toward the stimulus, away from the stimulus). In order to calculate an approach avoidance index, the RTs of the avoidance movements are subtracted from the approach movement RTs. Higher values of the distance orientation task indicate a stronger approach reaction.

Hypotheses. Based on the the reasoning in the Theory section, the following hypotheses were deduced:

H2.1: Relief stimuli elicit more positive affect than fear stimuli.

H2.2: Relief stimuli elicit a stronger approach distance orientation than fear stimuli.

Design. The design of the experiment was a 3(stimulus category: fear vs. classically associated relief vs. self-induced relief) X 2(measure: valence vs. distance orientation) within-subjects factor design.

Method. ***Participants.*** Fifty-six participants (40 female, 16 male) with a mean age of 23.41 years (*SD* = 3.22) took part in the experiment in sessions up to three persons at a time. They were students of the University of Würzburg enrolled in various majors (excluding psychology) and received € 6 as compensation.

Procedure. Experiment 2 consisted of the following phases: After the consent and US pretest (both identical to Experiment 1), several questionnaires followed. The following phases were run next: the habituation phase, the practice manikin task, the learning phase, the expectancy rating (manipulation check learning), the test manikin task, the valence rating (joystick online task), and demographic and control questions (identical to Experiment 1).

Habituation phase. The habituation phase in of Experiment 2 was identical to the one of Experiment 1, with the following exception: The participants rated three instead of two geometric shapes on both the valence and the arousal scale. This made a total of six trials which were presented in random order.

Practice manikin task. Then, each participant completed the practice trials of the manikin task. They were told the task would be to move a manikin either toward or away from a picture (downwards or upwards), using the arrow keys and as fast as possible.

The practice task consisted of two blocks, which were separated by specific instructions: Each block consisted of ten approach and ten avoidance trials, making a total of 40 trials. The blocks differed only in the assignment of practice figures to approach and avoidance (figure-direction assignment). In one block participants had to approach the circle and to avoid the square, while in the other block the same participant had to avoid the circle and to approach the square. The specific valid figure-direction assignment was instructed to the participants before each block (see Appendix). The order of the figure-direction assignment was counterbalanced between participants.

Each trial followed the same procedure: First, a fixation cross (+) appeared in the center of the screen. If the participant then pressed the center key of the arrow keys on the key pad (key 5), the fixation cross disappeared immediately and a manikin figure (type “standing”, see Appendix) would appear, either in the upper part or in the lower part of the screen. After 750 ms of manikin presentation, one of two practice shapes (made up of geometric shapes) appeared in the center of the screen. It stayed there until the next reaction of the participant: When she hit the correct arrow key (e.g., “up” was keypad 8; “down” was keypad 2) then the manikin (type “walking”) moved one discrete step in the indicated direction, either towards the central shape or away from the central shape. This manikin step could be repeated two times per trial, leading the manikin to further move towards the central shape or away from it. After the last correct key press, the trial ended and the next trial began (ITI: 500 ms). If the participants pressed another than the correct key, than the trial was stopped and the word “Fehler” (error) appeared in red (duration: 500 ms).

For instance, if the instruction was to approach a circle (and to avoid a square) and the manikin appeared above a circle, then the participant’s task was to hit the “down” key. If she did so, the manikin moved towards the circle, maximum three steps. Once she pressed the “up” key or another key, the trial was stopped and the error message appeared.

Two further variables were counterbalanced between participants: The place where the manikin appeared on the screen (either above or below the shape, De Houwer et al., 2001), and the assignment of the practice figure (circle and square) to either approach or avoidance. The order of the approach and avoidance blocks and the trial order within the blocks were random. After the 20 trials of the manikin practice phase, the participant saw a message that this phase was over.

Learning phase. The learning phase was identical to the learning phase of Experiment 1, with the following exceptions. First, there were three instead of two CS. The participants were told to find out which one of the three shapes would predict the occurrence of the negative sound. In addition to the fear stimulus and the self-induced relief stimulus, they also learned the meaning of a *classically associated relief stimulus*. This classically associated relief predicted that the US would not occur, independent of the participant's behavior. Again, the task was to determine the consequences of the CS (US occurrence vs. non-occurrence).

Second, the learning phase consisted of 36 trials, divided into four different kinds of trials. In the fear stimulus trials (8 trials), the following happened: At the beginning of each trial, one of the three shapes appeared in the center of the screen (together with a "plus" sign in the center of the screen). It was presented for 3,000 ms, either on the right or on the left side of the screen. Following a blank screen for 150 ms, this shape and the plus sign were again shown, together with the presentation of the US over the headphones, which took approximately 3,000 ms.

As mentioned above, the classically associated relief stimulus was learned in two different ways. In 8 trials, the geometric shape was shown alone. In these trials, it was shown on the screen (either on the right or on the left side of the center) and stayed there for 3,000 ms, without any sound (differentiation paradigm). In the other 8 trials, the fear stimulus was shown first alone for 1,500 ms, then accompanied by the classical relief stimulus for another 1,500 ms. One stimulus was shown on the right side and the other one on the left side of the screen (conditioned inhibition paradigm; order counterbalanced within each participant), These two stimuli were connected with a "plus" sign (+) in the screen center. In these trials, too, there was no sound.

The trials of the *self-induced relief stimulus* (12 trials) were identical to the ones of Experiment 1, with the only exception that they began with the presentation of the geometric shape.

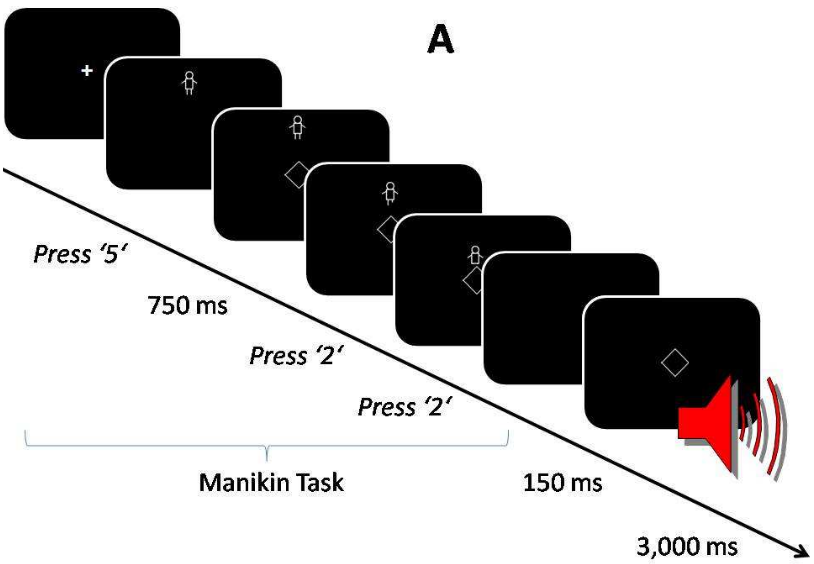
The ITI of all trials was 3,000 ms and the order of the trials was randomized for each participant. The assignment of geometric shape to stimulus category (fear vs. classically associated relief vs. self-induced relief) was balanced between the participants: each geometric shape was assigned to each stimulus category equally often.

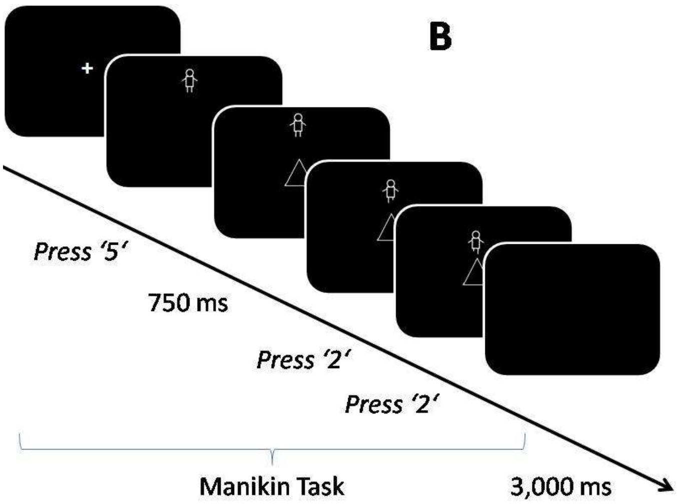
Expectancy rating. The expectancy rating was identical to the one described for Experiment 1, with the following two exceptions. First, there were three instead of two CS that were rated for US contingency, the triangle, the square, and the pentagon. Second, there were two blocks of expectancy rating for each participant with each three trials: In the first block, they indicated their US expectancy in the case that they had not pressed the space bar while presented with the geometric shape—called the *without-reaction expectancy* hereafter. In the second block, they indicated the US expectancy in the case that they had pressed the space bar while presented with the geometric shape—called the *with-reaction expectancy* hereafter.

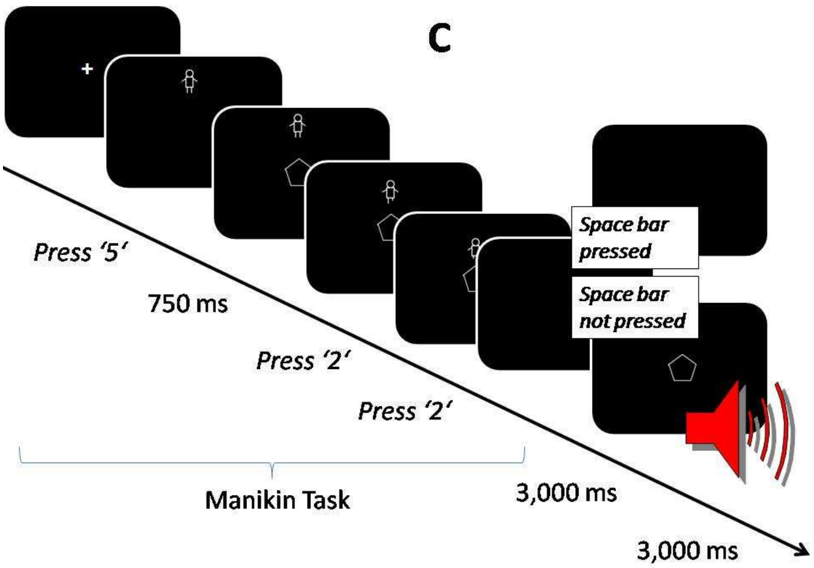
Test manikin task. The test phase consisted of the manikin test trials. This phase was similar to the practice manikin phase, but employed the CS during the manikin movement task. Participants were told that the task again would be to move a manikin either toward or away from a shape on the screen. They were told to do so depending on whether the stimulus on the screen predicted the occurrence or the non-occurrence of the negative sound (relevant feature). For instance, they had to approach the shape if they expected the US to occur (fear stimulus) and to avoid it if they expected the US not to occur (classically associated relief stimulus and self-induced relief stimulus), or vice versa.

The task consisted of two blocks, which were separated by specific instructions: Each block consisted of 12 practice trials (including four fear, four classical and four self-induced relief trials), and two series of 60 trials each (including 20 fear, 20 classical and 20 self-induced relief trials), making a total of 2 blocks X (12 + 60 + 60) trials = 264 trials. The two blocks differed only in the assignment of CS to movement direction (stimulus-direction assignment). In one block participants had to move toward the stimulus that predicted the US occurrence (the fear stimulus) and to move away from the stimuli that predicted the US non-occurrence (both relief stimuli), while in the other block the same participant had to move away from the fear stimulus and to move toward the relief stimuli. This assignment was instructed to the participants before each block. The order of the figure-direction assignment was counterbalanced between the participants.

The procedure within each trial was identical to the one described for the manikin practice trials (see above), with the following exceptions: First, after the last correct key press, the trial did not end, but was followed by stimulus-specific events: On the fear trials, the last correct key press was directly followed by a blank screen for 150 ms, which was followed by the fear stimulus which was presented together with the US (3,000 ms). After the US and fear stimulus presentation, a blank screen was shown for 3,000 ms (see Figure 3 A). On the classically associated relief trial, the last correct key press was directly followed by a blank screen for 3,000 ms, and no other stimuli (see Figure 3 B). On the self-induced relief trials, the last correct key press was directly followed by a 3,000 ms period during which participants could avoid the US occurrence. If they pressed the space bar during this 3,000 ms period at least once, the US did not occur and a 3,000 ms blank screen appeared, with no other stimulation. If the participant did not press the space bar during the 3,000 ms period, the self-induced relief stimulus re-appeared on the screen, presented together with the US (headphones, 3,000 ms). These stimuli were then replaced by a blank screen for 3,000 ms. The ITI for all stimuli and trials was 500 ms (see Figure 3 C).







Figures 3 A (previous page), 3 B, and 3 C. Sequence of events in the distance orientation task in Experiment 2: the fear trial (Figure A), the classically associated relief trial (Figure B), and the self-induced relief trial (Figure C).

Second, as in the manikin practice trials, two variables were counterbalanced between participants: the place where the manikin appeared on the screen (either above or below the figure), and the assignment of the geometric shapes (square, triangle, pentagon) to the fear, classical and self-induced relief stimuli. The order of the approach and avoidance blocks and the trial order within the trial series of each block were randomized. The sessions were separated by a short break. After the 264 trials of the manikin test phase, the participant saw a message that this phase was over and were asked to proceed.

Valence rating. The valence rating consisted of an online affect measure, during which the participants used an attached joystick (Attack 3 by Logitech). The procedure is judged to be superior to postexperimental summative affect ratings by the conditioning literature. Lipp and Purkis (2006), for instance, argued that the summative ratings rather reflect valence integration than the current valence (e.g., Lipp et al., 2003, Experiment 1, found differences between summative and online valence ratings especially for relief stimuli).

Participants were told that their task was to indicate their feelings when they saw the geometric shapes. They were told to push the joystick lever away from themselves if they experienced negative feelings, and to pull the joystick lever towards themselves if they experienced positive feelings. The stronger the positive or negative feelings, the stronger and the longer they were told to push or pull the joystick.

The task consisted of nine trials (three trials for each stimulus category), which looked the same: After fixation crosses (X X X) shown for 500 ms, one geometric shape appeared in the center of the screen. From the onset of this stimulus presentation on, participants could move the joystick lever in either direction. After 3,000 ms, the shape disappeared and the ITI followed. There was no other stimulation during the task. The ITI duration was changed within each stimulus category trial: It was 3,000 ms, 4,000 ms, or 5,000 ms, with each duration assigned to one trial of each stimulus category. Order of stimulus category and ITI duration were randomized for each participant. The valence rating was directly followed by an additional valence and arousal mood ratings as during the habituation phase.

Materials. The manikin figure consisted of several white lines on a black background, which made a simple human-like figure (see Appendix) similar to the one used by De Houwer and colleagues (2001), and Krieglmeyer and colleagues (e.g., Krieglmeyer & Deutsch, 2010; Krieglmeyer et al., 2010). The manikin had a size of approximately 75 pixels (wide) X 108 pixels (high). There were three versions of the manikin: The “standing” type had equally long legs; one leg of the two “walking” types was longer than the other leg (either the right or the left leg).

The geometric shapes used in the manikin practice task were similar to the ones used in the manikin test phase, but not the same. The practice shapes were a white circle and a white square (standing on one side, to avoid confusions with the square used in the test phase), each in approximately 165 X 165 pixels size.

Data preparation. *Valence rating.* For the valence rating data, the position of the peak reactions was analyzed, that means the point of lever movement with the largest distance to the resting midpoint of the lever. This strongest reaction that the participant fulfilled during the reaction window data indicates the strength of affect. The data are scaled from 1 (most extreme position towards the participant, *positive feeling*) to 100 (most extreme position away from the participant, *negative feeling*). The discrete data points of each stimulus category within each participant were integrated by calculating means over these data. Then, they were *z* transformed within the measure to ensure comparability to the distance orientation data.

Manikin task. After excluding false reactions (n = 3559, 6.5 %), I subtracted the stimulus presentation time from the reaction time (RT). Only the RTs of the first manikin step were included. The resulting final RT includes the time from the CS offset to the first manikin. These data were strongly skewed and therefore logarithmized within each participant and within each stimulus category (Ratcliff, 1993). The approach avoidance index was calculated by subtracting the RTs of the avoidance movement trials from the RTs of the approach movement trials: $RT_{avoidance} - RT_{approach}$. Finally the resulting data were *z* standardized over all participants within the measure, to ensure comparability to the valence data.

Results. ***Expectancy rating.*** A 3(stimulus meaning: fear vs. classical relief vs. self-induced relief) X 2(expectancy reaction: with reaction vs. without reaction) repeated measures ANOVA of the US expectancy ratings was conducted. First and most importantly, this analysis revealed a significant interaction between stimulus meaning and expectancy reaction, $F(2,54) = 13.85$, $p < .001$, $\eta^2_p = .34$. The analysis further revealed a significant main effect of stimulus meaning, $F(2,54) = 68.16$, $p < .001$, $\eta^2_p = .72$. Participants rated the US expectancy after both the classical relief stimuli ($M = 11.89$, $SD = 27.95$), $p < .001$, and the self-induced relief stimuli ($M = 46.42$, $SD = 43.01$), $p < .001$, as lower than after the fear stimuli ($M = 77.79$, $SD = 32.01$). Participants also rated the US expectancy after the classical relief stimuli as lower than after the self-induced relief stimuli, $p < .001$. Further, there was a significant main effect of expectancy reaction, $F(2,54) = 21.47$, $p < .001$, $\eta^2_p = .28$. Participants rated the US expectancy higher for the without-reaction expectancy ($M = 53.07$, $SD = 43.76$) than for the with-reaction expectancy ($M = 37.67$, $SD = 43.05$).

Planned comparisons showed that there was a significant difference between the with- vs. without-reaction expectancies only in the self-induced relief, $F(1,55) = 30.10$, $p < .001$, $\eta^2_p = .35$. The without-reaction expectancy for the self-induced relief ($M = 67.25$, $SD = 38.88$) was higher than the with-reaction expectancy for the self-induced relief ($M = 25.59$, $SD = 36.58$). There was no such difference for the fear stimuli, $F(2,54) = 0.07$, $p = .79$, $\eta^2_p = .001$ (without-reaction expectancy: $M = 77.11$, $SD = 33.45$; with-reaction expectancy: $M = 78.48$, $SD = 30.80$), and there was also no difference for the classically associated relief stimuli, $F(2,54) = 2.11$, $p = .15$, $\eta^2_p = .04$ (without-reaction expectancy: $M = 14.84$, $SD = 30.03$; with-reaction expectancy: $M = 8.95$, $SD = 25.63$).

These data show that the participants in mean learned the meanings of the stimuli and specifically the possibility to control the US after self-induced relief stimuli. For the experiment, however, it was specifically important that the participants learned that they could control the US—when the self-induced relief stimulus was presented—if, and only if, they pushed the space bar. I calculated an index in order to ensure that only the successful learners were analyzed. I subtracted the with-reaction expectancy from the without-reaction expectancy, resulting in an index that indicates how effective participants thought pressing the space bar would be for controlling the unwanted US (called *reaction index* hereafter). The higher the value, the more effective they thought pressing their reaction (pressing the space bar) would be, i.e. the less probable the US. In mean, the index was $M = 41.66$ ($SD = 56.83$, range = 199). These data show that there was a wide range of how successful the participants were in learning. Of the 56 participants, 38 (67.9%) had a positive space bar index, that means these 38 participants successfully learned the meaning of pressing the space bar, and therefore only these 38 participants are included in the following analyses.

Valence and distance orientation. A 2(measures: valence vs. distance orientation) X 3(stimulus category: fear vs. classical relief vs. self-induced relief) repeated measures ANOVA was conducted on the joystick valenc measure and on the manikin task.

First and most importantly, there was a significant main effect of stimulus category, $F(2,36) = 16.56$, $p < .001$, $\eta^2_p = .48$. Fear stimuli, on both measures ($M = -0.55$, $SD = 0.89$), had lower values, that means, lower less positive valence and a weaker approach distance orientation, than classical relief ($M = 0.49$, $SD = 0.89$), $p < .001$, and than self-induced relief ($M = 0.06$, $SD = 0.94$), $p = .001$ (see Figure 4). Surprisingly, there was also a significant difference between the two relief stimuli, $p = .004$.

Second, the different stimuli elicited different valence and distance orientations, as indicated by a significant interaction of Measure X Stimulus Category, $F(2,36) = 5.16$, $p = .01$, $\eta^2_p = .23$.

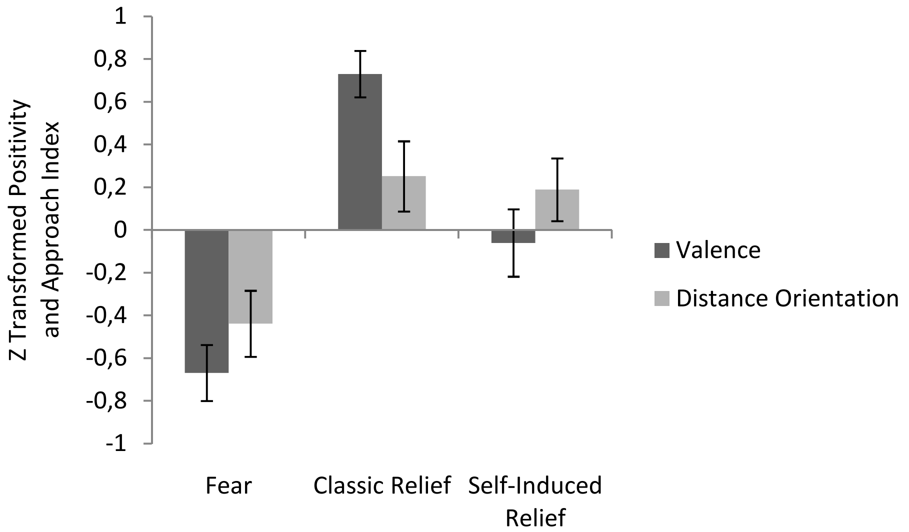


Figure 4. Valence and distance orientation by stimulus category and measure of Experiment 2. Higher numbers indicate more positive valence and stronger approach distance orientation. Error bars indicate standard errors of the mean.

Planned comparisons between both relief stimuli, taken together, and the fear stimulus, show that both relief stimuli (classical relief: $M = 0.73$, $SD = 0.67$; self-induced relief: $M = -0.06$, $SD = 0.97$) elicited more positive valence than the fear stimulus ($M = -0.67$, $SD = 0.81$), $F(1,37) = 37.54$, $p < .001$, $\eta^2_p = .50$ (H2.1). Interestingly, the classical relief stimuli elicited even more positive valence than the self-induced relief stimulus, $F(1,37) = 14.02$, $p = .001$, $\eta^2_p = .28$.

Similar to the valence data, on the distance orientation measure, both relief stimuli (classically associated relief: $M = 0.25$, $SD = 1.01$; self-induced relief: $M = 0.19$, $SD = 0.90$) elicited a stronger approach distance orientation than the fear stimulus ($M = -0.44$, $SD = 0.95$), $F(1,37) = 5.14$, $p = .03$, $\eta^2_p = .12$ (H2.2). For the distance orientation measure, there was no difference between the two relief stimuli, $F(1,37) = 0.35$, $p = .56$, $\eta^2_p = .01$.

Further planned comparisons revealed that there were no differences between the valence and distance orientation data for the fear stimuli, $F(1,37) = 1.17$, $p = .29$, $\eta^2_p = .03$, nor for the self-induced relief stimuli, $F(1,37) = 1.39$, $p = .25$, $\eta^2_p = .04$. The only significant difference between the two measures was found for the classical relief stimuli: The positive valence associated with these stimuli was stronger than their approach distance orientation, $F(1,37) = 6.16$, $p = .02$, $\eta^2_p = .14$.

Discussion. The hypotheses are supported by the data. Both relief stimuli elicited more positive affect than the fear stimulus (H2.1) and at the same time elicited stronger approach distance orientation reactions (H2.2). These results indicate that distance orientation indeed follows the valence principle, as stated by R. Neumann and Strack (2003) and in the RIM (Strack & Deutsch, 2004). Positively valenced relief stimuli elicit an approach distance orientation in an impulsive system. This finding is important because the alternative prediction—that relief elicits an avoidance orientation—was not supported by the current findings. For instance, Carver's (2009) theory predicts that relief would be associated with the "lower-level" system's avoidance system (BIS).

Interestingly, the classically associated relief stimuli elicited stronger positive valence than the self-induced relief stimuli. This effect was not expected and could be explained by various mechanisms:

First, the results could have been influenced by learning success. As expectancy rating shows, self-induced relief was more difficult to learn; probably the participants learned the classical relief stimuli to a higher degree, which could have caused the difference in valence. Interestingly, this reasoning is supported by an analysis of the valence associated to the two relief stimuli. When splitting up the sample by the median of the reaction index (*Md* = 100), a 2(relief type: classical vs. self-induced) X 2(learning success: above average vs. below average) repeated measures ANOVA on the valence data was conducted. This analysis replicated the main effect of relief type, $F(1,37) = 16.30$, $p < .001$, $\eta^2_p = .31$: Classically associated relief elicited more positive valence than self-induced relief. There was, however, a trend towards an interaction between relief type and learning success, $F(1,37) = 2.66$, $p = .11$, $\eta^2_p = .07$, indicating that the difference between the two relief stimuli was stronger in the bad learners, $F(1,37) = 15.15$, $p = .001$, $\eta^2_p = .50$; than in the good learners (reaction index = 100), $F(1,37) = 3.24$, $p = .09$, $\eta^2_p = .13$. Interestingly, also in those participants who fully learned that pressing the space bar reduced the US probability to zero—these are the participants who thought that both relief stimuli led to the same outcome—classical relief stimuli elicited marginally significant stronger affect than self-induced relief stimuli.

Second, the different numbers of pairings of the relief types could have caused the different valences. During the learning phase, classical relief stimuli were presented 16 times with the US non-occurrence, whereas self-induced relief stimuli were presented 12 times. The additional positive valence could have been caused by the more frequent exposure (mere exposure effect, e.g., Zajonc, 1968), as discussed already in the Theory section.

Third, the valence measure used in the current study was probably not sensitive enough. Participants in the study either pulled or pushed a joystick lever to indicate how strong positive or negative feelings they had. Studies have shown that approach movements on joystick measures are specifically associated to positive valence, and avoidance movements are associated to negative valence (e.g., Chen & Bargh, 1999). The valence-movement association could have led participants to interpret the affect measure as an approach avoidance measure. If so, the reactions on the joystick task cannot be interpreted as valence reactions, but rather as approach avoidance reactions. In this case, it was important which movement they interpreted to be the approach movement and which one they interpreted to be the avoid movement. Two factors have been shown to influence this interpretation: the label connected to the movement (e.g., pushing the joystick as “approach” versus pulling the joystick as “approach”, e.g., Eder & Rothermund, 2008) and the reference participants should use when moving the joystick (e.g., themselves or the monitor, e.g., Seibt, Neumann, Nussinson, & Strack, 2008). In the current study neither a label nor a reference point were given to the participants, so it is likely that may have been differences between participants in how to interpret these movements. If the participants have interpreted the joystick measure as an approach avoidance measure, the difference between the two relief stimuli could have been caused by a conflict between two goals (e.g., Kruglanski et al., 2002): The first goal to react to the joystick measure, the second goal to react with the space bar. As the latter goal was only active in the self-induced relief situation, it may have reduced the capacity to react to the first goal of reacting with the joystick. So it is likely that the react-with-space-bar goal reduced the intensity of the first goal and thus led to the weaker reaction on the joystick measure. This reasoning, however, is speculation at this time and so, in order to avoid the difficulties, the following experiments employed a different valence measure, which has proven to be reliable and valid in independent studies, the affect misattribution procedure (AMP, Payne et al., 2005; Payne, Govorun, & Arbuckle, 2007). With the AMP, the problems possibly resulting out of goal conflicts were minimized, as it requires participants to press one of two keys, and not to move a lever. The AMP is also assumed to be less direct, more indirect (“implicit”). As studies showed, other indirect valence measures were already successfully employed in conditioning studies (e.g., affective priming, e.g., Derryberry, 1988; Hermans, Baeyens, & Eelen, 2003; Hermans, Baeyens, Lamote, Spruyt, & Eelen, 2005; Hermans, Vansteenwegen, Crombez, Baeyens, & Eelen, 2002; Olson & Fazio, 2002; and the Implicit Association Test, IAT, Mitchell, Anderson, & Lovibond, 2003).

Experiment 3

The third experiment was designed to replicate the finding that relief elicits positive valence and an approach distance orientation. For this purpose, classically associated relief stimuli were tested.

Two larger differences were made in comparison to Experiment 2. In order to reduce the possibly confounding effect of presentation number in the conditioned inhibition paradigm (see Discussion section of Experiment 2), Experiment 3 used a differentiation paradigm. Furthermore, given that the valence measure used in Experiment 2—the joystick rating—was difficult to interpret, Exeriment 3 employed a different valence measure, the AMP (Payne et al., 2005). The AMP was run directly after the presentation of the learned stimulus, but before the actual consequences of the learned stimulus (US or no US). Again, I hypothesized that relief stimuli would elicit more positive affect than fear stimuli.

Furthermore, I tested the distance orientation that participants would associate to the CS. As in Experiment 1, participants fulfilled the manikin procedure proposed by De Houwer and colleagues (2001). The manikin task, as in Experiment 2, was run at the same time within one trial as the AMP.

Hypotheses. The following hypotheses were deduced from the general model. It was hypothesized in the Theory section that the distance orientation in the impulsive system (Strack & Deutsch, 2004) was determined by affective valence. Relief, operationalized as a conditioned stimulus that predicts the non-occurrence of a negative US, was hypothesized to elicit positive affect and thus to elicit an approach distance orientation.

H3.1: Classically associated relief stimuli elicit stronger positive valence than fear stimuli.

H3.2: Classically associated relief stimuli elicit a stronger approach distance orientation than fear stimuli.

Design. The design of the experiment was a 2(measure: AMP vs. distance orientation) X 2(stimulus category: fear vs. classically associated relief) within-subjects design.

Method. ***Participants.*** Thirty-eight participants (27 female, 11 male) with a mean age of 23.37 years (SD = 5.99) took part in the experiment in sessions up to three persons at a time. They were students of the University of Würzburg enrolled in various majors (excluding psychology) and received € 6 as compensation.

Procedure. The experiment basically consisted of the same phases as Experiment 2. After the consent and US rating (both identical to Experiment 2), several questionnaires followed. They were followed by the habituation phase, the learning phase, the expectancy rating (manipulation check), the valence measure (the AMP, Payne et al., 2005), the manikin task and the demographic and control questionnaire (identical to Experiment 1). The differences to the procedure in Experiment 2 are described in the following paragraphs.

Habituation phase. Different to Experiment 2, Experiment 3 included only two stimulus categories: fear and classically associated relief. Accordingly, only two geometric shapes were used: a triangle (as in Experiment 2) and a square (standing on one side). The stimulus pretest therefore consisted of the ratings of these two shapes. Both shapes were rated twice, once on a valence scale and once on an arousal scale. The other features of this task were identical to the one in Experiment 2.

Learning phase. The learning phase was identical to the learning phase in Experiment 2, with the following exceptions: First, there were two kinds of trials with six trials each: one fear trial and one classically associated relief trial. Second, there were only differentiation trials for the classically associated relief stimuli. There was always one geometric shape presented at one time on the screen, either the fear or the classically associated relief stimulus. These stimuli were always presented in the center of the screen, and there was no plus sign. Third, the sequence of events within one trial was slightly changed: Each trial began with the presentation of fixation crosses (X X X) for 500 ms in the center of the screen. The crosses were directly followed by the presentation of the corresponding geometric shape for 3,000 ms. Thus the fear stimulus was presented together with the US, and the classically associated relief stimulus was presented by its own. The ITI was 1,000 ms for all trials.

Affect misattribution procedure. Because of the problems associated to the valence measure used in Experiment 2, Experiment 3 used the AMP by Payne and colleagues (2005).

Participants were told that their task was to evaluate Chinese ideographs by pressing one of two keys. They had to indicate if they evaluated the ideograph as either above-average pleasurable or below-average pleasurable. The order of events during the AMP trials was explained to them in detail (see Appendix).

The AMP consisted of 20 trials, ten fear stimulus and ten relief stimulus trials. Each trial had the same sequence: After fixation crosses (+ + +) had been presented in the center of the screen for 500 ms, the CS (either the triangle or the square) appeared at the center for 175 ms. A blank screen followed for 25 ms. Immediately after the blank screen, a Chinese ideograph (Payne et al., 2005) was presented at the center for 100 ms. Together with the ideograph, the labels of the two keys were presented in the respective corners of the screen (left Control key: below average pleasant; right Control key: above-average pleasant). Participants then hit either the right key or the left key, without any time restrictions.

The following events depended on the stimulus category that was shown during a specific trial: In a fear trial, immediately after the participant's reaction, there was a 500 ms blank screen, followed by the presentation of the US over the headphones (3,000 ms; see Figure 5). In a relief trial, the participant's reaction ended the specific trial, without any further stimulation. The ITI for all AMP trials was 1,000 ms.

The Chinese ideographs were randomly taken out of a list of 218 Chinese ideographs prepared by Keith Payne, without replacement. The order of the fear and relief trials presentation was randomized for each participant.

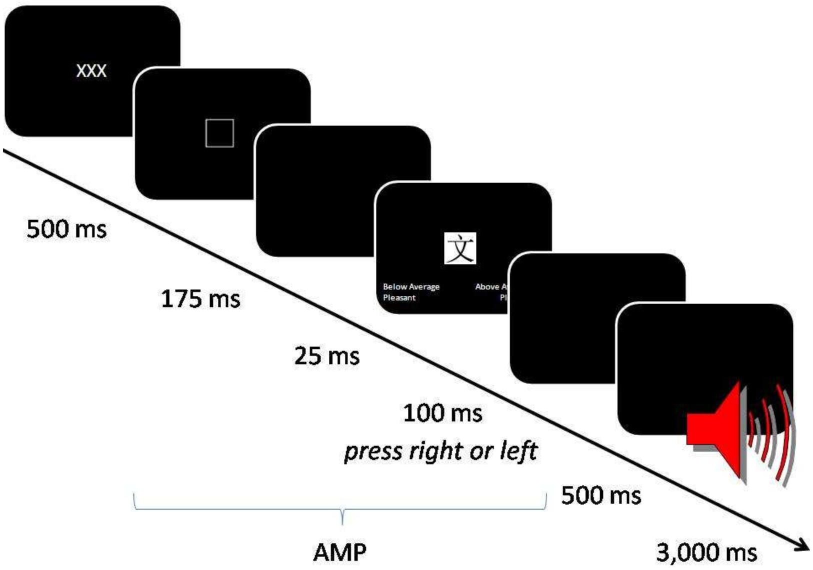


Figure 5. Sequence of events in the AMP in Experiment 3: the fear trial.

Manikin task. The manikin task was identical to the test phase in Experiment 2, with the following exceptions: Instead of separate practice and test phases, there was only one test phase that included the practice trials.

The manikin task followed this order: After the instruction for the practice trials (identical to Experiment 2), the participants practiced the movement of the manikin towards or away from the practice stimuli. These practice stimuli were made up of a circle and a hexagon geometric shape. There were 20 practice trials for each of the practice stimulus-direction assignment.

After the first 20 trials of practice, the participants were instructed to execute the task of moving the manikin in dependence on what the CS predicted (the manikin test block). In one specific block, participants either had to approach the stimulus that predicted the US occurrence (fear) and to avoid the stimulus that predicted the US non-occurrence (relief) or vice versa. There were 40 manikin test trials within each manikin test block. The test trials were identical to the test trials in Experiment 1, with two exceptions: First, there were only 40 test trials in each of the two blocks (80 test trials in total), including 20 fear and 20 relief stimulus trials in each block. Second, each trial followed a slightly different sequence: The trial started with the presentation of the CS in the center of the screen for 1,000 ms. Immediately afterwards, a fixation cross (+) appeared on the screen until the participant pressed the center key on the key pad (5). The key press led to the presentation of one CS (either the square or the triangle), which stayed on the screen for 750 ms. Immediately after this 750 ms period, the first manikin figure (“standing type”) appeared either in the upper or in the lower part of the screen. The next manikin steps were identical to the procedure described for Experiment 1. In each fear trial, after the last correct key press (manikin step), each fear trial, the US was presented over the headphones (3,000 ms). There was no such stimulation in relief trials. The ITI was 500 ms, and the order of CS was randomized for each participant.

After the first test block, the participants again practiced the manikin movement with the practice stimuli (20 trials), but this time in reversed order (e.g., approach the circle and avoid the hexagon in the first practice block, then avoid the circle and approach the hexagon in the second practice block).

After the second practice block, participants fulfilled the second test block, which changed the assignment of stimulus category to movement direction. An example: If the participant, in the first test block, had to move toward the fear stimulus and to move away from the relief stimulus, then she had to move away from the fear stimulus and to move toward the relief stimulus in the second test block (or vice versa).

Data preparation. *AMP.* For the analyses of the AMP data, I calculated the proportion of above-average pleasant responses of all responses within one stimulus category, separately for each stimulus category and each participant. This proportion is an index of the positivity elicited by the stimuli (e.g., Deutsch et al., 2009; Payne et al., 2005). The index was then z standardized for the comparison with distance orientation.

Manikin task. The manikin test data were prepared in the same way as in Experiment 2 (false reactions $n = 265$, 5.9% of all reactions).

Results. ***Expectancy rating.*** As in Experiment 2, participants indicated the probability with which they expected the US to occur given the presence of specific CS. Again, I first tested whether the learning procedure was successful. Participants rated the US expectancy following fear stimuli ($M = 89.42\%$, $SD = 25.96$) as significantly higher than the US expectancy following relief stimuli ($M = 10.11\%$, $SD = 26.06$), $F(1,37) = 113.66$, $p < .001$, $\eta^2_p = .75$. These data indicate that the participants learned the meanings of the stimuli, particularly the difference between the fear and the relief stimuli. Of the 38 participants in the original sample, 33 (86.8%) rated the expectancy after a fear stimulus as descriptively higher than after a relief stimulus, so they were success in learning and are included in the following analyses.

Valence and distance orientation. A 2(measures: valence vs. distance orientation) X 2(stimulus category: fear vs. classically associated relief) repeated measures ANOVA was conducted on the AMP and manikin task.

First and most importantly, there was a significant main effect of stimulus meaning, $F(1,32) = 7.73$, $p = .01$, $\eta^2_p = .19$ (see Figure 6). Fear stimuli, on both measures ($M = -0.26$, $SD = 0.99$), had lower values than classically associated relief ($M = 0.26$, $SD = 0.94$). Importantly, there was also no interaction of Measure X Stimulus Category: $F(1,32) = 0.00$, $p = .99$, indicating that the affect and the distance orientation measure reacted to the CS in the same way. Due to the z standardization, the main effect of measure was not significant, $F(1,32) = 0.00$.

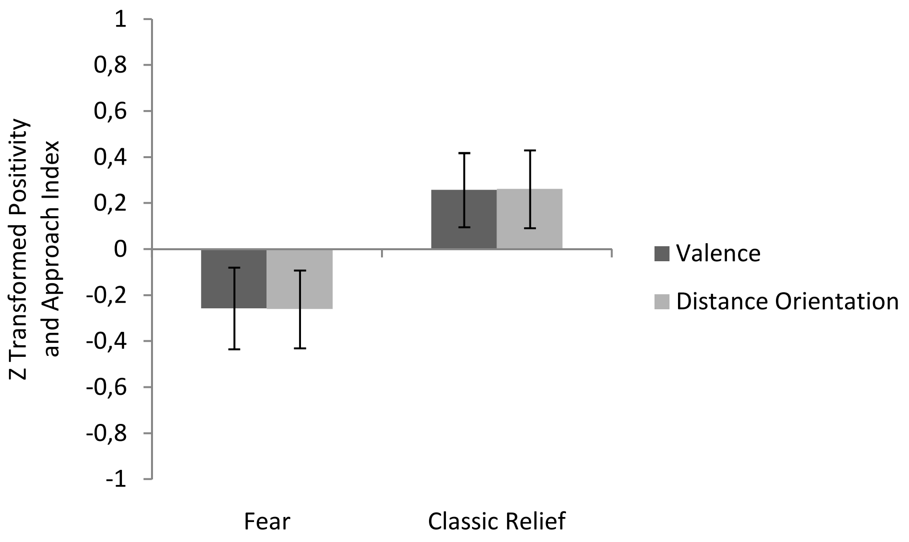


Figure 6. Valence and distance orientation by stimulus category and measure of Experiment 3. Higher numbers indicate more positive valence and stronger approach distance orientation. Error bars indicate standard errors of the mean.

Planned comparisons indicated that the relief stimuli (*M* = 0.26, *SD* = 0.92) elicited marginally significant more positive valence than the fear stimulus (*M* = -0.26, *SD* = 1.02), $F(1,32) = 2.99$, $p = .094$, $\eta^2_p = .09$ (H2.1). Similar to the valence data, on the distance orientation data, the relief stimuli (*M* = 0.26, *SD* = 0.97) elicited a marginally significant stronger approach than the fear stimulus (*M* = -0.26, *SD* = 0.97), $F(1,32) = 3.36$, $p = .076$, $\eta^2_p = .10$ (H2.2). Further comparisons between the valence and the distance orientation data were not significant, due to the *z* standardization, all *F*s = 0.00, all *p*s =.99.

Discussion. Both hypotheses were supported. The classically associated relief stimuli elicited more positive valence than the fear stimulus (H3.1). This was found also on the new valence measure, the AMP. At the same time relief elicited a stronger approach distance orientation (H3.2). This experiment thus replicates the finding of Experiment 2, but with a changed conditioning procedure (differentiation paradigm) and with another valence measure (the AMP). So it is neither the conditioning procedure nor the valence measure used in Experiment 2 that produced the effects in that experiment.

Again, one can conclude that it is correct to assume that distance orientation in the impulsive system (Strack & Deutsch, 2004) is determined by the affective valence. Relief stimuli that are positively valenced elicit an approach distance orientation. The predictions of an alternative approach avoidance theory, Carver's (2009) theory, are not supported. Following his theory, one would predict that relief, because it is an emotion of an avoidance process, would elicit an avoidance orientation on the "lower-level" system. The present data show that this is not the case: On an impulsive system, relief, as a positive emotion, elicits an approach orientation.

Experiment 4

The fourth experiment was designed to assess the distance orientation elicited by self-induced relief. The experiment was a partial replication of Experiment 2. There were two qualifications in comparison to Experiment 2.

First, Experiment 4 tested if the amount of affect affected distance orientation. Therefore, the affect connected to the US non-occurrence was manipulated. The operationalization was based on the reasoning that the temporal change of valenced states strongly influences affective valence (e.g., Russell, 2003). For instance, the change from a neutral to a positive state leads to positive affect; but the same positive affect can be elicited by a change from a negative to a neutral state. The change of affective states over time, not the absolute values themselves, determine affective valence. Applying this idea to relief, half of the participants in Experiment 4 started every trial from a neutral state, such as the participants in all other experiments (called the *neutral stimulation group*). These participants were assumed to experience positive affect (relief), as indicated by Experiments 1 to 3. The other half of the participants received a negative stimulation from the beginning of each trial on and they could reach the same relief state as the first half (no US; called the *negative stimulation group*). For these latter participants, obtaining relief meant a stronger affective change (from negative to neutral) which should lead to stronger positive affect. For the neutral stimulation group, obtaining relief meant a weaker affective change (from neutral [negative expected] to neutral) which should lead to less positive affect. As reasoned in the Theory section, more positive affective valence should elicit stronger approach distance orientation.

Second, Experiment 4 controlled for a factor that was confounded in the previous experiments, the general behavioral activation (to press the space bar). Gray's (e.g., 1987) and Carver's (e.g., 2001, 2003) theories imply that an approach orientation is specifically connected to a general activation system—see the term "behavioral activation system" (e.g., Carver, 2001). These theories imply that approach distance orientation can be caused by a general behavioral activation. The present experiment excluded this possibility by comparing effects of two stimuli that were presented together on the screen. In the active avoidance paradigm, one stimulus was always present on the screen, so that participants could get the impression that this stimulus predicted the US controllability (by pressing the space bar in all trials). This stimulus is called the *subjectively valid relief cue* throughout this experiment (for an instructed fear version of this idea, see Olsson & Phelps, 2004; Phelps et al., 2001). Thereby, Experiment 4 kept the general activation constant—because participants could control the US in every trial—and specifically tested the prediction that self-induced *relief* stimuli elicit an approach distance orientation, and not every stimulus that is connected to a behavioral activation.

Hypotheses. Based on the reasoning above, the following hypotheses were deduced and put to test in Experiment 4.

H4.1: Negative stimulation leads to stronger approach distance orientation than neutral stimulation.

H4.2: Subjectively valid relief cues elicit a stronger approach distance orientation than subjectively invalid relief cues.

Design. The design of the experiment was a 2(subjective cue validity: subjectively valid cue vs. invalid cue) X 2(relief situation: negative stimulation vs. no stimulation), with the first factor varied within subjects and the second factor varied between subjects.

Method. ***Participants.*** Fifty participants (40 female, 10 male) with a mean age of 23.78 years (*SD* = 5.10) took part in the experiment in sessions up to three persons at a time. They were students of the University of Würzburg enrolled in different majors (excluding psychology) and received € 6 as compensation.

Procedure. The experiment basically consisted of the same phases as Experiments 2 and 3. After the consent and the US pretest rating (identical to Experiment 1), all participants fulfilled the habituation phase, then the practice manikin task, the learning phase, the expectancy rating (manipulation check), the test manikin task, and finally, after other questionnaires, the demographic and control questionnaire (identical to Experiment 2).

Habituation phase. The habituation phase was identical to Experiment 2, with the only difference that the geometric shapes used were a circle instead of a pentagon and a square which stood on a line, instead of a square which stood on a corner. The triangle was the same shape as in Experiment 2.

Practice manikin task. The manikin practice phase was identical to the manikin practice phase of Experiment 2, with the following exceptions:

First, instead of reacting to different geometric shapes, the participants reacted to two differently colored pentagon shapes, which were a white-lined shape, filled with blue or yellow color, and which were presented in the center of the screen. Second, there were two blocks with 20 practice trials each, separated by differential instructions. The order of the assignment of color to movement direction was counterbalanced between participants (e.g., half the participants approached the blue circle and avoided the yellow circle in the first block, and then avoided the blue circle and approached the yellow circle in the second block; and vice versa).

Learning phase. The learning phase of Experiment 4 was different to the ones in Experiments 1 to 3. The most obvious difference was that in every trial, two instead of one geometric shape were present on the screen.

At the beginning of the learning phase, participants were instructed that during this phase, they would see two of the three geometric shapes on the screen one at a time. They were told that one of the three shapes gave them the possibility to control the negative sound (the US) by pressing the space bar press (the *subjectively valid relief cue*), and that the other two shapes did not influence the sound (the *subjectively invalid cues*). Their task was to determine which one of the three shapes predicted the controllability of the negative sound and to keep this in mind. Then they were again instructed to put up the headphones (in case they had taken them off before) and to use their non-dominant hand to press the space bar.

The learning phase consisted of two blocks with 20 trials each. Each block showed the combination of two different geometric shapes. Each trial contained the valid relief cue, which was shown together with one of the invalid cues (20 trials with one shape, 20 trials with the other shape).

The sequence of each trial for the neutral stimulation group was as follows: At the beginning of each trial, participants were presented with fixation crosses (X X X) in the center of the screen for 500 ms. Immediately after the fixation crosses, the valid and one of the two invalid relief cues appeared on the screen, one left of the center of the screen, the other one right to the center of the screen, both on the same vertical position. Both shapes stayed on the screen together for 3,000 ms. The following events during the trial procedure depended on the behavioral reaction by the participant: If she reacted with at least one space bar press within the 3,000 ms, then the ITI of 3,000 ms followed (successful US control). If the participant had not reacted with a space bar press within the presentation of the geometric shapes, then the participant was presented the US over the headphones (3,000 ms), followed by the ITI of 3,000 ms (unsuccessful US control).

The sequence of each trial in the learning phase for the negative stimulation group was identical to the neutral stimulation group, with one difference. At the beginning of each trial, at the onset of the fixation crosses (500 ms duration), the US was presented over the headphones. This first US presentation lasted for 3,000 ms and also accompanied the presentation of the two geometric shapes. The participant's reaction on the space bar then hindered the US to appear once again.

The geometric shapes were randomly assigned to the stimulus categories (valid vs. invalid cues). The order of appearance (right vs. left to the center of the screen) of the geometric shapes was random.

Expectancy rating. The expectancy rating was the same as in Experiment 2, with the following differences: First, there were two blocks with six trials each. In the first block, participants were instructed to indicate their without-reaction expectancy (when they had not pressed the space bar). In the second block, they indicated the with-reaction expectancy (when they had pressed the space bar). Second, during each block, all six possible combinations of the three geometric shapes were shown at one time on the screen. Two shapes were presented together on the screen (right and left to the screen center). The order of the presentation of the stimuli combinations was randomized for each participant.

Test manikin task. The test phase was identical to the tasks used in Experiment 3, with the following differences. First, there were always two geometric shapes on the screen (one right and one left to the screen center). Second, the manikin appeared above or below one of the two geometric shapes, so either above or below the shape on the right, or above or below the shape on the left side. Third, participants had to move the manikin depending on which side the manikin appeared. The task-relevant feature was the cue validity: In one condition, participants were instructed to *move towards* the shape if the manikin appeared near (above or below) the subjectively *valid* relief cue. These same participants were instructed to *move away from* the shape if the manikin appeared near the subjectively *invalid* cue. In the other condition, this assignment was reversed. Fourth, there were two blocks with one of these assignments each. Fifth, each block consisted of eight practice trials in the beginning and four identical sessions with 32 test trials each, summing up to 128 test trials in each block. During each session, the manikin appeared above or below the subjectively invalid relief cue in 16 trials and above or below the subjectively valid relief cue in the other 16 trials. This location of the manikin (above or below the shape), and the order of the presented geometric shapes were random.

The trial sequence for the neutral stimulation group was as follows: With the onset of the fixation cross (+), the participant could start the manikin task by pressing the key. Immediately after this key press the manikin appeared (either above or below either the subjectively valid or invalid cue). The correct key presses (keys 2 or 8 on the keypad) led to "steps" of the manikin either toward or away from the stimulus. After the last correct key press, the participants had 3,000 ms period to control the appearance or the re-appearance of the US. The ITI was 500 ms.

The trial sequence for the negative stimulation group was identical to the other group, with one difference: Each trial started with the presentation of the US over the headphones (3,000 ms). The US onset was followed by the fixation cross and the sequence described for the other group.

Data preparation. The manikin test data were prepared in the same way as in Experiment 3 (false reactions n = 1454, 10.3% of all reactions).

Results. ***Expectancy rating.*** In this experiment, participants learned the distinction between subjectively valid relief and invalid cues, that is, between stimuli that predicted relief, and stimuli that did not predict relief. In mean, there was a trend that participants rated combinations of one valid relief cue and one invalid relief cue (US expectancy: M = 33.39%, SD = 42.45) as safer than combinations of two invalid relief cues (US expectancy: M = 47.26%, SD = 46.27), $F(1,49) = 2.47$, $p = .12$, $\eta^2_p = .05$. Of the 50 participants, 39 (78.0%) rated the US contingency of stimulus combinations including the valid relief cue as equally high or lower than the contingency of stimulus combinations not including the subjectively valid relief cue. This criterion—US expectancy for subjectively valid cues not higher than for subjectively invalid cues—is called the *liberal learning criterion* hereafter. By contrast, only 21 of the 50 participants (42.0%) rated the contingency of combinations including the subjectively valid cue as lower than the contingency of combinations not including the subjectively valid cue. This criterion—US expectancy for subjectively valid cues as lower than for subjectively invalid cues—is named *conservative learning criterion* hereafter. Because the conservative learning criterion was met by less than half of participants, the following analyses were done with the participants fulfilling the liberal learning criterion (n = 39), thereby including those participants who assigned the same expectancy to subjectively valid and invalid cue combinations.

Distance orientation. First and most importantly, a 2(subjective cue validity: valid cue vs. invalid cue) X 2(relief situation: negative stimulation vs. no stimulation) mixed model ANOVA on the distance orientation data revealed a marginally significant effect of relief situation, $F(1,37) = 3.23$, $p = .08$, $\eta^2_p = .05$, indicating that participants in the negative stimulation group ($M = 0.08$, $SD = 0.37$) had a stronger approach distance orientation than the participants in the neutral stimulation group ($M = -0.07$, $SD = 0.28$).

Second, the analysis revealed a significant main effect of subjective cue validity, $F(1,37) = 8.79$, $p = .005$, $\eta^2_p = .19$. As predicted, subjectively valid relief cues elicited a stronger approach distance orientation ($M = 0.42$, $SD = 0.93$) than subjectively invalid relief cues ($M = -0.42$, $SD = 0.90$). Furthermore, there was no interaction between subjective cue validity and relief situation: $F(1,37) = 1.13$, $p = .29$, $\eta^2_p = .03$, indicating that the subjective relief validity did not lead to differential distance orientations depending on the affect induced.

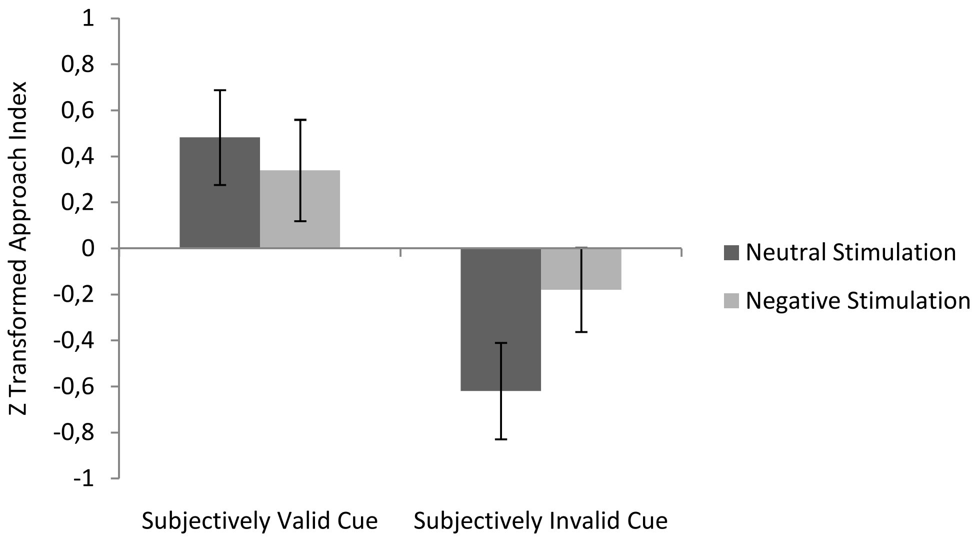


Figure 7. Distance orientation by subjective relief validity and relief situation of Experiment 4. Higher numbers indicate stronger approach distance orientation. Error bars indicate standard errors of the mean.

Planned comparisons indicated that the subjective valid and invalid cues differed in the neutral stimulation group (subjectively valid relief cue: $M = 0.48$, $SD = 0.95$; subjectively invalid cue: M = -0.62, SD = 0.96), $F(1,20) = 7.69$, $p = .012$, $\eta^2_p = .28$. There was a trend towards this difference in the negative stimulation group (subjectively valid relief cue: M = 0.34, SD = 0.93; subjectively invalid relief cue: M = -0.18, SD = 0.78), $F(1,17) = 2.02$, $p = .17$, $\eta^2_p = .11$. Further comparisons showed that the two groups did not differ with respect to subjectively invalid relief cues, $F(1,38) = 2.42$, $p = .13$, $\eta^2_p = .06$, nor valid relief cues, $F(1,38) = 0.22$, $p = .64$, $\eta^2_p = .01$[8].

Discussion. The hypotheses of Experiment 4 were supported: Negative stimulation in the beginning of each test trial led to a marginally stronger approach distance orientation than a neutral stimulation (H4.1), and subjectively valid relief cues elicited a stronger approach distance orientation than subjectively invalid cues (H4.2).

The first result (H4.1) demonstrates the influence of associatively learning positive affect on distance orientation. This mechanism has already been indicated by Experiments 2 and 3. These experiments demonstrated that even relief that does not require reflective processing—i.e. relief that is classically associated in an impulsive system—elicits an approach distance orientation. The associative learning hypothesis is further supported by the effect of the negative stimulation on distance orientation in Experiment 4. If individuals experience a strong shift in the direction of positive affect (here: negative stimulation to no stimulation), then they approach the relief stimulus with greater intensity. This effect, too, is likely mediated by the classical association of positive affect to the CS. In addition, it underlines the importance of states change for affect. Although from an absolute point of view, the neutral end state (no negative stimulation) was the same for both groups, it is not from a relative point of view: In relation to the starting point (negative stimulation) obtaining relief is highly positive. This change aspect (starting point vs. end point) has to be focused on in future studies on affect.

The second result (H4.2) implies that it is not the general activation that causes the approach distance orientation of self-induced relief stimuli. An alternative interpretation of

[8] When adopting the conservative learning criterion for the participant selection, there again was a main effect of subjective cue validity in the same direction as the one reported, $F(1,19) = 12.43$, $p = .002$, $\eta^2_p = .40$; but there was also a significant interaction of subjective cue validity X relief situation, $F(1,19) = 9.26$, $p = .007$, $\eta^2_p = .33$. This interaction indicated that the subjective cue validity effect was only significant in the negative-stimulation participants, $F(1,8) = 18.19$, $p = .003$, $\eta^2_p = .69$, but not in the neutral-stimulation participants, $F(1,11) = 0.14$, $p = .72$, $\eta^2_p = .01$. Given the very small subsample, I prefer to interpret only the two main effects.

this result could be based on cognitive expectancies. As Declercq and De Houwer and Lovibond have argued, active avoidance behavior is mediated by higher-order cognitions (e.g., Declercq & De Houwer, 2009, in press; Lovibond, 1983, 2006). One could argue that the higher-order cognitions have been activated by the intention to control the US. The present experiment, however, does not allow a decision between the RIM (Strack & Deutsch, 2004) and De Houwer and colleagues' expectation account, because it did not manipulate the expectations independent of the active goal.

There are, however, two methodological issues that can be criticized in this experiment:

First, it is clear from the current findings that many participants did not learn the contingencies of the stimuli. This fact may be due to the learning procedure used in this experiment. While in all other experiments there was at least one stimulus that led to the presentation of the negative US (the fear stimulus), the present experiment employed only relief stimuli that required reactions. As stated above, there was no *objective* differential prediction of US controllability (relief) by the three different cues, so that the use of an objective difference in relief prediction contingencies could eliminate this problem. This procedure, however, would introduce the confounding variable of behavioral activation into the study: Objectively valid relief cues would elicit a behavioral activation (pushing the space bar), whereas objectively invalid relief cues would not lead elicit a behavioral activation. Still, some participants believed that it was the subjectively valid cue that led to relief, but not the two subjectively invalid cues. Importantly, these participants approached the *subjectively* valid relief cue stronger than the *subjectively* invalid cues. This finding indicates that the actual experience of relief may not be necessary for the approach distance orientiation, thereby extending the instructed fear findings by Phelps and colleagues (e.g., Olsson & Phelps, 2004; Phelps et al., 2001). Still, one may criticize that this interpretation is based on data from a small subsample of the current sample. It could be that the effect was caused not by the subjective validity of relief prediction, but by other factors, one of which (mere exposure) is discussed below. The current data do not allow to rejecting this alternative interpretation, but call for the closer investigation into the factors that influence the subjective validity in predictive learning.

In addition, there were always two stimuli present at one given time. The participants not only had to find out which stimulus was causally responsible for relief, but they also had to do this while they were processing two stimuli at a time. And this learning had to be done while participants feared—or actually experienced, in the negative stimulation condition—the negative US. It could be that these features of the procedure distracted participants so that they did not learn the distinction between the valid and the invalid cues (for the distraction of attention by threatening stimuli, see Öhman, Flykt, & Esteves, 2001).

Second, the experiment was designed so that the valid relief stimuli were presented twice as often as the invalid stimuli, both during the learning and the test phase. It is likely that the stronger exposure of the valid relief cues has caused these stimuli to attract more positive valence than the invalid cues (mere exposure effect, e.g., Harmon-Jones & Allen, 2007; Zajonc, 1968). As studies by Harmon-Jones and Allen (2001) show, the mere exposure effect is mediated in part by affect. This additional positive affect of the valid cue may have caused their stronger approach distance orientation. This mere exposure explanation cannot be ruled out at the moment, because there was no differential valence measurement of discrete stimuli during the experiment. In order to rule out this alternative explanation, I recommend future researchers to replicate Experiment 4 with an improved learning procedure (e.g., more learning trials or learning ad criterion procedure), to use two instead of one (subjectively) valid relief cues, and to assess affect to specific singular, not combined, stimuli, with the affect misattribution procedure (AMP; Payne et al., 2005).

Experiment 5

The experiments discussed so far have shown that relief elicits approach on an impulsive, distance orientation level of processing (Strack & Deutsch, 2004). This approach orientation is elicited both by classically associated relief stimuli (Experiments 2 and 3), and by self-induced relief stimuli (Experiments 2 and 4).

It is still unclear, however, what orientation relief elicits on a reflective, goal orientation level (Strack & Deutsch, 2004). Several theories imply that relief belongs to an avoidance process (e.g., Carver, 2001, 2009; Higgins, 1997). As was argued in the Theory section, there are two boundary conditions on this proposition: First, relief has to be caused by an active avoidance behavior (called *self-induced relief* here). Second, the relief state has to be uncertain (called *uncertain self-induced relief*). The first boundary condition is tested in Experiment 5, the second in Experiments 6 and 7.

It is important that the theory predicted an influence of self-induced relief states only on goal orientation. Self-induced relief requires that the individual forms an intention (to control or end the negative stimulation), and that she reacts adequately to the circumstances. These processes take place in a reflective system (Strack & Deutsch, 2004). Therefore, self-induced relief should affect measures that assess the reflective goal system, but not measures that assess the impulsive distance orientation. As Experiment 2 demonstrated, there was no difference between classically associated and self-induced relief stimuli on distance orientation. The theory does also not predict an influence of classically associated relief on goal orientation. This proposition was tested in Experiment 5. It contrasted classically associated relief with the fear stimulus which does not—according to the theory—elicit a goal orientation. The hypothesis was that there is no difference in goal orientation between fear and classically associated relief.

The conditioning paradigm used in the previously discussed experiments elicited short-termed affective states. On a theoretical basis, this timing is no problem for the impulsive distance orientations—impulsive processes are supposed to be quick, reflex-like (Strack & Deutsch, 2004). For the reflective goal orientation, however, this operationalization of relief can be problematic. Goals are typically described as reflective processes that require time (e.g., Strack & Deutsch, 2004, p. 225). Usually, goals are assessed by self-report ratings. Because of the time these ratings usually require, they are, however, are not suited to assess the short-termed, phasic states elicited with the present conditioning method.

Which alternative, indirect methods are available in order to assess goals? To date, some researchers have used indirect goal measures that assess longer-lasting, tonic goals. For instance, the anagram task used by Foerster (1998) required participants to solve anagrams with which they could either gain points or prevent losing points (see, for an overview of motivation measures, Mayer, Faber, & Xu, 2007). Other research, however, demonstrated that quickly activated goals can influence goal-induced valence (e.g., Ferguson, 2007; Moors & De Houwer, 2001; Moors et al., 2005). Thus, goals can be elicited in a phasic paradigm.

The present experiments combined the gaining- versus not-losing-points idea by Foerster with the phasic nature of goals in a goal compatibility manner. This task will be called *goal task* hereafter. In the goal task, participants could either gain points (or not gain points) in one trial and lose points (or not lose points) in another trial. As known from independent research, the information of gaining points elicits a short approach goal and the information of losing points elicits a short avoidance goal (e.g., Markman et al., 2007, p. 138). In addition, the gain versus lose point information also elicits the respective affect (e.g., Foerster et al., 1998; Moors & De Houwer, 2001).

In the current experiments, the goal task induced phasic secondary goals by giving participants the opportunity to gain points or to not lose points. This secondary goal was either congruent or incongruent to the primary goal—which was elicited by the relief stimulus. If the two goal orientations—the primary goal of relief and the secondary goal of the points task—were congruent, the primary goal facilitated the execution of secondary goal behavior. Shorter reaction times (RTs) in the goal task would be the consequence of this compatibility. If the two goals were incongruent, the primary goal would inhibit the execution of the secondary goal's behavior (a phenomenon called goal shielding, see Kruglanski & Kopetz, 2009; Shah et al., 2002). If this reasoning is correct, then the resulting RT of the secondary, point task behavior indicates which primary goal orientation is stronger at a given moment: approach or avoidance. If RTs are shorter when participants try to gain points than when they try to not lose points, this indicates a stronger approach goal for this person. If RTs are shorter for the not-losing-points-trials, this indicates a stronger avoidance goal.

The logic of the task can be illustrated with the following example: Imagine that a person has a strong approach goal, e.g., because she is hungry and is confronted with a chocolate cake: She has the goal to eat the cake. During this state of hunger she fulfills the goal task, which requires her to gain points in some trials, and to not lose points in other trials. The task-induced secondary approach goal (gaining points) is congruent to her eating goal (approach) and thus she will execute the congruent reactions (gain points) faster than the incongruent reactions (not lose points).

The goal task can be described as an indirect measure of stimulus-consequence compatibility (with a manipulation of the relevant S-R compatibility, e.g., De Houwer, 2003a, 2006, 2009). The compatibility between the stimulus presented and the consequence of the trial is supposed to influence the ease (speed, error-proneness) of executing the secondary, task-induced goal-fulfilling behavior. As De Houwer (e.g., 2009) stated, this classification does not say anything about the properties of the to-be-measured construct, the goals. The present theory states that they are processed by a reflective system, although they can be elicited quickly (see above).

To sum up, the present experiment tested the hypothesis that classically associated relief did not differ from fear on goal orientation. This assumption was tested with a newly developed goal compatibility task that elicits phasic secondary goals that are either congruent or incongruent to the prevailing primary goal elicited by relief or fear. However, the same classically associated relief was expected to elicit positive affect when compared to fear (see Experiments 2 and 3).

Hypotheses. I deduced the following hypotheses for valence and goal orientation of classically associated relief.

H5.1: Classically associated relief stimuli elicit a stronger positive affect than fear stimuli.

H5.2: Classically associated relief stimuli elicit the same goal orientation as fear stimuli.

Design. In order to increase the power of the significance testing, three separate experiments were run. The combined data of these three experiments are reported here, always including Experiment as a between-subjects factor, in order to account for systematic variation between the different experiments. The design of Experiment 5 is a 3(experiment: A vs. B vs. C) X 2(measure: valence vs. goal orientation) X 2(stimulus category: fear vs. classically associated relief), with Experiment varied between participants and the other two factors varied within participants.

Method. ***Participants.*** One hundred twenty-three participants (87 female, 36 male) took part in one of three small experiments (experiment A: n = 38; experiment B: n = 44;

experiment C: $n = 41$), in sessions up to three persons at one time. They had a mean age of 24.31 years ($SD = 4.81$). They were students of the University of Würzburg enrolled in various majors (excluding psychology) and received € 6 as compensation.

Procedure. The three experiments consisted of the same phases as Experiment 3. They started with the consent and the US rating (both identical to Experiment 2). The following phases were run next: the habituation phase (identical to Experiment 3), the learning phase (identical to Experiment 3), the expectancy rating (identical to Experiment 3), the AMP (identical to Experiment 3), an additional stimulus rating (only in Experiments B and C), the goal task and the demographic and control questionnaire (identical to Experiment 3). The differences to the procedure in Experiment 3 are described in the following paragraphs.

Goal task. The goal task was introduced to participants as a game during which they could earn points that would be rewarded with additional presents after the experiment.

The task consisted of two blocks which each contained one practice session and one test session. The participants were told that their task was to move a manikin over the screen, and thereby earn as many points as possible, while losing as few points as possible. They reacted dependent on whether they could earn points or whether they could lose points in one specific trial. They learned that two colors, blue and yellow coded if they could gain or lose points (on the motivational meaning of colors, see Elliot et al., 2007; Mehta & Zhu, 2009). They were also told which colors coded the two possibilities—for instance, blue indicated “you can gain points” and yellow indicated “you can lose points”, and vice versa.

Importantly, the secondary task-elicited goal was manipulated independently of the manikin movement. This way, the task allowed for the specific calculation of an approach avoidance goal index. This index was independent from the actual manikin movement (which was used for the distance orientation assessment in Experiments 2-4). Each participant completed all four combinations of movement (approach vs. avoidance) and goal direction (gaining vs. losing points): In one block, they moved toward the stimulus in order to gain points and away from it in order to prevent losing points; in the other block, they moved away from the stimulus in order to gain points and toward it in order to prevent losing points. Each participant fulfilled the same amount of trials of each of these combinations (e.g., 10 practice trials approaching in order to gain points, 10 practice trials avoiding in order to not lose points in the first block; and 10 practice trials avoiding in order to not lose points, 10 practice trials avoiding in order to gain points in the second block).

Each block started with a practice session during which the participants learned the meaning of the colors. For instance, blue meant gain points and yellow meant lose points, or vice versa. They were told to react depending on this gain versus lose point information: For instance, if they saw the color that meant gain points (in the screen center), they had to move the manikin toward this color. Likewise, if they saw the lose points color, they had to move away from the color. Each of the two practice sessions consisted of 20 trials: 10 “gain points” and 10 “lose points” trials. Each trial followed this sequence: From the onset of a fixation cross (+) on, participants could press the key 5 on the key pad. If they did so, a blue or yellow shape (for the exact stimuli, see below) appeared in the center of the screen. After 750 ms, an additional manikin figure (type “standing”) appeared either above or below the circle. Then the participant could move the manikin either toward or away from the colored shape by pressing the keys 2 (down) or 8 (up; identical to the procedure in the manikin task in Experiment 2). After the last correct key press, the last manikin figure (walking “type”) appeared for 500 ms. A correctly fulfilled “gain point” trial was followed by the text message “Plus 10 points” presented on the screen; there was no such information for correctly fulfilled “lose points” trials. In case of incorrect key presses during a “gain point” trial, the participants received the text message “Error!”; in case of an incorrect key press during a “lose point” trial, participants received the text message “Error! Minus 10 points!” (1500 ms) immediately after the incorrect key press. Then the next trial started. The ITI was 500 ms and the gain versus lose points trials as well as the location of the manikin in relation to the center colored circle (above or below) was presented in random order.

After each practice session, one test session followed. Before starting the test sessions, the participants were instructed that in addition to the task they just completed, they would react to the geometric shapes previously learned (the CS). Each of the test sessions consisted of 40 trials (20 fear and 20 classically associated relief trials, of which each 10 were gain points trials and 10 were lose points trials). The test trials had the following sequence (see Figure 8):

Each trial started with the presentation of the fear or relief CS (triangle or square figure) in the center of the screen for 1,000 ms. Immediately after that period, the fixation cross (+) appeared and from its onset on the participants could press the key 5. Immediately after the participant’s reaction, the blue or yellow shape appeared in the screen center (Experiments 5A and 5B) or the fear or relief stimulus turned either blue or yellow (Experiment 5C). The colored shape stayed on the screen for 750 ms and was followed by the appearance of a manikin figure (standing "type"), either above or below the center stimulus. The participant then could move the manikin downwards or upwards by pressing one of two designated keys (2 or 8), as described for the practice session. The last events of each trial depended on the kind of trial (gain vs. lose points), the CS that had been presented in the beginning of each trial (fear vs. classically associated relief) and the correctness of the key reaction during the trial:

Correct key presses: In case of a fear gain point trial—when the fear stimulus had been presented in the beginning of a trial and the participants could gain points in that trial— the last correct key press led to the message "Plus 10 points!" on the screen (1,500 ms), followed by the presentation of the fear stimulus (500 ms) and then the presentation of the US (3,000 ms). In case of a fear lose point trial, the last correct key press led immediately to the fear stimulus (500 ms) and then the US (3,000 ms). In case of a relief trial, the last correct key press led to the same consequences as in fear trials, with the only difference that the trials did not present the US.

Incorrect key presses: If the participant pressed the wrong keys in any lose point trial, she received the message "Error! Minus 10 points!" (1,500 ms) immediately after the incorrect key press. This error message was either followed by the US (in fear trials) or was not followed by any other stimuli (in relief trials). If the participant pressed the wrong keys in any gain point trial, she received a text message "Error!" (1,500 ms). After each error message—and after the US in fear trials—the next trial started. The ITI of all trials was 500 ms.

The gain versus lose points trials, the fear versus classically associated relief trials and the location of the manikin in relation to the center stimulus (above or below) were presented in random order.

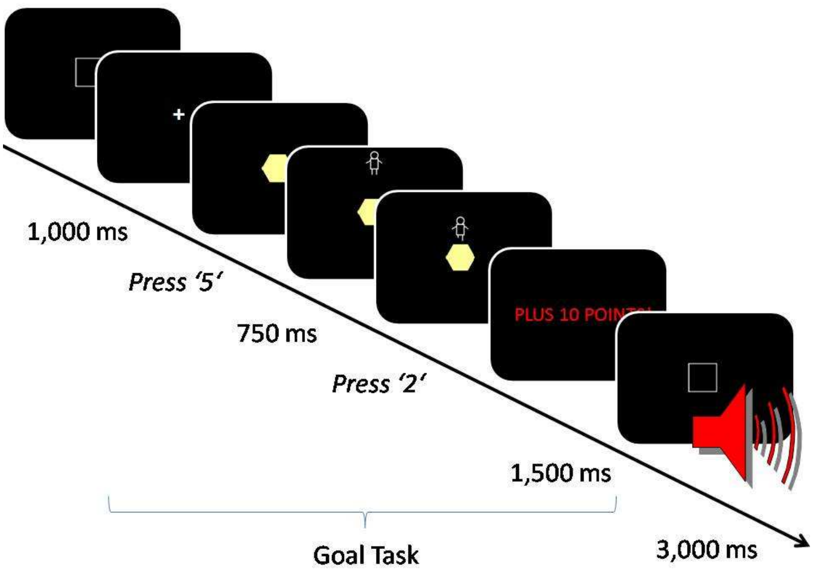


Figure 8. Sequence of events in the goal task in Experiment 5: the fear gaining-points trial.

Materials. The stimuli used in these experiments were the same as in Experiment 3, with one exception: The shapes that were used as color cues for the gain versus lose points information were blue and yellow rectangles (Experiments A and B, 150 X 125 pixels) or blue and yellow circles (Experiment C, 200 X 200 pixels).

Data preparation. For the goal task, the same data preparation steps were done as for the manikin task in Experiments 1-3 (false reactions: n = 716, 3.7%), including the logarithmization of the RT data. Other than in Experiments 2-4, I calculated an approach avoidance goal index: The RTs of the avoidance goal trials ("lose points") were subtracted from the RT of the approach goal trials ("gain points"): $RT_{avoidancegoal} - RT_{approachgoal}$. In this way, the data were collapsed over the concrete movements (toward the stimulus or away from the stimulus). Finally the resulting data were z standardized over all participants within the measure, to ensure the comparability to AMP data.

Results. ***Expectancy rating.*** As in the previous experiments, participants indicated the US expectancy after the CS. Again, it was first tested if the participants successfully learned the meaning of the CS, i.e. whether the conditioning procedure was successful. A 2(stimulus category: fear vs. classically associated relief) X 3(experiment: A vs. B vs. C) repeated measures ANOVA on the goal task and AMP data was conducted.

The analysis revealed a main effect of stimulus category, $F(1,120) = 1331.44$, $p < .001$, $\eta^2_p = .92$. Over the three experiments, participants rated the fear stimulus expectancy ($M = 96.55\%$, $SD = 15.71$) as higher than the relief stimulus expectancy ($M = 3.80\%$, $SD = 16.85$). There was no significant main effect of experiment, $F(1,120) = 2.45$, $p = .09$, $\eta^2_p = .04$, nor an interaction effect, $F(1,120) = 0.44$, $p = .65$, $\eta^2_p = .01$. These data show that the participants in all three experiments learned the meaning of the stimuli. Of the 123 participants, 118 (95.9%) rated the US expectancy after the fear stimulus as higher than the US expectancy after the relief stimulus, which is why the following analyses include only these participants.

Valence and goal orientation. The AMP and the goal task data were analyzed with a 3(experiment: A vs. B vs. C) X 2(measure: valence vs. goal orientation) X 2(stimulus category: fear vs. classically associated relief) mixed model ANOVA with Experiment varied between subjects and the other factors varied within subjects.

Most importantly, there was a two-way interaction of Measure X Stimulus Category, $F(1,115) = 3.75$, $p = .055$, $\eta^2_p = .03$ (see Figure 9). Further, the ANOVA revealed no significant main effects of either stimulus category, $F(1,115) = 2.74$, $p = .10$, $\eta^2_p = .02$, nor measure, $F(1,115) = 0.02$, $p = .89$, $\eta^2_p < .01$. No other effect was significant, all Fs < 2, all ps > .15 (see Appendix).

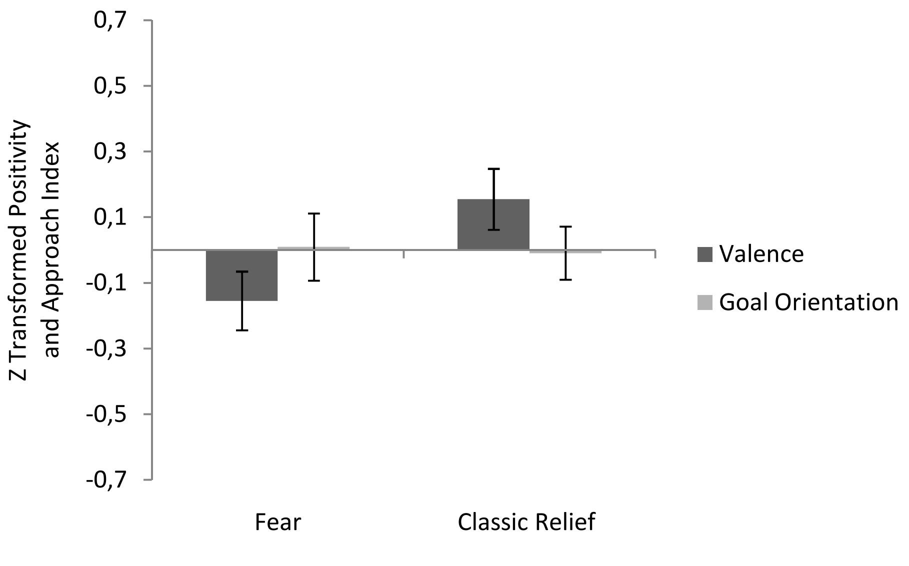


Figure 9. Valence and goal orientation by stimulus category and measure of Experiment 5. Higher numbers indicate more positive valence and stronger approach goal orientation. Error bars indicate standard errors of the mean.

Planned comparisons for the AMP and the goal task data indicated that classically associated relief (*M* = 0.15, *SD* = 1.01) elicited stronger positive valence than fear on the AMP (*M* = -0.15, *SD* = 0.97), $F(1,115) = 5.60$, $p = .02$, $\eta^2_p = .05$. On goal orientation, however, relief (*M* = -0.01, *SD* = 0.88) and fear (*M* = 0.01, *SD* = 1.11) did not differ, $F(1,115) = 0.04$, $p = .84$, $\eta^2_p < .01$. Further comparisons showed that the two measures did not differ for the fear stimulus, $F(1,115) = 1.78$, $p = .19$, $\eta^2_p = .02$, nor for the relief stimulus, $F(1,115) = 1.53$, $p = .22$, $\eta^2_p = .01$.

Discussion. Both hypotheses were supported. There was no difference between fear and classically associated relief with respect to goal orientation (H5.2), but there was a significant difference between the two with respect to valence: Classically associated relief elicited a stronger positive affect than fear (H5.1).

Given the high number of participants in this experiment, it is unlikely that the null-finding for the goal orientation was caused by low statistical power. One can conclude that classically associated relief does not elicit a specific goal orientation, although these stimuli elicit positive affect (this experiment) and a stronger approach distance orientation (Experiments 2-3). The RIM (Strack & Deutsch, 2004) predicts that effects on goal orientation should only be found if there is an active intention (uncertain self-induced relief), but not if there is no active intention (classically associated relief). The latter idea is supported by Experiment 5; the former hypothesis is tested in Experiments 6 and 7.

Experiment 6

Experiment 5 confirmed the hypothesis that classically associated relief elicits no specific goal orientation. Experiment 6 tested if uncertain self-induced relief stimuli elicit an avoidance goal orientation. This proposition can be derived from the principle of the "default system" embedded in the RIM. The reflective system is only active if there is motivation and capacity for its functioning (Strack & Deutsch, 2004, p. 223). If relief can be obtained with certainty, that means if the individual is definitely sure that she can obtain relief with her behavior, then there is no motivation for reflective functioning. This certainty can be obtained after several repetitions of the same situation, e.g. after the learning of relief-eliciting behaviors (operant conditioning). If the indivual is certain, then eventually the impulsive system will process stimuli and behavior, and the reflective system will be less involved[9]. This reasoning implies that there will be only strong reflective goal activity if relief is obtained with an uncertain subjective probability, i.e. if relief is uncertain. Only in this case—uncertain self-induced relief—should the reflective system activate an avoidance goal. In all other cases—if self-induced relief is certain or if relief is not caused by one's own behavior—there will be no avoidance goal orientation.

Experiments 6 operationalized the subjective certainty of relief with a memory manipulation. One can assume that if people have to memorize the stimulus, they will be less certain about the outcome (for research on how working memory activity reduces memory retrieval, see Anderson, Reder, & Lebiere, 1996). Some of the participants had to memorize the stimulus throughout a goal task trial, whereas the other participants did not have to memorize it. Therefore, there were two versions of the goal task. In one condition (Experiment 6A), the participants saw the CS only in the beginning of the trial, later it was replaced by the colored stimulus. In this condition (the *memorize condition*, Experiment 6A), participants had to remember the stimulus throughout the whole trial. Memorizing the CS was important because participants had to decide if pressing the space bar would lead to relief or the negative sound at the end of each trial. In the other condition (the *no-memorize condition,* Experiment 6B) participants did not have to remember the stimulus, but could rely on the

[9] However, if the preparation or the execution of behavior is highly complex, for instance verbal (for negation see Deutsch et al., 2006, 2009), then the reflective system will be active in preparing the behavioral outcome. The current studies used simple behaviors that do not require reflective behavioral control (pressing the space bar), so that the motivational, goal aspect of the reflective system can be studied apart from influences of reflective behavioral control (Strack & Deutsch, 2004).

visual presence when they pressed the space bar—the CS turned blue or yellow and stayed on the screen until participants pressed the space bar.

Based on the reasoning above, I assumed that self-induced relief in the memorize-condition elicited uncertain relief, whereas the self-induced relief in the no-memorize condition elicited a certain relief. I expected that uncertain relief led to a stronger avoidance goal orientation than certain relief. Importantly, I expected that there was no difference between certain and uncertain relief with respect to valence.

Hypotheses. Experiment 6 used two independent studies in which the relief stimuli (certain self-induced and uncertain self-induced relief) were compared to fear stimuli. Fear was not expected to elicit a goal, so fear was used as neutral baseline in the goal task.

H6.1: Self-induced relief stimuli elicit stronger positive valence than fear stimuli.

H6.2: Uncertain self-induced relief elicits a stronger avoidance goal than fear stimuli, whereas certain self-induced relief elicits the same goal orientation as fear stimuli.

Design. The design of Experiment 6 was a 2(relief certainty: certain vs. uncertain) X 2(measure: valence vs. goal orientation) X 2(stimulus category: fear vs. relief) mixed design, with relief certainty varied between participants and the other factors varied within participants.

Method. Two separate experiments were run (6A and 6B). In both experiments, participants fulfilled the goal task with self-induced relief. Experiment 6A manipulated relief certainty by requiring participants to memorize the stimulus during one trial; in Experiment 6B, the participants did not have to memorize the stimulus, thus assuring them a certain relief.

Participants. One hundred and four participants (76 female, 28 male) fulfilled one of two experiments (experiment A: n = 40; experiment B: n = 64) in sessions up to three persons at a time. They had a mean age of 24.63 years (SD = 4.59). They were students of the University of Würzburg enrolled in various majors (excluding psychology) and received € 6 as compensation.

Procedure. The two experiments consisted of the same phases as Experiment 5. They started with the consent (identical to Experiment 5), which was followed by additional questionnaires in Experiment 6A, and the US rating (in both Experiment 6A and 6B, identical to Experiment 5). The following phases were run next: the habituation phase (identical to

Experiment 5), the learning phase, the expectancy rating (identical to Experiment 5), the AMP (Payne et al., 2005), the goal task and the demographic and control questionnaire (identical to Experiment 4). The differences to the procedure in the other experiments are described in the following paragraphs.

Learning phase. The learning phase of Experiment 6 was identical to the one of Experiment 5, with the following exception. Instead of classically associated relief, self-induced relief stimuli were used. Participants could control the occurrence of the US during the presentation of the relief stimulus (3,000 ms). When they pressed the space bar at least once within that time period, the US did not occur. When they did not press the space bar within this time period, the US was presented via the headphones.

AMP. The AMP was identical to the AMP described for Experiment 3, with the following exceptions: First, the trials which used the self-induced stimuli as primes ended with a 2,000 ms period during which participants could hinder the US to occur by hitting the space bar. The fear trials were identical to Experiment 2. Second, only Experiment 6B manipulated the presentation time of the CS: For one third of the participants each, the CS was shown for 175 ms, 450 ms, or 725 ms. This factor was kept constant in Experiment 6A. The ITI was 1,000 ms in all AMP trials.

Goal task. The goal task used in Experiments 6A and 6B were identical to the one used in Experiments 5A and 5B, with the following exceptions: First, each test session included 40 test trials with 20 fear trials and 20 self-induced relief trials. During self-induced relief trials, participants could control US occurrence after the last correct key: If they pressed the space bar at least once within a time period of 2,000 ms, the US did not occur. If they did not press the space bar within this time period, the US was presented via the headphones.

Second, in Experiment 6A the CS was only shown in the beginning of each trial (1,000 ms), immediately followed by the fixation cross and the manikin task. After the CS presentation, participants saw the blue versus yellow shape that indicated the gain versus lose point information. By contrast, in Experiment 6B the CS was shown throughout the trial: After the first presentation (identical to Experiment 6A), the CS turned either blue or yellow and was visible until the last correct manikin movement.

Both Experiments 6A and 6B presented the gain versus lose point trials, the fear versus relief trials as well as the manikin location in random order. In addition, only Experiment 6B varied the order of AMP and goal task (first AMP, then goal task; and vice versa) between subjects, as a methodological factor. Experiment 6A kept this factor constant. The same materials were used as in Experiment 5.

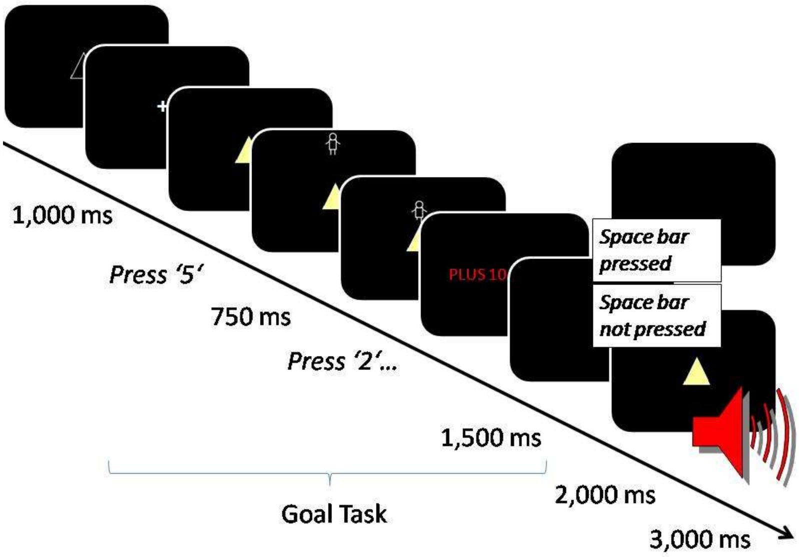


Figure 10. Sequence of events in the goal task in Experiment 6B: the self-induced relief gain points trial.

Results. ***Expectancy rating.*** It was important that the participants correctly learned the difference between fear and relief stimuli. I compared the expectancy ratings (given that the space bar was pressed) in a 2(relief certainty: uncertain vs. certain) X 2(stimulus category: fear vs. relief) repeated measures ANOVA with relief certainty varied between and stimulus category varied within subjects.

The analysis revealed a significant main effect of stimulus category, $F(1,102) = 215.31$, $p < .001$, $\eta^2_p = .68$. Fear stimuli (M = 92.02%, SD = 21.06) were rated to more likely be followed by the US than relief stimuli (M = 24.34%, SD = 33.90). There was no main effect of relief certainty, $F(1,102) = 0.61$, $p = .44$, $\eta^2_p = .01$, nor an interaction of relief certainty and stimulus category, $F(1,102) = 0.01$, $p = .93$, $\eta^2_p < .01$. These data indicate that participants in both conditions were successful in learning the stimulus meanings.

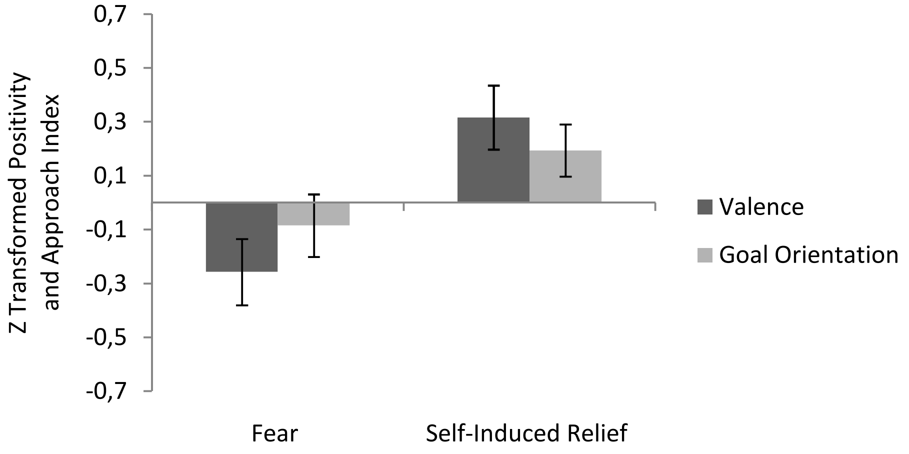
Of the 104 participants, 97 (93.3%) rated the US expectancy after fear stimuli at least as high as the US expectancy after relief stimuli (liberal learning criterion); only 87 of the 104 participants (83.7%) rated the US expectancy after fear stimuli higher than the US expectancy after relief stimuli (conservative learning criterion). The following analyses were done including all of the participants meeting the liberal criterion (n = 97).

Valence and goal task. The z transformed goal task data (false reactions: n = 401, 3.4%) and the z transformed AMP data were analyzed with a 2(relief certainty: certain vs. uncertain) X 2(measure: valence vs. goal orientation) X 2(stimulus category: fear vs. self-induced relief) mixed model ANOVA, with relief certainty (experiment) factor varied between subjects and the other factors varied within subjects.

First, this analysis revealed a main effect of stimulus category, $F(1,95) = 5.40$, $p = .02$, $\eta^2_p = .05$. Second, this main effect was qualified by a significant two-way interaction between stimulus category and relief certainty, $F(1,95) = 5.40$, $p = .02$, $\eta^2_p = .05$. Third, there was also a significant interaction between stimulus category and measure, $F(1,95) = 11.74$, $p < .01$, $\eta^2_p = .11$. Fourth and most importantly, all the mentioned effects were qualified by a three-way interaction of Relief Certainty X Measure X Stimulus Category, $F(1,95) = 3.52$, $p = .06$, $\eta^2_p = .04$. There were no other significant effects, all Fs < 1.2, all ps > .28 (see Appendix).

A

B



Figures 11 A (previous page) and 11 B. Valence and goal orientation by stimulus category and measure in the uncertain relief condition, n = 59 (Figure A) and in the certain relief condition, n = 38 (Figure B) of Experiment 6. Higher numbers indicate more positive valence and stronger approach goal orientation. Error bars indicate standard errors of the mean.

Separate analyses for the two relief certainty revealed systematic differences between certain and uncertain relief (see Figures 11 A and 11 B): The analysis of the certain relief data revealed a significant main effect of stimulus category, $F(1,58) = 12.23$, $p < .01$, $\eta^2_p = .17$, but no Measure X Stimulus Category interaction, $F(1,58) = 1.82$, $p = .18$, $\eta^2_p = .03$. The main effect of measure was not significant, $F(1,58) = 0.06$, $p = .82$, $\eta^2_p < .01$. Planned comparisons showed that, over both measures, relief stimuli ($M = 0.26$, $SD = 0.66$) had higher values than fear stimuli ($M = -0.17$, $SD = 0.64$). This was true for both the valence measure, $F(1,58) = 10.50$, $p < .01$, $\eta^2_p = .15$, and, marginally significant, for the goal task, $F(1,58) = 3.49$, $p = .07$, $\eta^2_p = .06$.

In contrary, the analysis of the uncertain relief data revealed no significant main effect of stimulus category, $F(1,37) < 0.01$, $p = .97$, $\eta^2_p < .01$, but a significant Measure X Stimulus Category interaction, $F(1,37) = 9.28$, $p < .01$, $\eta^2_p = .20$. The main effect of measure was not significant, $F(1,37) = 0.03$, $p = .87$, $\eta^2_p < .01$. Planned comparisons showed that, on the AMP, relief stimuli ($M = 0.21$, $SD = 1.03$) elicited stronger positive valence than the fear stimuli ($M = -0.30$, $SD = 1.03$), $F(1,37) = 9.39$, $p < .01$, $\eta^2_p = 20$. However, on the goal task, relief stimuli (M = -0.33, SD = 1.22) elicited a stronger avoidance goal orientation than fear stimuli (M = 0.17, SD = 1.18), $F(1,37) = 4.02$, $p = .05$, $\eta^2_p = .10$[10].

Discussion. Both hypotheses of Experiment 6 are supported. Self-induced relief elicited more positive valence than fear stimuli (H6.1). At the same time, uncertain self-induced relief elicited a stronger avoidance goal than fear stimuli (H6.2). As predicted, this was not true for certain self-induced relief. These stimuli elicited even a—marginally significant—stronger approach goal than fear. This latter finding can be best interpreted as an instance of the certainty effect: Certain relief situations are disproportionately overvalued in the reflective system and thus elicit a weak approach goal orientation (see General Discussion).

There are, however, some caveats when interpreting the present data. For instance, the relevant three-way interaction was only marginally significant. The separate analyses for uncertain and certain relief, however, were significant and showed in the hypothesized direction. Furthermore, when all participants are included in the ANOVA (N = 104), the three-way interaction is statistically significant, $F(1,102) = 4.93$, $p = .03$, $\eta^2_p = .05$. This result implies that the non-significance is due to low statistical power.

Furthermore, one can question the certainty operationalization in the present experiment. If the memory manipulation had influenced subjective relief certainty, then the expectancy ratings should have supported this assumption. If so, expectancy ratings would have shown a significant Relief Certainty X Stimulus Category interaction: The US expectancy for certain relief should have been lower than the US expectancy for uncertain relief. This, however, was not found. Recall, however, that the expectancy ratings of Experiment 6 did not differentiate between situations when participants had pressed the space

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[10] When adopting the conservative learning criterion (n = 87), the predicted three-way interaction of Relief Certainty X Measure X Stimulus Category was not significant, $F(1,85) = 0.73$, $p = .40$, $\eta^2_p = .01$. The follow-up analyses, however, showed in the same direction as with the liberal criterion and were also significant. The interaction of Measure X Stimulus Category was significant for uncertain relief: $F(1,33) = 5.13$, $p = .03$, $\eta^2_p = .13$, in the absence of a main effect of stimulus category, $F(1,33) = 0.15$, $p = .70$, $\eta^2_p < .01$. This two-way interaction of Measure X Stimulus Category was not found for certain relief: $F(1,52) = 2.41$, $p = .13$, $\eta^2_p = .04$; but for certain relief there was the main effect of stimulus category: $F(1,52) = 12.60$, $p = .001$, $\eta^2_p = .20$. These findings replicate the findings with the liberal criterion, and make it plausible that, when adopting the conservative learning criterion, the three-way interaction was not significant due to the small sample size.

bar versus when they had not pressed the space bar (with-reaction expectancy vs. without-reaction expectancy). Given that the certainty difference should only influence the with-reaction expectancy, it is plausible that the expectancy rating was too insensitive to detect the difference between certain and uncertain relief states.

Finally, the memory manipulation of Experiment 6 could have also caused other differences between the processing of the two relief stimuli. For instance, the memorize-manipulation could have led to a partial depletion of the reflective system (cognitive load, e.g., Deutsch et al., 2009), which could have led to a weaker goal intention in general. A weaker goal intention could have led to a stronger reliance on the information that was present at the time of the decision. This information was, for instance, the affective valence of relief. So, processing relief stimuli with a weakened goal could have led to an impulsive "shortcut": Positive valence as positive information could have caused a stronger approach goal. Although this explanation was not supported by the present findings—in fact, the opposite was found—the criticisms justify a replication of the findings. Experiment 7 addressed the criticized issues by directly manipulating the objective relief contingencies in one experiment.

Experiment 7

Experiment 6 showed that certain and uncertain self-induced relief elicited different goal orientations. Uncertain relief elicited an avoidance goal, whereas certain self-induced relief elicited a weak approach goal. Both relief stimuli, however, elicited stronger positive valence than fear. Experiment 7 was designed to replicate the goal orientation finding with a within-subjects paradigm. Participants specifically learned to differentiate between a certain and uncertain self-induced relief stimulus. It was hypothesized that there was no valence difference between the two relief stimuli. At the same time, uncertain relief was predicted to elicit a stronger avoidance goal than certain relief.

Although participants also learned fear stimuli, the experiment specifically tested the difference between the two relief stimuli. The fear stimulus served as a context, comparable to negative US in Sidman avoidance learning (e.g., Sidman, 1953, 1962). Sidman (e.g., 1953) described a procedure during which the aversive US was administered in a regular time schedule, without warning signals. The rats in the Sidman (1953) study successfully learned to avoid the US (c.f. Ader & Tatum, 1961, 1963; Benedict, Cofer, & Cole, 1980). The present experiment is similar to the Sidman avoidance learning in that it also focused on the avoidance learning aspect, not on the fear aspect.

Hypotheses. H7.1: Uncertain self-induced relief stimuli will elicit the same positive valence as certain self-induced stimuli.

H7.2: Uncertain self-induced relief stimuli will elicit a stronger avoidance goal than certain self-induced relief.

Design. The experiment followed this design: 2(relief certainty: certain vs. uncertain) X 2(measure: valence vs. goal orientation), with both factors varied within subjects.

Method. ***Participants.*** Sixty-one participants (41 female, 20 male) with a mean age of 24.79 (*SD* = 3.01) took part in the experiment in sessions up to three persons at a time. They were students of the University of Würzburg enrolled in various majors (excluding psychology) and received € 6 as compensation.

Procedure. Experiment 7 consisted of the same phases as Experiment 6A, with one exception. Experiment 7 started with the consent and the US rating (identical to Experiment 5). The following phases were run next: the habituation phase, the learning phase, the expectancy rating, the affect misattribution procedure (AMP, Payne et al., 2005), another stimulus rating, the goal task, another emotion rating, and the demographic and control questionnaire (identical to Experiment 3). The differences to the procedure in the other experiments are described in the following paragraphs.

Habituation phase. The stimulus pretest was identical to the one used in Experiment 1, with the exception that one of the CS was changed: The square figure was a square standing on one corner. So the CSs were a triangle figure, standing on one side; a square, standing on a corner; and a pentagon standing on one side.

Learning phase. The learning phase was identical to the one described for Experiment 6B, with the following exceptions:

First, three instead of two stimuli were used: The stimuli described one paragraph above were conditioned to be either a fear stimulus (identical learning procedure as in Experiment 6), a certain self-induced relief stimulus (identical learning procedure as in Experiment 6B), or an uncertain self-induced relief stimulus (see below).

Second, there were 18 learning trials. These trials were made up of six fear, six certain and six uncertain relief trials. The fear trial was identical to the one in Experiment 6B, with the only exception that the US at the end of each trial appeared after a time period of 3,000 ms.

The certain relief trials were identical to the ones in Experiment 6B. Importantly, of the six uncertain relief learning trials, four (66.67%) were also identical to the relief trials of Experiment 6B, but the other two (33.34%) were identical to the fear trials. In these latter trials the uncertain relief stimulus was followed by the US, independent of the participant's reaction. This set-up gave participants the opportunity to control the US in 67% of the uncertain relief trials, and in 100% of the certain relief trials.

Third, the instructions for the learning phase made it explicit to the participants that certain and uncertain relief differed in US control contingency. In addition, participants learned the contingency during the learning phase. This procedure was chosen in order to exclude the bias known as description experience gap in the decision literature. This bias describes findings that description-based decisions typically overestimate the probability of rare events, while experience-based decisions underestimate their probability (e.g., Barron & Erev, 2003; Gottlieb, Weiss, & Chapman, 2007; Hau, Pleskac, Kiefer, & Hertwig, 2008; Hertwig & Erev, 2009; Hertwig, Barron, Weber, & Erev, 2004). The description experience bias was minimized in the current experiment by both explicitly telling participants the probability of the rare event (the US) and having participants experience it.

The assignment of the geometric shapes to the stimulus meaning, the meaning of the colors with respect to the gain versus lose point information and the order of the assignment of manikin movement to goal orientation (gain vs. lose points) were varied between subjects as methodological factors.

Expectancy rating. The manipulation check was identical to the one used in Experiment 1, with the following exceptions: First, Experiment 7 used the three CS described above. Second, Experiment 7 both tested the with-reaction expectancy and the without-reaction expectancy.

AMP. The AMP was identical to the AMP employed in Experiment 6B, with the following exceptions. First, it used the three CSs as primes that were described above. Second, there were 36 AMP trials: 12 fear stimulus trials (identical to Experiment 6), 12 certain relief trials (identical to Experiment 6), and 12 uncertain relief trials. The uncertain relief trials consisted of eight self-induced relief trials (identical to Experiment 6) and of 4 fear trials (identical to Experiment 6). Using this set-up, each participant could control the US in 67% of the uncertain relief trials. Third, each trial presented the CS for 450 ms.

Goal task. The goal task was identical to the one used in Experiment 6B, with the following exceptions: First, the three CSs were used that are described above. Second, each test session included 72 trials: twenty-four fear trials of Experiment 6B (with a 3,000 ms interval before US presentation), 24 self-induced relief trials identical to Experiment 6B, and 24 uncertain relief trials which consisted of 16 self-induced relief trials (identical to Experiment 6B) and eight fear trials (Experiment 6B). The order of trial presentation was random. Third, after the last correct key press of each trial participants received a text message about the change of points. When a participant acted correctly in a gain point trial, she received the message “Plus 10 points”, when she made an error, she received the message “Error! Minus 0 points”. In a lose point trial, she received the message “Minus 0 points” or “Error! Plus 0 points”.

Results. ***Expectancy rating.*** In order to check whether the participants learned the meanings of the stimuli, a 3(stimulus category: fear vs. certain relief vs. uncertain relief) X 2(expectancy reaction: with reaction vs. without reaction) repeated measures ANOVA was conducted on the expectancy ratings, with both factors varied within subjects.

First and most importantly, the analysis revealed a significant interaction of Stimulus Category X Expectancy Reaction, $F(2,120) = 4.09$, $p = .02$, $\eta^2_p = .06$. This interaction was further analyzed with planned comparisons. These comparisons showed that the without-reaction expectancy was higher than the with-reaction expectancy for the certain relief stimulus (with-reaction: $M = 18.52$ %, $SD = 35.06$; without-reaction: $M = 45.66$ %, $SD = 45.09$), $F(1,60) = 14.51$, $p < .001$, $\eta^2_p = .20$. This difference was also significant for the uncertain relief stimulus (with-reaction: $M = 50.36$ %, $SD = 20.84$; without-reaction: $M = 67.59$ %, $SD = 32.21$), $F(1,60) = 14.77$, $p < .001$, $\eta^2_p = .20$. As expected, the with- vs. without-reaction expectancies did not differ for the relief stimulus (with-reaction: $M = 89.02$ %, $SD = 30.09$; without-reaction: $M = 92.13$ %, $SD = 23.74$), $F(1,60) = 0.41$, $p = .53$, $\eta^2_p = .01$ (see Figure 12).

Second, the analysis revealed a main effect of stimulus category, $F(2,120) = 90.42$, $p < .001$, $\eta^2_p = .60$. Planned comparisons showed that the US expectancy after fear ($M = 90.57$ %, $SD = 27.04$) was higher than after certain relief ($M = 32.09$ %, $SD = 42.46$), $F(1,60) = 118.92$, $p < .001$, $\eta^2_p = .67$, and than after uncertain relief ($M = 58.98$ %, $SD = 28.37$), $F(1,60) = 86.80$, $p < .001$, $\eta^2_p = .59$. As expected, US expectancy after uncertain relief was higher than after certain relief, $F(1,60) = 43.55$, $p < .001$, $\eta^2_p = .42$.

Third, there was a main effect of expectancy reaction, $F(1,60) = 32.21$, $p < .001$, $\eta^2_p = .35$. Over all three stimuli, US expectancy without the reaction ($M = 68.46$ %, $SD = 39.50$) was higher than the with reaction expectancy ($M = 52.63$ %, $SD = 41.02$).

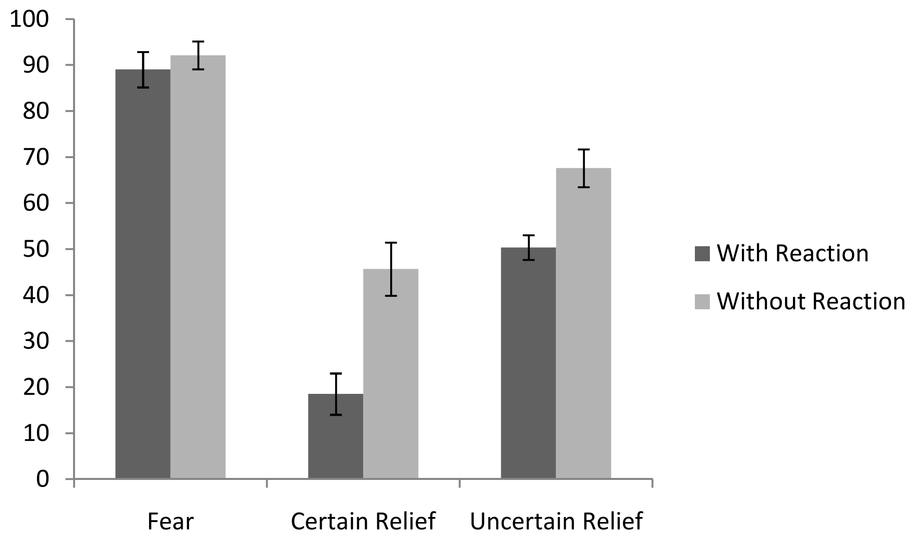


Figure 12. The rating of the US expectancy by stimulus category and expectancy reaction of Experiment 7, in percent. Higher numbers indicate higher US expectation. Error bars indicate standard errors of the mean.

In order to estimate participants' learning success, I again calculated the learning index by subtracting the with-reaction US expectancy from the without-reaction US expectancy (see Experiment 2). This index indicates the subjective efficiency of the space bar reaction. For Experiment 7, this index was calculated twice, separately for certain and for uncertain relief. In mean, the learning index for certain relief was 27.13 (*SD* = 55.62); the mean learning index for uncertain relief was 17.23 (*SD* = 35.02). Although both indices did not significantly correlate, $r(61) = .14$, $p = .27$, it was important that participants learned the meaning of both relief stimuli. Thus, the two learning indices were aggregated into a mean learning index. When this combined learning index was positive, then the participant had learned that the space bar reaction led to a reduction of US probability after both the certain and the uncertain relief. The mean of this combined learning index was 22.18 (*SD* = 34.92), the range was 147.50. Of the 61 participants, only 38 (67.9%) had a positive learning index, that means that these 38 participants were successful in learning the meaning of the reaction.

Because the selection of successful learning participants—as in the previous experiments—would largely reduce the sample, I conducted—with all participants—an analysis of covariance including the learning index as covariate.

Valence and goal task. The goal task (false reactions: $n = 192$, 2.2%) and the AMP data were analyzed with a 2(measure: valence vs. goal orientation) X 2(stimulus category: fear vs. certain relief vs. uncertain relief) repeated measures analysis of covariance (ANCOVA), with the *z*-standardized learning success (combined learning index) as covariate.

First and most importantly, the ANCOVA revealed a significant interaction of Stimulus Category X Measure X Learning Index (covariate), $F(2,118) = 5.19$, $p < .01$, $\eta^2_p = .08$. This interaction is further analyzed using comparisons on several levels of the covariate, see below.

Second, the analysis revealed a significant main effect of stimulus category, $F(2,118) = 13.73$, $p < .001$, $\eta^2_p = .19$. Further comparisons between the fear and both relief stimuli showed that over both measures, the fear stimulus ($M = -0.30$, $SD = 0.98$) had lower values—more negative valence and stronger avoidance goals—than certain relief ($M = 0.18$, $SD = 1.03$), $F(1,59) = 22.08$, $p < .001$, $\eta^2_p = .27$, and than uncertain relief ($M = 0.12$, $SD = 0.93$), $F(1,59) = 18.03$, $p < .001$, $\eta^2_p = .23$. Over both measures, there was no difference between the two relief stimuli, $F(1,59) = 0.34$, $p = .56$, $\eta^2_p = .01$.

Third, the stimulus category interacted with the covariate learning success, $F(2,118) = 3.92$, $p = .02$, $\eta^2_p = .06$. No other effect reached significance, all *F*s < 1.9, all *p*s > .16 (see Appendix).

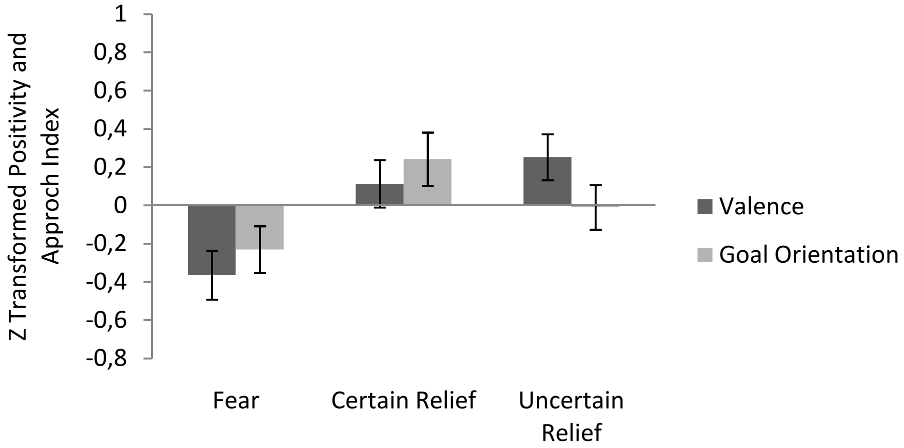
Pairwise comparisons (Bonferroni corrected) revealed the differences between the stimuli on two different levels of the covariate Learning Success: first, for the participants who learned very well (learning success = *M* + 1 *SD* level; called *successful learners*); second, for the participants who learned relatively little (learning success = *M* – 1 *SD* level; called *unsuccessful learners*).

Most importantly, the comparisons for the successful learners indicated that uncertain relief elicited a significantly stronger avoidance goal than certain relief (certain relief: $M = 0.64$; uncertain relief: $M = -0.04$), $p = .02$. Importantly, the relief stimuli did not differ on valence (certain relief: $M = 0.04$; uncertain relief: $M = 0.07$), $p = 1.00$ (see Figure 13 B).

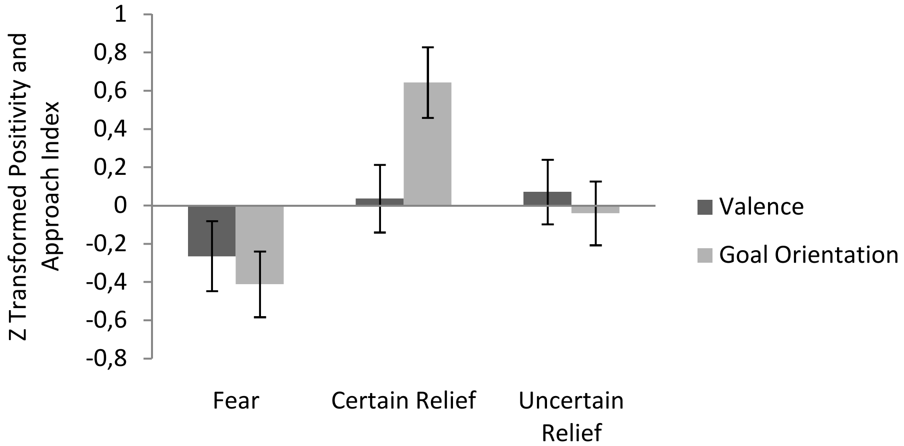
Further comparisons for the unsuccessful learners indicated that the relief stimuli did not differ on the goal task (certain relief: $M = -0.16$; uncertain relief: $M = 0.02$), $p = 1.00$. Again, they did also not differ on valence (certain relief: $M = 0.19$; uncertain relief: $M = 0.43$), $p = 1.00$ (see Figure 13 C).

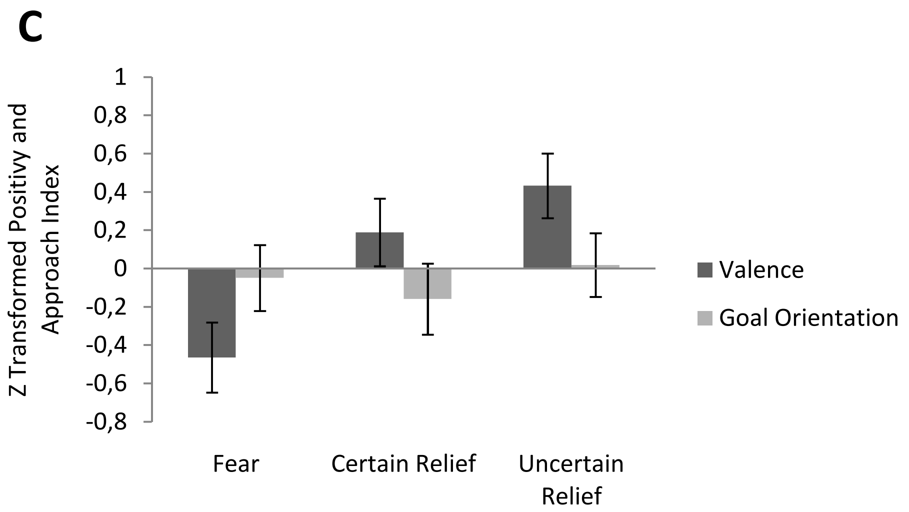
These data show that especially the successful learners demonstrated the hypothesized difference between the two relief stimuli. In these successful learners, uncertain relief elicited a stronger avoidance goal than certain relief. Importantly, at the same time, the two relief stimuli elicited the same amount of positive valence. This valence equivalence was even found for all participants. This finding indicates that all participants learned that the certain and the uncertain relief stimuli elicited the same amount of affect, but only the above-average learners had an active avoidance goal in uncertain relief.

A



B





Figures 13 A, 13 B (both previous page), and 13 C. Valence and goal orientation by stimulus category and measure for all participants (Figure A), for successful learners (Figure B), and for unsuccessful learners (Figure C). Higher numbers indicate more positive valence and stronger approach goal orientation. Error bars indicate standard errors of the mean.

Discussion. Experiment 7 found support for both hypotheses: Uncertain self-induced relief elicited a stronger avoidance goal than certain self-induced relief (H7.2), at the same time the two relief stimuli elicited the same amount of positive valence (H7.1). These results were predicted on the basis that the impulsive processing functions as a default system, whereas the reflective goal processing works only if there is motivation and capacity, and that the motivation for reflective processing requires an uncertainty of the relief outcome. This reasoning was supported by Experiment 7.

The analysis of the successful learners further indicated that both relief stimuli elicited a stronger approach goal orientation than fear. Why? It could be that the higher difficulty of the task shifted both relief stimuli towards an approach goal. Recent research on the execution of self-control showed that executing voluntary control increased self-reported approach motivation, incentive sensitivity, and the sensitivity to reward cues (Schmeichel, Harmon-Jones, & Harmon-Jones, 2010). Two task changes from Experiment 6 to Experiment 7 made the tasks more complex and strenuous. Participants had to differentiate three instead of two stimuli, and they had to precisely discriminate between two stimuli with only a small difference in US contingency (see the small number of successful learners). Due to this additional task complexity, participants may have had to exercise greater self-control, due to the instruction to correctly fulfill the task (for reviews on self-control, see Hofmann, Friese, & Strack, 2009; Muraven & Baumeister, 2000). The increased self-control may have caused the additional approach goal orientation for relief.

There are two caveats about the results: First, again, relatively few participants successfully learned the correct meaning of the stimuli. This effect may be due to the fact that Experiment 7, similar to Experiments 2 and 4, used a pure within-subjects design. It is plausible that this set-up has created cognitive load which distracted participants from correctly learning the consequences of the stimuli (see the discussion on self-control above). The difficulty in learning is also apparent in the contingency rating data. So, future research should employ an improved learning procedure, such as an ad-criterion learning paradigm. This procedure could contain expectancy ratings at every 10th or 20th trial (e.g., Lipp & Purkis, 2006) and could last up to the point when participants reach a given learning-criterion. For instance, one could employ a learning procedure that stops when the participant indicates expectancies that approximates the objective contingency by a certain degree.

Second, one may change the operationalization of the behavioral reaction in the active avoidance paradigm. It may be that, during learning and test phase, the simple space bar reaction became a reflex-like action tendency. If so, then the impulsive system may have "taken over" (Strack & Deutsch, 2004, p. 238), reflective processing may have been strongly reduced. As a solution for this problem, one may substitute the space bar reaction by other, more complex and demanding behaviors, such as mathematical calculations or logical operations (e.g., Deutsch et al., 2009). Employing such a procedure may enhance reflective activity and may enhance the avoidance goal orientation of uncertain self-induced relief.

General Discussion

Summary of Results

The present experiments examined the question of the relation between approach avoidance and the emotion relief. The following paragraphs review the predictions of this thesis and the data supporting them.

Experiment 1 found that an active avoidance learning paradigm produced relief. Self-induced relief stimuli elicited more relief than another positive emotion, happiness. Furthermore, the data indicated that fear stimuli elicited stronger anger than fear, when compared to relief stimuli.

Prediction A: Relief will elicit positive affective valence and an approach distance orientation. This should be true for both relief that is caused by the impulsive system and for relief that is caused by the reflective system (Experiments 2-3).

Prediction A was tested and confirmed in Experiments 2 and 3. Both experiments found evidence in support of this hypothesis: Relief stimuli elicited an approach distance orientation moreso when compared to fear stimuli. This effect was found both with a combined differentiation and conditioned inhibition paradigm (Experiment 2) and a differentiation paradigm (Experiment 3). At the same time, both kinds of relief stimuli elicited stronger positive valence than fear stimuli. This effect was found both with a joystick measure of affect and the affect misattribution procedure (AMP, Payne et al., 2005).

Prediction B: More positive valence of relief—caused by a larger change of affective states—will elicit a stronger approach distance orientation (Experiment 4).

This prediction was tested and confirmed in Experiment 4. Negative stimulation at the starting point led to a stronger approach distance orientation than neutral stimulation. In addition, Experiment 4 found that valid relief cues elicited a stronger approach distance orientation than invalid cues, thereby excluding a general behavioral activation as source of the approach distance orientation.

Prediction C: Relief caused by the impulsive system will not elicit a specific goal orientation (Experiment 5).

This prediction was tested and confirmed in Experiment 5 with a large number of participants. There was no difference between classically associated relief and fear stimuli with respect to the goal orientation. This indicates that classically associated relief stimuli do not elicit a specific goal orientation. At the same time, however, relief stimuli elicited a stronger positive valence than fear stimuli.

Prediction D: Uncertain self-induced relief—caused by the reflective system—will elicit an avoidance goal orientation (Experiments 6-7).

This prediction was tested and confirmed in Experiments 6 and 7. Both experiments demonstrated that uncertain self-induced relief elicited an avoidance goal orientation moreso than certain self-induced relief. Two different operationalizations of certainty were used and the predicted effects were found for both of them.

Implications for Research on Affective Learning

Conditioning produces relief. The present studies are among the few that show that aversive conditioning procedures (conditioned inhibition in Experiment 2 and differentiation in Experiments 1 and 3-7) reliably produce relief. This means that relief, like fear and happiness, can be reliably elicited in controlled settings. The imagination procedure used by Carver (2009), by contrast, is higly susceptible to the influence of third variables. Carver's methodological problems can be minimized by employing a conditioning procedure as in the current studies.

There is, however, one qualification to the current findings of relief conditioning. Experiment 1 assessed the specific emotion elicited by self-induced relief stimuli, but not classically associated relief stimuli. It could be that the classically associated relief elicited another positive emotion, for instance, happiness. This is theoretically plausible: Carver (e.g., 2001) and Higgins (e.g., 1997) state that relief stems from an avoidance process that includes goals and active behavior. Classically associated relief does not contain goals or active behavior. Further research is needed to clarify this issue. For the present hypotheses on distance orientation, however, it is not necessary: I predicted that positive affect would elicit an approach distance orientation, and this prediction was confirmed.

The AMP assesses conditioned affect. The present studies are, to my knowledge, the first to employ the affect misattribution procedure (AMP, Payne et al., 2005) in an aversive conditioning procedure—there are, however, studies employing the AMP in evaluative conditioning procedures (e.g., Gawronski, Rydell, Vervliet, & De Houwer, 2010; Prestwich, Perugini, Hurling, & Richetin, 2010; Rydell & Jones, 2009; Rydell, McConnell, & Mackie, 2008). The current data indicate not only that the conditioning procedures were successful, but also that the AMP is sensitive and reliable enough to assess learned affect. This observation is important for future studies examining phasic, i.e., short-termed affective states. Previous research on the indirect assessment of conditioned affect used RT methods, such as the IAT and the affective priming paradigm (e.g., Hermans et al., 2003, 2005; Mitchell et al., 2003; Olson & Fazio, 2002). These methods, however, suffer from methodological problems. For instance, in the use of RT methods, certain reaction time windows have to be used (e.g., Deutsch et al., 2009, used a 2,000 ms window). The AMP, by contrast, is less limited to a speficic RT window (e.g., Payne et al., 2005). Thus, future research has broader possibilities for assessing affect indirectly.

Implications for Research on Impulsive Processes

Relief elicits an approach distance orientation. The notion that relief elicits an approach distance orientation was supported by data in several experiments, which are the first to explicitly address this question. They confirm R. Neumann and Strack's (e.g., 2000; cf. Strack & Deutsch, 2004) hypothesis regarding motivational orientations: Affective valence determines basic approach avoidance orientations, even if the valence is caused by an avoidance process (e.g., Carver, 2001; Higgins, 1997). Carver and colleagues (2009), for instance, have proposed that the approach avoidance systems (BIS and BAS) are located in a "lower-level" system. When comparing his two-level model to the RIM (Strack & Deutsch, 2004), one could easily equate Carver's "lower-level system" to the impulsive system. The present experiments, however, lead to the conclusion that this equation is not valid. Whereas Carver predicts that relief will be associated with an avoidance orientation on this lower level, the present experiments showed that relief causes an approach orientation in the impulsive system. Given the correlational nature of Carver and colleagues' research and the fact that they use questionnaires in their studies (see Theory section), one can conclude that Strack and Deutsch's (2004) predictions are a better fit with the empirical data.

Additional evidence for the general idea—that valence determines distance orientation—can be found in work by Krieglmeyer on anger and frustration (Krieglmeyer, 2007). In these studies, negatively valenced frustration stimuli elicited an avoidance distance orientation, despite a supposed approach goal (e.g., Harmon-Jones & Allen, 1998; Harmon-Jones et al., 2009).

It is still unclear which aspect or part of the affective valence mediates the effect of relief on distance orientation. Researchers have differentiated two aspects of affective valence: the impulsive feeling (experiential knowledge) and the reflective knowing (noetic knowledge, e.g., Strack & Deutsch, 2004, p. 224; cf. the differentiation between core affect and affective quality by Russell, 2003). Following this distinction, it could be that the experiential feeling in the impulsive system is sufficient. It could also be, however, that noetic knowledge ("this is a positive relief stimulus") in the reflective system is necessary. The experiments reported herein are not sufficient to answer this question, although Experiment 2 indirectly suggests that the latter explanation is relatively unlikely. If reflective noetic knowledge had influenced distance orientation in Experiment 2, then the distance orientation scores of self-induced relief should have differed from classically associated relief: Self-induced relief would have activated avoidance information in the reflective system, which would have alleviated the approach distance orientation. A crucial experiment to examine this possibility could compare a situation with an active avoidance goal to a situation without an avoidance goal—basically, the effects of certain versus uncertain relief on distance orientation (similar to Experiments 6 and 7). These data are, however, not currently available, so it is too early to make a decisive conclusion.

Implications for valence theories. What do the current findings mean for the other studies supporting valence theories? They imply that valence theories are valid, but only for some of the examined behaviors. It is not by chance that valence theories are mostly proposed by researchers that work in neuropsychology or who are interested in implicit processes, as their predictions hold true for basic behavioral orientations that are mediated by impulsive low-level processes. "Hope = relief" (Gray, 1987, p. 248) is only true for low-level approach avoidance motivation. The studies cited in the Theory section can be interpreted in this light.

Other issues are left open by the present findings. First, the present model does not explain the source of the positive valence in the backward-conditioning studies mentioned in the theory section (e.g., Cole & Miller, 1999; Grelle & James, 1981). It is possible that the positive valence after negative stimulation is another instantiation of relief (e.g., Lazarus, 1991), possibly caused by an opponent-process mechanism (e.g., Solomon, 1980). Interestingly, however, in the studies by Andreatta and colleagues (2010), positive relief did not lead to positive affect, but only a reduction of the aversive startle reflex. These studies underline the importance of timing and sequential order in conditioning studies: For example, evaluative backward conditioning effects are smaller than forward conditioning effects (De Houwer et al., 2001).

Second, it is unclear how the present findings relate to relief effects on instrumental behaviors. The present reasoning does not explain how distance orientation could have caused the reduction of aversive responses or the increase of appetitive responses (e.g., Dickinson, 1977; Dickinson & Pearce, 1977). One possibility is that in these experiments, the positive affect of relief not only influenced the impulsive distance orientation, but also led to the activation of approach goals. According to the RIM (Strack & Deutsch, 2004), this could only happen when there is no other active (avoidance) goal—i.e., when the relief state is certain (see Experiments 6 and 7). Further, this effect should occur only when motivation and ability to engage in reflective processing are both high—i.e., when no other tasks or needs are active. Further empirical work may shed light on this hypothesis.

Alternative explanations for the distance orientation effects. There are several alternative explanations of the current effect: Relief elicits an approach distance orientation. One possibility is that the distance orientation measure, the manikin task (e.g., De Houwer et al., 2001), partially tapped goal activation, and thus activation in the reflective system. This would imply that the manikin task not only assessed impulsive distance orientation. The recently developed theory of event coding (TEC, e.g., Eder & Klauer, 2007; Eder & Rothermund, 2008) could explain these effects on the manikin task. According to the TEC, any feature of a task that matches to another feature of that task can facilitate the task's execution. This feature does not necessarily have to be affective in nature. In the present experiments, the task feature could be the goal to approach or avoid (move toward or away from) the CS. A goal to approach the stimulus would match either the relief stimulus' positive valence or the end-point of the avoidance goal, the positive relief state.

Does this alternative explanation threaten the central tenets of the current work? In the present experiments, participants were instructed to approach (move toward) vs. avoid (move away) the fear and relief stimuli. The match between the approach instruction and the relief stimulus' positive valence or the anticipated relief outcome could indeed have led to the facilitation of this movement. This could be independent from the actual movement—toward or away from the relief stimulus. Krieglmeyer and colleagues (2010), however, found that the manikin task assesses *specific* motivational orientations (distance orientations). This point is important, because in their studies, goal instructions also enhanced the effect. Yet, they did not explain all of their effects: There was a basic motivational effect of stimulus valence on distance orientation *independent* of the instructions given. So, although the alternative explanation cannot be completely ruled out at the moment, it is unlikely to account for our findings by itself. Therefore, it is reasonable to conclude that there is at least some degree of motivational congruence in the present experiments. Further research may overcome this confound by explicitly manipulating goal instructions.

A second alternative explanation for the current studies is that distance orientation is driven by the avoidance elicited by fear stimuli, rather than the approach orientation elicited by relief. It could be, then, that the relief stimuli elicited a weaker avoidance distance orientation than the fear stimuli, with no approach orientation involved. The problem of arbitrary metrics (e.g., Blanton & Jaccard, 2006) pertains to the manikin task and all similar tasks. Blanton, Jaccard, Christie, and Gonzales (2006) discussed the Implicit Association Test (IAT, Greenwald et al., 1998) intensively. They showed that the IAT effect is a relative measure: The *absolute* value of IAT effects cannot be interpreted without any reference to other values. For instance, the IAT does not say anything about the absolute amount of implicit prejudice. It can only be interpreted as a *relative* measure, for instance some people have stronger prejudicial associations than others. The same argument can be made for the distance orientation task of the present experiments: It could be the case that relief elicits an approach distance orientation (as predicted), or it could be the case that fear elicits an avoidance orientation and relief does not elicit any orientation.

How can the arbitrary metrics problem be dealt with regarding the present experiments? There are at least two ways of solving it. One could use a neutral comparison stimulus in order to correct the distance orientation indices for baseline activation. This procedure has been employed, for instance, in the affective priming paradigm (e.g., Sanbonmatsu, Posavac, Vanous, Ho, & Fazio, 2007). However, this procedure would create new problems if applied to a conditioning paradigm. What would a neutral stimulus look like? It could be a stimulus that has not been shown in the learning phase at all. It could also be a stimulus that predicted the negative US only in 50% of the cases. In both cases, due to the novelty of the neutral stimulus, it could attract more attention than the CS and thus be associated with changed valence and a changed distance orientation (e.g., Fenske & Raymond, 2006; Öhman et al., 2001; Öhman, Lundqvist, & Esteves, 2001; Raymond, Fenske, & Tavassoli, 2003). In the second case, given the basic loss aversion in humans (e.g., Kahneman & Tversky, 1979, 1981), it could still be interpreted as a fear stimulus. This interpretation could lead to a subjective overestimation of the US prediction despite the objective 50% contingency.

Alternatively, one could use a version of the manikin task that uses only one evaluative category (similar to the extrinsic affective Simon task, EAST, De Houwer, 2003b) or that uses only one stimulus category (similar to single-target and single-category IAT versions, e.g., Bluemke & Friese, 2008; Karpinski & Steinman, 2006). The EAST-like version would assess only one of the two approach avoidance dimensions in a given trial block, for instance, only approach toward the relief stimulus. Single-target or single-category manikin tasks could assess the distance orientation of only one stimulus category, for instance of the relief stimulus. If one combined both approaches, one could estimate the independence of approach and avoidance. Further, one could get absolute values of approach avoidance for each stimulus category. This procedure seems promising and could clarify the specific contributions of approach and avoidance. More research is needed here to rule out the second alternative explanation—that the effects in the current studies were caused by the avoidance distance orientation of fear rather than the approach distance orientation of relief.

Third, the present studies used a within-subjects designs examining US expectancy ratings, valence (online joystick measure or AMP), and distance orientation (manikin task). In all experiments, participants first completed the contingency rating and then the DV. In addition, in Experiment 2, participants first completed the distance orientation task and then the joystick valence rating; in Experiment 3, participants completed first the AMP and then the distance orientation task. Thus, in all three experiments, it could have been that the completion of the contingency rating increased participants' attention toward the US non-occurrence and toward the resulting positive valence. If so, the manipulation check (in addition, the AMP in Experiment 3) could have caused the effects on the DV (for a similar discussion of how a manipulation check can cause effects in the ease-of-retrieval heuristic, see Kühnen, 2010).

The within-subjects design is, however, not a problem for the hypotheses regarding impulsive distance orientation. Recall that relief's positive valence was predicted to cause the effects on the distance orientation task. It was not hypothesized that this influence would be unconscious (e.g., Winkielman, Berridge, & Wilbarger, 2005a, 2005b). This leads to an interesting question, however: How automatic (unaware, efficient, unintentional and uncontrolled, Bargh, 1994) is the impulsive distance orientation? As a first step towards an answer, De Houwer and colleagues (e.g., De Houwer, 2003a; De Houwer & Moors, 2007;

Moors & De Houwer, 2006) proposed that automaticity has to be specified. A process may be automatic only in a certain sense, for instance, it may be fast (efficient), but intentional (e.g., as in negation, Deutsch et al., 2009). Recent research by Krieglmeyer and colleagues (Krieglmeyer & Deutsch, in prep.; Krieglmeyer et al., 2010) examined this question with respect to distance orientation as measured via the manikin task. They manipulated intentionality and response windows (i.e., timing) and found compatibility between valence and approach avoidance even when ther was no intention to approach or avoid the stimulus (because participants intended to evaluate the grammatical properties of the stimulus instead). The authors also found compatibility when participants had little time to process the target (less than 1000 ms). These studies indicated that impulsive distance orientation can occur under conditions that allow for automatic processing only. It is not clear, however, if distance orientation also fulfills other automaticity criteria such as unconsciousness, effectiveness, or controllability (Bargh, 1994; De Houwer, 2003a). Further research is needed to determine which other automaticity criteria distance orientation meets.

Implications for Research on Reflective Processes

Relief elicits an avoidance goal orientation. The present experiments are the first to investigate the connection between goal orientation and relief. They demonstrate that relief can cause an avoidance goal orientation (aversive goal in Lang's terms, e.g., Lang, 1995). In contrast with other accounts—called goal theories in the Theory section—the present studies specify the conditions under which this effect appears: First, when the relief state is self-induced, in that means the individual herself causes the relief state through her own behavior, and second, when the relief state that she causes is subjectively uncertain.

It is important to note that these studies differ from other studies on relief that used the backward conditioning paradigm (e.g., Andreatta et al., 2010; cf. Tanimoto et al., 2004). In those studies, backward-conditioned CS+ (fear stimuli) were explicitly rated as more negative, due to their contingency with the negative US. On a basic physiological level, however, the stimuli alleviated the startle reflex magnitude—an approach reaction. This may be an instance of a physiological opponent process on the impulsive level (e.g., Solomon, 1980; Siegel & Siegel, 1949), which the RIM could integrate into the impulsive system (Strack & Deutsch, 2004). Importantly, this finding does not help to clarify the current research question on two issues.

First, the cited studies leave the reflective goal orientation open: They only assessed direct ratings of the stimuli. The current studies, however, found a dissociation between valence (assessed via the joystick online rating and the AMP) and the goal orientation (avoidance goal) under certain circumstances. Thus, goal orientation cannot be derived simply from the directly rated valence. Second, the Andreatta and colleagues' (2010) study leaves open the question of a dissociation between the impulsive and reflective processes of positively-valenced relief stimuli, because they investigate negatively-valenced stimuli. The present studies provide the first conclusive evidence regarding this question.

Implications for goal theories. The present studies on goal orientation (Experiments 5 to 7) partially verify the predictions made by the goal theorists (e.g., Carver, 2001; Higgins, 1997). One can conclude that the goal theories are valid, but only for part of the included measures. Two moderators are important for the goal orientation: Is there an active goal (e.g., behavioral goal)? Is the attainment of the end state (here: relief) uncertain? Only when both questions can be answered affirmatively, will relief elicit an avoidance goal orientation. These qualifications are the first empirically-based qualifications to the general idea that relief is an avoidance process emotion (e.g., Higgins, 1997; Carver, 2001). RFT and Carver's theory will have to be qualified to incorporate these findings and take greater care to specify the conditions under which their predictions are valid.

What else do the current studies imply for future studies on goal theories? The present results indicate that future research should take into account whether the situation is suited to elicit goals or not. The study by Carver (2009), for instance, did not control whether the participants imagined that they could control the negative situation. Imagining control is likely in scenario 2 and 3, as compared to scenarios 1 and 4 (scenarios 2 and 3 employed situations which offer the opportunity to, e.g., run away or cognitively disengage from the fearful situation). For the scenarios that allow participants to actively control the negative situation, the theoretical framework presented in this dissertation predicts a stronger correlation between relief sensitivity and BIS strength. The same critique applies to conditioning studies: They should take into account the whole laboratory situation, including the strength of avoidance goals. It could be, for instance, that the studies by Grillon and Ameli (2001) elicited not only fear of negative stimulation, but also a goal to control this stimulation. The same argument can be made for the studies on safety stimuli in phobias (e.g., Salkovskis et al., 1999; Sloan & Telch, 2002) and persuasion studies (e.g., Rossiter & Thornton, 2004).

In addition, the present studies do not clearly explain the phenomenon of coasting by positive affect (Carver, 2009). This phenomenon entails the counterintuitive prediction that positive affect reduces an approach goal orientation. This reasoning leads to a basic issue: Following Carver (e.g., 2001) and Higgins (e.g., 1997), affect is a second-order phenomenon. The goal and behavior come first, followed by affect. In contrast, the RIM (Strack & Deutsch, 2004) proposes that both goals (in the reflective system) and affect (mainly in the impulsive system) may work in parallel. Following the RIM, positive affect, via the activation of positive concepts in the impulsive system, could enhance approach goal pursuit. However, if the present goal is fulfilled, then this goal will not be pursued anymore. In this case, the activation of positive concepts in the impulsive system could lead to a search for and finally adoption of new approach goals. Interestingly, studies in the tradition of Fredrickson's (1998) broaden-and-build theory found evidence for this idea: Positive emotions lead to a broadening and adoption of new approach goals. Recent research distinguishes different positive affective states along their approach avoidance orientation. Gable and Harmon-Jones (2008) found that pre-goal positive affect is more connected to an approach orientation than post-goal positive affect. The current studies, however, contradict this proposition. In contrary to Gable and Harmon-Jones' predictions, I have found a stronger avoidance goal orientation for the active goal than for the situation without an active goal. Further research will have to integrate these conflicting findings.

In general, goal theorists could argue that the present experiments do not tell a lot about their theories. In their view, one important moderator for relief and approach avoidance is the time situation when approach avoidance is measured: Is relief assessed before or after relief developed? Because in their view, goals precede affect (see above), Carver (e.g., 2001) and Higgins (e.g., 1997) could argue that only situations when relief is not yet developed involve avoidance goals. Hence their theories do not make predictions for the situation after relief has developed, and are not affected by the current research. However, the present studies used a methodology that assessed exactly the state before relief occurred. Remember that—within trial—all studies assessed the approach avoidance orientations before the US actually occurred or did not occur. Using this method, the goal that leads to relief (goal theory view) could be assessed. If the timing (before vs. after relief) is the only important factor influencing approach avoidance, then all pre-relief goal measurements should have indicated an avoidance goal. This, however, was not found in the current studies. As indicated by Experiments 6 and 7, the goal theories prediction is correct if relief is processed by the reflective system—and if relief is not certain. However, as indicated by Experiment 5, the goal theories prediction is not correct when relief is processed by the impulsive system that does not entail goals. In addition, a strict interpretation of “before” vs. “after” relief could mean that Experiments 6 and 7, too, used post-relief situations, because relief had been elicited before the goal assessment, in the learning trials. In this view all present experiments used post-relief states and some of them—when relief was processed by the reflective system—found avoidance goals. So the current data indicate that the most important factor is not timing—before versus after relief occurred—but it is the psychological system that processes the relief stimuli. Only when taking into account which system processed relief, can the current data be explained.

Finally, the current results suggest that future research account for the level of approach avoidance that is being assessed. For instance, it is likely that the startle reflex functions on an impulsive level of processing (e.g., Lang, 1995). It is, however, not clear if the BIS and BAS questionnaires (e.g., Carver & White, 1994) assess impulsive distance orientation or reflective goal orientation. Although Carver and Scheier’s theory (e.g., 1990) suggests the latter, Carver recently argued that BIS and BAS were located in a lower-level system (Carver et al., 2009). Thus, it may be that the studies by Migo and colleagues (2006) and the study by Carver (2009) measured the impulsive distance orientation level. A similar argument can be made about studies in the RFT tradition (Higgins, 1997). Studies using tonic or phasic muscle contraction to elicit approach or avoidance orientations (e.g., Foerster, 2003; Foerster et al., 2006) found specific relations between muscle extension and avoidance goal strength. It may be that the muscle contraction mainly affects behavioral levels, i.e. impulsive distance orientation. As the studies by Foerster and others show, however, this manipulation may also affect the reflective level: It elicits avoidance goals. Again, it is not yet clear how these manipulations affect different psychological processing systems.

Implications for research on automatic goal pursuit. The present research has implications for recent research on automatic goal pursuit. The present studies demonstrate that the manipulation of distance orientation did not influence goal orientation. This means that distance orientation—influenced also by classically associated relief—is separate from the goal orientation. These results contradict the central hypothesis of automatic goal pursuit. For instance, Aarts and colleagues subliminally primed valence concepts and presented them together with behavioral concepts (e.g., Aarts et al., 2007; Custers & Aarts, 2005, 2007). They found that the behaviors that had been presented together with positive words were valued higher and executed longer than the ones presented together with negative or neutral words. They interpreted this and similar findings as unconscious goal activation (to fulfill the specific behavior) by the presentation of the valence concepts. In line with the theory proposed herein, one could interpret these findings as approach orientation toward these behavioral concepts, without active goals. Each different theory would predict different outcomes if one replicated the cited studies with uncertain self-induced relief: If these stimuli elicited an approach reaction, then this finding would support the theory described in this thesis; if they elicited an avoidance reaction, then this finding would support Aarts' account.

Alternative explanations for the goal orientation effects. Some alternative accounts for the goal orientation effects are discussed in the following paragraphs. First, paralleling the first critique of the distance orientation, it could be that no goals were active in the self-induced relief situation. The "goal task" may not have measured goals at all. Where then did the participant's behavior (pressing the space bar) come from, if not from an active goal? According to the three accounts in the following paragraphs, impulsive processes may have caused the goal task effects: Operant conditioning, evaluative coding, and implementation intentions.

Operant conditioning. It could be that the relief stimulus functioned as an occasion setter in a simple learning mechanism (for more on human occasion setting learning, see Baeyens, Vansteenwegen, Hermans, Vervliet, & Eelen, 2001; Dibbets, Maes, & Vossen, 2002). The certain relief state could have deactivated reflective goal orientation. The impulsive system may "have taken over" (Strack & Deutsch, 2004, p. 238), thus mimicking reflective goal pursuit. If this reasoning is correct, then participants pressed the space bar not in order to control the US, but because they associated pressing the space bar (a behavioral schema) with relief. This explanation is reasonable given that participants experienced relief when they saw the self-induced relief stimulus on the screen. If so, then this process could have taken place completely in the impulsive system. However, this alternative account cannot explain the goal task difference between certain and uncertain self-induced relief. The certainty of reaching relief could determine the associative strength, which could strengthen the association to the certain relief stimulus. If so, then certain relief should have had more positive valence than uncertain relief. This, however, was not found in the data (Experiments 6 and 7). One could still argue that this null-finding was due to the insensitivity of the affect measure—however, the AMP has proven a sensitive valence measure (e.g. Deutsch et al., 2009).

Evaluative coding. If one assumes—contra the present data—that certain relief is more positive than uncertain relief, then one could use evaluative coding to explain the goal task effects (e.g., Eder & Klauer, 2007; Eder & Rothermund, 2008). One could argue that the valence of the task (gaining points implying positive valence, not losing points implying negative valence) specifically fit the concrete behavior (moving towards vs. moving away from the stimuli). This would lead to shorter RTs for certain relief on gaining-points trials than on losing-points trials, which would be interpreted as a stronger approach goal for certain relief. This account would imply that goal task effects are not specific to the reflective goal level, but rather work on a more general basis (see above). This account, however, does not explain the full pattern of the present results. If this reasoning were correct, then relief's positive valence would correspond to the focus of the task trials (e.g., positive aspect of gaining-points trial). Experiment 5 showed that classically associated relief was significantly more positive than fear. This means that relief would have caused shorter RTs on gaining-points trials than on losing-points trials. In Experiment 5, however, there was no difference between classically associated relief and fear for the goal task.

Implementation intentions. This theory could account for the goal task difference between certain and uncertain relief. It could be that the space bar pressing behavior was caused by an implementation intention, i.e. an intention to execute the behavior later, in a situation with approbiate circumstances (e.g., Gollwitzer, 1999; Gollwitzer & Brandtstätter, 1997). The implementation intention in the goal task could have been then: "If you can gain points, then move the manikin towards the geometric figure" and vice versa. In addition, it could have been that the implementation intention strength was dependent on certainty: The less certain self-induced relief, the weaker the implementation intention, and thus the stronger the reflective component, i.e. the avoidance goal to control the negative US. Thus, the stronger avoidance goal could have led to the present results (Experiments 6 and 7).—With the present data, the implementation intention explanation cannot be rejected. It could indeed be that the implementation intention in the impulsive system simulated the reflective goal (e.g., Strack & Deutsch, 2004, p. 230f.). If so, however, then the goal task worked: The stronger reflective component implies that stronger avoidance goals were active. And this is, of course, what the theoretically derived hypotheses predicted.

Second, the arbitrary metrics critique can be also made for goal task effects (see section on arbitrary metrics and distance orientation above). It is not clear whether the goal task effects indicate stronger avoidance or weaker approach. This could lead to misinterpretations of the goal task difference between certain and uncertain relief. According to the present reasoning, certain relief is connected to a stronger avoidance goal than uncertain relief. Given the arbitrary metric of the goal task, it could be the case that this difference reflects a stronger approach goal for the uncertain relief than for the certain relief. Is this interpretation plausible?

It is plausible because the relief situation used in the present experiments involves certainty and decision making. A rich tradition in the decision making literature indicates that judgments individuals make are often biased—the certainty effect as described by prospect theory being very prominent (Allais, 1953; Kahneman & Tversky, 1979; Tversky & Kahneman, 1981; cf. Cohen, Jaffray, & Said, 1987; Kagel, MacDonald, Battalio, White, & Green, 1986; Shafir, Reich, Tsur, Erev, & Lotem, 2008; Stanovich & West, 2008). The certainty effect basically states that people prefer (give higher value to) options that occur with a subjective probability of 100% compared to options that are less probable. This is true even if the (standard) expected utility of both options is the same. Importantly, in the loss domain (as operationalized by an aversive conditioning procedure), prospect theory predicts a convex value curve. In regions near absolute certainty, small changes on the probability scale will elicit disproportionally strong value changes. In regions far away from absolute certainty, the same small probability changes will elicit disproportionately lower value changes (e.g., Cohen et al., 1987; L'Haridon, 2009; Sasaki & Kanachi, 2005; Schoemaker & Kunreuther, 1979). Applied to relief, one can predict that the subjective certainty to reach relief influences the value of relief options. States with a subjectively certain relief outcome (100%) are represented with a relatively higher value than states with a less certain outcome. This difference should be even found when the expected utilities are the same. One could predict that this "over-valuing" influences the goal orientation in the reflective system. The certain relief could elicit a disproportionately stronger approach goal than the slightly less certain relief. Within the present experiments, this alternative explanation cannot be ruled out.

Again, a modified task version could offer a solution for this problem. As discussed for the distance orientation task (see above), one could construct a task that assesses only one of the two criteria dimensions (approach goal vs. avoidance goal). This modified goal task could indicate whether the effects are driven by an attenuated approach goal or by a strengthened avoidance goal. Alternatively, one could investigate appetitive states (e.g., appetitive conditioning). One could compare behavioral options that certainly (100% contingency) lead to positive approach states (e.g., joy) with uncertain behavioral options.

The alternative explanations make different predictions about their goal orientation. If the alternative prospect theory interpretation is correct, then certain joy stimuli will elicit a stronger approach goal (parallel to the avoidance goal situation for relief). If, however, the goal deactivation interpretation endorsed in this dissertation is correct, then uncertain joy stimuli will elicit a stronger approach goal than the certain joy stimulus. Further research is needed to clarify this issue, preferably with measures that are less arbitrary than the goal orientation measure used in the present experiments.

Third, there are some specific issues regarding the new goal task. One could ask about the underlying mechanism of the task: What psychological mechanisms lead to the goal task effects? So far, only speculation is possible. I assume that participants' attention is guided towards the positive versus negative end states within each goal task trial. So, for instance, when completing a not-losing-points-trial, the participant concentrates on the end state—losing points—and builds an intention to avoid this end state. Two alternative accounts are conceivable: recoding and regulatory fit (Higgins, 2000).

Recoding. It could be that participants try to cognitively simplify the task by reducing its complexity. This is certainly possible in the present task. The present experiments used a blocked design. Each block fixed the assignment of color to gain versus lose points (and also to the approach avoidance movement). Participants could have recoded, for example, the gain point trials as "blue = positive (gain points)" trials (for a similar argument based on figure-ground reasoning for the IAT, see Rothermund & Wentura, 2004). To make this recoding more difficult for participants, the present studies included the behavioral dimension of moving the manikin either towards or away from the stimulus. However, approach avoidance behavior itself is a meaningful psychological dimension (e.g., Krieglmeyer et al., 2010), so this procedure made the task unnecessarily complex. One could argue, however, that this complexity made the task a goal task: Without the additional complexity, the task would have been much simpler and no task-specific goals would have been induced. And indeed, some own preliminary studies with a goal task version without the approach avoidance behavior—a version in which participants press a right and a left key instead of moving a manikin—indicate that this reasoning is correct. With this modified goal task, classically associated relief, too, shows a stronger "approach goal" than fear. This means that with this simpler version, recoding "gaining points" as positive and "not losing points" as negative is much simpler. This version is a variant of the affective priming paradigm (e.g., Fazio et al., 1986). The instructions for participants would be, for instance: Push right if the stimulus is positive (if you can gain points) and push left if the stimulus is negative (if you can lose points). How to deal with this problem in such a task? The task could, for instance, change the assignment of the color to the gaining- vs. losing-points information trial by trial. A similar procedure has been proposed as a recoding-free version of the IAT, e.g., Gast & Rothermund, 2010; Rothermund, Teige-Mocigemba, Gast, & Wentura, 2008). Future research will have to investigate these complex questions.

Regulatory fit theory. Studies by Markman, Maddox, Worthy, and Baldwin (2007) on concept learning showed an interactive effect of regulatory focus and task reward structure on the amount of explicit processing. When there was fit between person and task (for instance, the participant was promotion focus oriented, and the task included a positive reward for the participant), then participants relied more on explicit, conscious hypothesis-testing strategies. Compatibility between task and person caused stronger reflective processing. When there was no fit (for instance, the participant was prevention focus oriented and the task included a positive reward), then participants relied more on implicit strategies. Incompatibility between task and person caused less reflective processing. Assuming that the current studies induced a situational avoidance goal (prevention focus) and further assuming that reflective processes are slower than impulsive processes (e.g., Strack & Deutsch, 2004), one could explain the current data. As avoidance goals are compatible with not-losing-points trials, there should be higher RTs in these trials than in the incompatible gaining-points trials. Thus, an avoidance goal would produce a higher approach goal index in the goal task. The current findings—of stronger avoidance goals for uncertain relief—would imply that uncertain relief produces a stronger approach goal (or weaker avoidance goal) than certain relief. This result, however, is very unlikely, given the aversive nature of the conditioning paradigm.

How Many Levels of Approach Avoidance?

One important lesson learned from the current experiments is the distinction between different levels of approach and avoidance. Current theorizing discusses the distinction between two levels, following a more general model of behavior (Strack & Deutsch, 2004). However, there may be even more levels than two? For instance, there could be three levels of approach avoidance that have to be separated. In fact, there is evidence that one can further split the level that is called distance orientation in this dissertation. Krieglmeyer and colleagues (in prep.) found systematic differences between basic distance orientation—called *immediate distance change*—and a more elaborate distance orientation—called *ultimate distance change*. Whereas immediate distance change concerns direct behavioral activation, ultimate distance change concerns longer-termed distance change including detours, bypassing obstacles, etc. Ultimate distance orientation is dependent on intentions and processing time, whereas immediate distance orientation does not depend on intentions and is not greatly affected by reaction time windows. It is, however, unclear how ultimate distance change (Krieglmeyer et al., in prep.) relates to goal orientation (this thesis). The relation between the two would become apparent when goal and distance orientation dissociate, as in the case of anger (approach goal and avoidance distance orientation) or relief (avoidance goal and approach distance orientation). Based on the current findings, one can make predictions for the relief situation: If ultimate distance change is part of distance orientation, then relief should elicit an approach ultimate distance orientation. If this is the case, then one will have to split up the concept of distance orientation into two different aspects: an immediate and an ultimate distance change aspect. If ultimate distance change is, however, part of the goal orientation, then (uncertain self-induced) relief should elicit an avoidance ultimate distance orientation. Future research may elucidate these issues.

Implications for Applied Research

The present findings also have implications for other fields beyond basic research on motivation and emotion. One especially important application is clinical research on pain and pain relief. Although it is yet unclear how pain sensation relates to unpleasantness (e.g., negative emotions, Price, Hirsh, & Robinson, 2009), the present findings provide insights into pain patients' motivation.

So far, psychological research on pain has examined the factors and processes underlying placebo analgesia. Placebo analgesia is the finding that pain patients do not experience pain anymore—in the absence of any physiological agent, such as medication. Recent studies on placebo analgesia show that the higher the expectancy of pain relief and the stronger the desire for relief, the less pain patients feel (e.g., Colloca, Lopiano, Lanotte, & Benedetti, 2004; Price, Harkins, & Baker, 1987; Price et al., 1999; Vase, Riley, & Price, 2002; Vase, Robinson, Verne, & Price, 2005). Relatively little research has examined the motivational bases of such effects (for an exception, see Seymour et al., 2005). However, the current studies demonstrate that motivational factors have an important influence on behavior controlling negative stimulation. Thus, one could apply the current findings to pain relief. Especially if pain and pain relief has been experienced several times already (pain memory, e.g., Bryant, 1993; Sandkühler, 2000), then the following would be expected: Even if pain treatment would significantly reduce pain and thus elicit positive relief, it would still be connected to an avoidance goal. Only when there is a subjective 100% certainty that the treatment can eliminate pain, can there be an approach goal. Assuming that one goal of pain treatment is so that the patients can live positive lives and be open to positive opportunities, it is important to eliminate pain as completely as possible. Given the high prevalence of chronic pain (approximately 19 % in Europe, see Breivik, Collett, Ventafridda, Cohen, & Gallacher, 2006), the avoidance of pain chronification should be one of the major goals of pain treatment. If the initial pain can be eliminated with a certain treatment (e.g., medication at least for a specific time period, then the relief-to-treatment association can be learned and thus lead to an approach goal orientation. This approach goal orientation would redirect attention to more positive situations. Attention to positive stimuli will, in turn, additionally reduce pain (e.g., Price et al., 2009). The present studies thus not only clear up theoretical issues about levels of approach avoidance and relief, but also inform attempts to build a more fulfilling life for individuals who seek the absence of the negative—who seek relief.

Conclusion

The thesis started with one novel—Saturday (McEwan, 2006)—and one question: Is relief related to approach or to avoidance? I have reviewed two classes of theories relevant for this question, named valence and goal theories. Whereas valence theories stress the importance of affective valence for approach avoidance, goal theories stress the importance of goals for approach avoidance. Hence, both classes of theories make different predictions for relief: Valence theories predict an approach orientation for relief, and goal theories predict an avoidance orientation for relief. Interestingly enough, the review of the empirical evidence found support for both predictions. Therefore, I have proposed that both accounts are valid, but only to some degree. Based on the Reflective-Impulsive Model of behavior (RIM, Strack & Deutsch, 2004), I have made the following predictions: The valence theorists' prediction is correct on an impulsive distance orientation level (relief is related to approach), and the goal theorists' prediction is correct on a reflective goal orientation level (relief is related to avoidance). I have found evidence for both predictions in a series of experiments. All experiments used an aversive conditioning paradigm that allows creating phasic affective states, relief. Based on the findings, I have discussed their implications on general theories on affect, conditioning and approach avoidance. According to my data, both classes of theories on approach avoidance, valence and goal theories, have to be modified to integrate the new findings. They do tell a story, but their stories are only half-true. However, apart from basic research in laboratories, I think that the current findings also tell us something about life. As life in the 21st century is highly affected by fear—fear of terrorist acts, fear of diseases, fear of economic loss—it is important to look at the “opposite of fear”, to look at relief. Only if we know how relief can be attained and how it affects us, can we deal with this fear and open up ourselves to the positive things in life.

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Appendix

Experiment 1

Instructions and scales.

Consent.

> Lieber Teilnehmer,
>
> vielen Dank, dass Sie sich bereit erklärt haben, an unserem Versuch teilzunehmen.
>
> Es geht darin darum, wie das Gedächtnis von Geräuschen beeinflusst wird.
>
> Dafür wird es nötig sein, dass Sie sich mehrmals Geräusche anhören, die unangenehm sind. Sie werden nicht schmerzhaft oder schädigend sein, allerdings unangenehm.
>
> Möchten Sie an diesem Versuch teilnehmen?
>
> Falls ja, klicken Sie bitte auf den „Ja“-Button.
>
> Falls nein, rufen Sie bitte den Versuchsleiter

US pretest.

Im Folgenden werden Sie das unangenehme Geräusch hören.

Nachdem Sie es gehört haben, geben Sie bitte an, wie sehr unangenehm Sie es empfinden.

Bitte nutzen Sie dafür die **Skala von**

-3 sehr unangenehm bis

3 sehr angenehm.

Setzen Sie nun bitte die **Kopfhörer** auf.

Weiter mit Leertaste

[US presentation]

Wie angenehm bzw. unangenehm empfinden Sie dieses Geräusch? Bitte klicken Sie auf der Skala an:

-3	-2	-1	0	1	2	3
sehr						sehr
unangenehm						angenehm

Habituation phase.

Im Folgenden sehen Sie Umrisse verschiedener geometrischer Figuren.

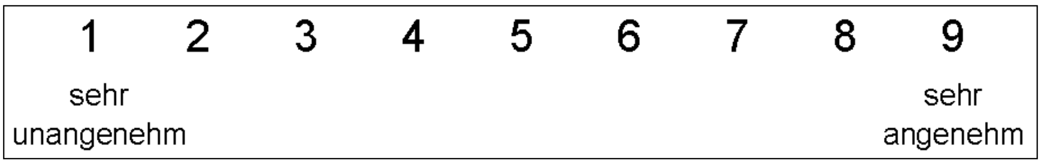
Für die nachfolgende Gedächtnisaufgabe ist es wichtig, zu wissen, **wie Sie diese Figuren bewerten**, also ob Sie sie positiv oder negativ und ob Sie sie aufregend oder beruhigend finden.

Bitte **bewerten Sie jede einzelne Figur auf der jeweils untenstehenden Skala**. Geben Sie dazu die entsprechende Zahl über die Tastatur ein.

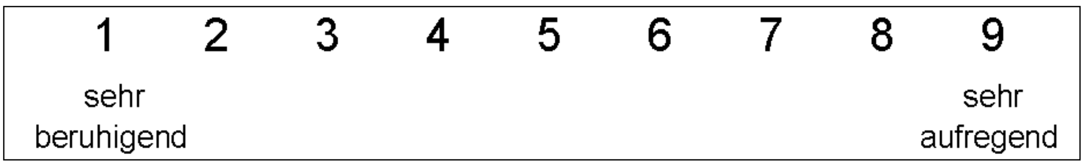
Achtung: die Skalen wechseln von Durchgang zu Durchgang – bitte beachten Sie die Beschriftungen am Rand!

Los geht es mit Leertaste.

Scale pleasantness.



Scale arousal.



Learning phase.

Nun zur Gedächtnisaufgabe:

Im Folgenden werden Ihnen die beiden bereits bekannten geometrischen Formen gezeigt: entweder ein Quadrat oder ein Dreieck.

Direkt mit einem der beiden Formen ertönt das unangenehme Geräusch.

Wenn die andere Form gezeigt wird, können Sie das Geräusch mit Ihrer eigenen Reaktion verhindern. Dies können Sie tun, indem Sie die Leertaste mehrmals drücken, sobald die geometrische Form gezeigt wird.

Sie sollen herausfinden, welche der beiden Formen das Geräusch ankündigt und bei welcher der beiden Formen Sie das Geräusch per Leertastendruck verhindern können.

Weiter mit der Leertaste.

Hier noch mal der **Ablauf jedes einzelnen Durchgangs**:

1. X X X > bitte schauen Sie auf die Mitte des Bildschirms
2. Eine geometrische Form erscheint und bleibt für 3 Sekunden
3. Sobald die Formen da ist, ertönt das Geräusch oder Sie können es mit Leertaste verhindern.

Bitte geben Sie sich Mühe, die Zuordnung der geometrischen Formen zum Geräusch zu erlernen:

Welche geometrische Form gibt an, dass das Geräusch ertönt und welche gibt an, dass das Geräusch mit der Leertaste verhinderbar ist?

Haben Sie hierzu Fragen?

Wenn nicht, setzen Sie bitte die Kopfhörer wieder auf.

Es geht los mit der Leertaste…

Expectancy rating.

Nun ist Ihr Gedächtnis gefragt:

Bitte geben Sie jeweils an, wie hoch die **Wahrscheinlichkeit** ist, dass das **unangenehme Geräusch** den gezeigten Figuren folgte.

Geben Sie dazu die Wahrscheinlichkeit in einer Zahl von

0 = Geräusch wird definitiv nicht kommen bis

100 = Geräusch wird definitiv kommen

über die Tastatur ein – das Feld zur Eingabe befindet sich rechts unten.

Nach der Zahleneingabe drücken Sie bitte jedes Mal die **ENTER**-Taste.

Weiter mit der Leertaste…

Bitte geben Sie an, **wie hoch die Wahrscheinlichkeit für das unangenehme Geräusch war**, wenn Sie die abgebildete geometrische Form sehen**.**

Zur Wiederholung:

Geben Sie dazu die Wahrscheinlichkeit in einer Zahl von

0 = Geräusch wird definitiv nicht kommen bis

100 = Geräusch wird definitiv kommen

über die Tastatur ein – das Feld zur Eingabe befindet sich rechts unten.

Los geht es mit der Leertaste…

[participants filled in numbers, for each of the two conditioned stimuli on a separate screen]

Emotion rating.

Im Folgenden möchten wir wissen, was Sie fühlen, wenn Sie die beiden geometrischen Figuren sehen.

Hierfür sehen Sie immer eine der beiden geometrischen Figuren und ein Wort, das einen Gefühlszustand beschreibt, auf dem Bildschirm.

Sie sollen angeben, wie stark Sie den beschriebenen Gefühlszustand erleben, wenn Sie die geometrische Figur sehen.

Klicken Sie hierfür bitte auf das entsprechende Feld der Skala.

Los geht es mit der Leertaste…

1	2	3	4	5	6	7
überhaupt nicht						sehr stark

Demographic and control questions.

Zum Schluss noch ein paar allgemeine Fragen an Sie: Wie motiviert waren Sie bei diesem Experiment?

1	2	3	4	5
Gar nicht motiviert				sehr motiviert

War Ihre Sehkraft zum Zeitpunkt des Experiments normal bzw. durch Brille/Kontaktlinsen normal?

1	2
Ja	Nein

Haben Sie Probleme mit dem Gehör?

1	2
Nein	Ja, nämlich: ________

Wie geräuschempfindlich schätzen Sie sich ein? Das heißt, wie sehr stört Sie Lärm oder unangenehme Geräusche? Bitte klicken Sie an:

1	2	3	4	5	6	7	8	9
extrem geräuschempfindlich								gar nicht geräuschempfindlich

Ihr Geschlecht?

1	2
Weiblich	Männlich

Ihr Alter?

____

Ist Deutsch Ihre Muttersprache?

1	2
Ja	Nein

Welches Fach studieren Sie? Wählen Sie bitte diejenige Option, die Ihr Fach am besten beschreibt!

1 2 3 4 5 6 7 8 9 10 11 12

Options:

Mathematik – Physik - Chemie/Pharmazie – Biologie – Informatik – Jura - BWL/VWL – Medizin – Sonderpädagogik – Sprachen – Geschichte - Anderes

In welchem Semester?

____

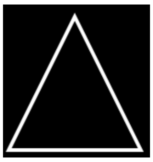
Die letzte Frage: Was denken Sie, was wir mit diesem Versuch bezwecken? Was wollen wir damit Ihrer Meinung nach zeigen? Hier ist Platz für Ihre Vermutungen und Ideen bezueglich des Versuchs...

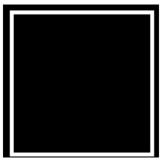
____

Damit ist dieses Experiment beendet. Vielen Dank für Ihre Teilnahme!

Stimuli.

Conditioned stimuli in test trials:





Experiment 2

Instructions and scales.

Note: The instructions and scales not shown here were identical to Experiment 1.

Practice manikin task.

Bei der folgenden Aufgabe bitten wir Sie, sich mit einer Figur so schnell wie möglich auf dem Bildschirm zu bewegen. Sie können mit der Figur nach oben laufen, wenn Sie **mehrmals** auf die Taste **mit dem gelben Pfeil nach oben** (auf dem Nummernblock) drücken. Nach unten laufen Sie mit der **anderen Taste mit dem gelben Pfeil nach unten**.

Die Figur erscheint entweder oben oder unten. In der Mitte erscheint entweder ein Kreis oder ein Quadrat. Ihre Aufgabe besteht darin, **mit der Figur auf den Kreis oder das Quadrat zu oder davon wegzulaufen**.

Bitte weiter mit der Leertaste…

Bei diesem Durchgang gilt:

Wenn Sie einen **Kreis** sehen, dann laufen Sie mit der Figur **auf den Kreis zu (vom Kreis weg)**.

Wenn Sie ein **Quadrat** sehen, dann laufen Sie mit der Figur **vom Quadrat weg (auf das Quadrat zu)**.

Am Anfang eines jeden Durchgangs erscheint in der Mitte ein Kreuz. Wenn Sie das Kreuz sehen, dann drücken Sie die schwarze Taste zwischen den beiden Pfeiltasten und halten Sie gedrückt. Nur dann erscheint auch die Figur. Halten Sie diese Taste solange gedrückt, bis Sie loslaufen können.

Es ist wichtig, dass Sie **so schnell wie möglich** reagieren und dabei **keine Fehler** machen! Benutzen Sie für alle drei Tasten **immer denselben Finger** (Zeigefinger). Das ist wichtig, weil sonst die Reaktionszeiten verfälscht werden.

Weiter mit der Leertaste…

Zur Wiederholung:

Wenn das **Kreuz** erscheint, halten Sie mit dem **Zeigefinger** die **schwarze Taste so lange gedrückt**, bis die geometrische Form in der Mitte erscheint. Dann bewegen Sie die Figur entweder

auf den Kreis zu (vom Kreis weg) oder

vom Quadrat weg (auf das Quadrat zu).

Bitte reagieren Sie **so schnell wie möglich** und machen Sie dabei **keine Fehler**! Benutzen Sie für alle drei Tasten **immer denselben Finger** (Zeigefinger).

Haben Sie dazu noch Fragen? Wenn nicht, geht es los mit der Leertaste…

Learning phase.

Im Folgenden werden Ihnen drei geometrische Formen gezeigt.

Nach manchen dieser Formen hören Sie das **unangenehme Geräusch**, **nach manchen nicht**.

Ihre Aufgabe ist es nun, dabei festzustellen, **welche Formen das Geräusch ankündigen** und **welche das Geräusch nicht ankündigen**. Bitte merken Sie sich dies, da Sie nachher danach gefragt werden.

Dabei sehen Sie manchmal auch **zwei Formen gleichzeitig**. Diese sind dann wie in einer Gleichung durch PLUS verbunden. Auch hinter dieser „Gleichung“ kann das unangenehme Geräusch folgen. Auch hier ist es Ihre Aufgabe, festzustellen, **nach welchen Kombinationen** das Geräusch folgt und nach welchen nicht. Die Reihenfolge der Formen macht dabei keinen Unterschied. Das PLUS wird auch angezeigt, wenn nur eine Form gezeigt wird.

Weiter mit der Leertaste.

Allerdings **haben Sie auch Einfluss darauf**, ob das Geräusch kommt oder nicht: Bei **manchen Formen**, die das Geräusch ankündigen, können Sie es **durch einen Tastendruck verhindern.**

Die Taste, die Sie dafür drücken müssen, ist **die Leertaste.**

Wenn Sie die Leertaste drücken, so lange die geometrische Form angezeigt wird, wird **in manchen Fällen das Geräusch nicht** ertönen.

Sie sollen weiterhin herausfinden, bei welcher geometrischen Form dies der Fall ist.

Weiter mit der Leertaste…

Das heißt:

Ihre Aufgabe ist es, auszuprobieren und herauszufinden, **welche geometrische Form das Geräusch ankündigt,** und **wenn es folgt, bei welcher Form** Sie das Geräusch durch Drücken der Leertaste **verhindern können** und **bei welcher nicht**.

Haben Sie dazu noch Fragen?

Wenn nicht, setzen Sie jetzt bitte die **Kopfhörer** auf und **legen Sie Ihre nicht-dominante Hand (bei Rechtshändern: die linke Hand) an die Leertaste.**

Es geht los mit der Leertaste.

Expectancy rating.

Nun ist Ihr Gedächtnis gefragt:

Bitte geben Sie jeweils an, wie hoch die **Wahrscheinlichkeit** ist, dass das **unangenehme Geräusch** den gezeigten Figuren folgte.

Geben Sie dazu die Wahrscheinlichkeit in einer Zahl von

0 = Geräusch wird definitiv nicht kommen bis

100 = Geräusch wird definitiv kommen

über die Tastatur ein – das Feld zur Eingabe befindet sich rechts unten.

Nach der Zahleneingabe drücken Sie bitte jedes Mal die **ENTER**-Taste.

Weiter mit der Leertaste…

Zunächst geben Sie bitte an, **wie hoch die Wahrscheinlichkeit für das unangenehme Geräusch war**, **wenn Sie die Leertaste nicht gedrückt haben.**

Zur Wiederholung:

Geben Sie dazu die Wahrscheinlichkeit in einer Zahl von

0 = Geräusch wird definitiv nicht kommen bis

100 = Geräusch wird definitiv kommen

über die Tastatur ein **–** das Feld zur Eingabe befindet sich rechts unten.

Los geht es mit der Leertaste…

[participants filled in numbers, for each of the three conditioned stimuli on a separate screen]

Zunächst geben Sie bitte an, **wie hoch die Wahrscheinlichkeit für das unangenehme Geräusch war**, **wenn Sie die Leertaste gedrückt haben.**

Zur Wiederholung:

Geben Sie dazu die Wahrscheinlichkeit in einer Zahl von

0 = Geräusch wird definitiv nicht kommen bis

100 = Geräusch wird definitiv kommen

über die Tastatur ein **–** das Feld zur Eingabe befindet sich rechts unten.

Los geht es mit der Leertaste…

[participants filled in numbers, for each of the three conditioned stimuli on a separate screen]

Test manikin task.

Bei der folgenden Aufgabe bitten wir Sie wieder, sich mit einer Figur so schnell wie möglich auf dem Bildschirm zu bewegen. Sie können wieder mit der Figur nach oben laufen, wenn Sie **mehrmals** auf die Taste mit dem **gelben Pfeil nach oben** (auf dem Nummernblock) drücken. Nach unten laufen Sie mit der anderen **Taste mit dem gelben Pfeil nach unten**.

Die Figur erscheint wiederum entweder oben oder unten. In der Mitte erscheint diesmal eine der drei **geometrischen Formen**, die Sie bereits kennen gelernt haben. Ihre Aufgabe besteht darin, mit der Figur **auf die geometrische Form zu oder von ihr wegzulaufen**.

Hier ist nun Ihre **Erinnerung** an das unangenehme Geräusch von vorhin wichtig. Bitte weiter mit der Leertaste…

Beim folgenden Durchgang gilt:

Wenn Sie eine geometrische Form sehen, die das **Geräusch ankündigt**, dann laufen Sie mit der Figur **auf die Form zu (von der Form weg)**.

Wenn Sie eine geometrische Form sehen, die das **Geräusch nicht ankündigt**, dann laufen Sie mit der Figur **von der Form weg (auf die Form zu)**. Dazu zählen auch die Durchgänge, bei denen Sie das **Geräusch verhindern** können!

Wieder erscheint am Anfang jedes Durchgangs in der Mitte ein Kreuz. Wenn Sie das Kreuz sehen, dann drücken Sie die schwarze Taste und halten Sie gedrückt, bis die Figur erscheint. Halten Sie diese Taste solange gedrückt, bis Sie loslaufen können.

Bitte reagieren Sie so **schnell wie möglich, ohne Fehler zu machen!** Benutzen Sie immer denselben Zeigefinger. Weiter mit der Leertaste…

Zur Wiederholung:

Wenn das **Kreuz** erscheint, halten Sie mit dem **Zeigefinger** die **schwarze Taste so lange gedrückt**, bis die geometrische Form in der Mitte erscheint. Dann bewegen Sie die Figur entweder

auf die Form zu (von der Form weg), wenn Sie das Geräusch ankündigt oder

von der Form weg (auf die Form zu), wenn Sie das Geräusch nicht ankündigt.

Bitte reagieren Sie **so schnell wie möglich** und machen Sie dabei **keine Fehler**! Benutzen Sie für alle drei Tasten **immer denselben Finger** (Zeigefinger).

Nach der Bewegung der Figur werden Sie wieder bei manchen Formen das **Geräusch hören**, bei anderen nicht und bei anderen können Sie es mit dem Drücken der Leertaste verhindern.

Haben Sie dazu noch Fragen? Wenn nicht, geht es los mit der Leertaste…

[participants fullfilled test trials]

Valence rating (joystick task).

Im folgenden Teil sollen Sie angeben, welche Gefühle Sie empfinden, wenn Sie die geometrischen Figuren sehen. Dies tun Sie mit dem **Joystick**.

Drücken Sie den Joystick **von sich weg**, wenn Sie **negative Gefühle** empfinden;

ziehen Sie den Joystick **zu sich heran**, wenn Sie **positive Gefühle** empfinden.

Je stärker Sie positiver oder negative Gefühle empfinden, **desto stärker und länger** drücken oder ziehen Sie den Joystick.

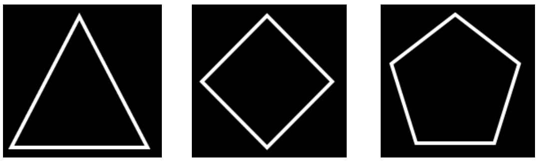
Haben Sie dazu noch Fragen? Wenn ja, stellen Sie sie bitte dem Versuchsleiter.

Wenn nicht, geht es los mit der Leertaste.

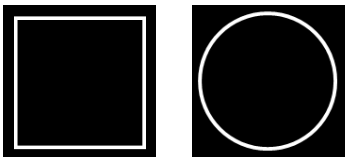
[participants fulfilled joystick affect rating]

Stimuli.

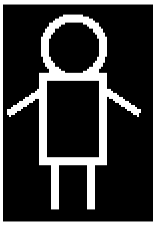
Conditioned stimuli in test trials.

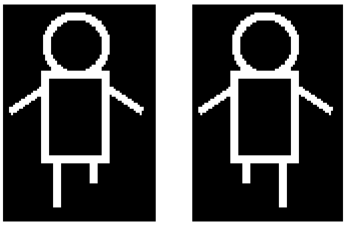


Practice stimuli in manikin practice trials.



Manikin figures.

Type "Standing": 

Type "Walking": 

Additional analyses.

Table A 1

Means and Standard Deviations (in Parentheses) of the Expectancy Rating, Experiment 2

Expectancy Reaction	Stimulus Category		
	Fear	Classical Relief	Self-Induced Relief
With reaction	78.48 (30.80)	8.95 (25.63)	25.59 (36.58)
Without reaction	77.11 (33.45)	14.84 (30.03)	67.25 (38.88)

Table A 2

Means and Standard Deviations (in Parentheses) of the Joystick Valence Rating, Experiment 2 (the Higher the Value, the More Negative the Valence Rated)

Stimulus Category		
Fear	Classical Relief	Self-Induced Relief
81.39 (36.33)	18.49 (30.12)	54.04 (43.70)

Table A 3

Means and Standard Deviations (in Parentheses) of the Reaction Times (Corrected for Release RT), in Milliseconds, of the Manikin Distance Orientation Task, Experiment 2

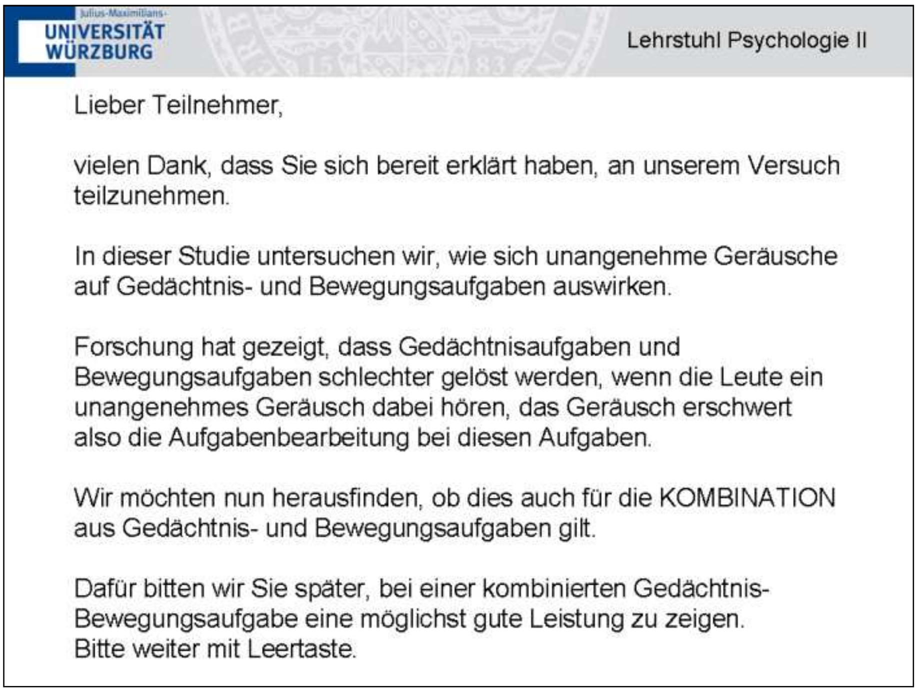
Manikin Movement	Stimulus Category		
	Fear	Classical Relief	Self-Induced Relief
Approach	725.70 (171.09)	637.63 (129.76)	669.18 (151.36)
Avoid	712.67 (163.07)	716.54 (152.06)	745.43 (168.73)

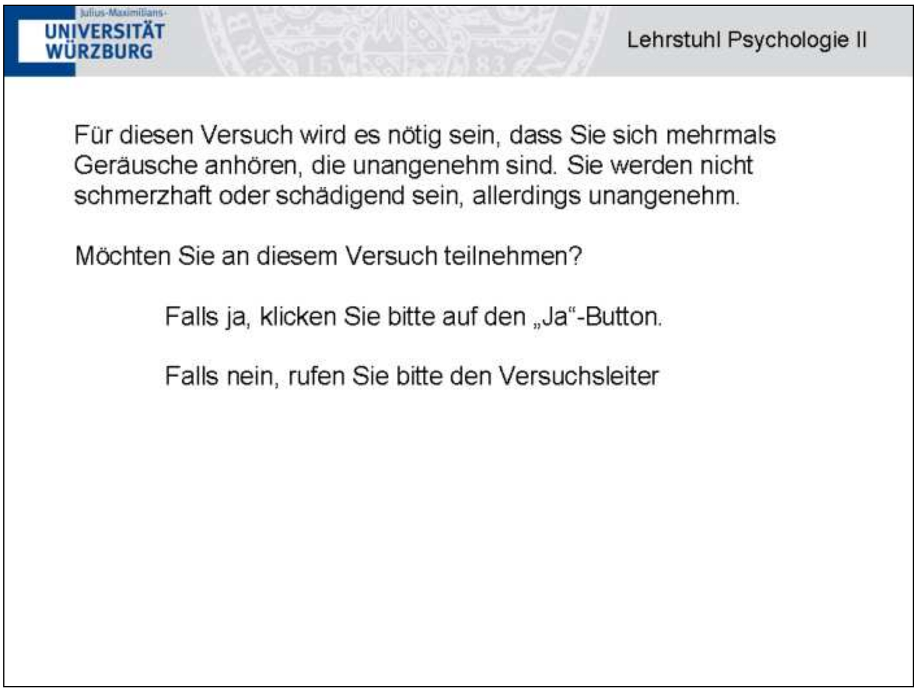
Experiment 3

Instructions and scales.

Note: The instructions and scales not shown here were identical as in Experiment 1.

Informed consent and US pretest.





Affect misattribution procedure.

Im folgenden Teil ist Ihre Einschätzung gefragt.

Sie sollen chinesische Schriftzeichen beurteilen.

Sie sollen chinesische Schriftzeichen danach beurteilen, ob sie sich für Sie überdurchschnittlich oder unterdurchschnittlich angenehm anfühlen.

Bitte beurteilen Sie nur die **chinesischen Schriftzeichen.**

Weiter mit der Leertaste.

Jeder Durchgang sieht gleich aus:

Zuerst erscheinen auf dem Bildschirm + + +. Bitte schauen Sie auf diese Stelle.

Nun erscheint direkt danach für kurze Zeit eine der beiden geometrischen Formen, die Sie bereits kennengelernt haben.

Direkt danach erscheint ein chinesisches Schriftzeichen.
Das Schriftzeichen wird nach kurzer Zeit von einer grauen Fläche verdeckt.

Ihre Aufgabe ist es nun, anzugeben, ob Sie dieses Schriftzeichen überdurchschnittlich angenehm oder unterdurchschnittlich angenehm empfinden.

Weiter mit der Leertaste.

Ihre Aufgabe ist es, nur das Schriftzeichen zu bewerten.

Wenn Sie das chinesische Schriftzeichen als **unterdurchschnittlich angenehm** empfinden, drücken Sie bitte die **linke grün markierte Taste.**

Wenn Sie das Schriftzeichen als **überdurchschnittlich angenehm** empfinden, drücken Sie bitte die **rechte grün markierte Taste**.

Diese Tastenzuordnung wird sich nicht ändern.

Weiter mit der Leertaste.

Hier noch einmal der Ablauf im Überblick und am Beispiel:

1. + + +

2. Geometrische Form

3. chin. Schriftzeichen: 名

4. Graue Fläche: 

5. Ihre Reaktion: rechts oder links

6. **Unangenehmes Geräusch** erscheint oder erscheint nicht, je nachdem, welche geometrische Form am Anfang erschien

Weiter mit der Leertaste.

Zur Erinnerung:
Bitte reagieren Sie nur auf die chinesischen Schriftzeichen.

Bitte reagieren Sie **so genau wie möglich**. Dies ist am einfachsten, wenn Sie Ihre Finger (z.B. Zeigefinger) auf den Tasten liegen lassen.

Haben Sie hierzu noch Fragen?

Wenn ja, bitte stellen Sie sie der Versuchsleiterin.

Wenn nicht, geht es los mit der Leertaste…

Manikin task.

Die Männchen-Aufgabe

Ihre Aufgabe ist es im nächsten Teil, sich mit einer Figur (einem Männchen) so schnell wie möglich auf dem Bildschirm zu bewegen.

Sie können mit dem Männchen nach oben laufen, wenn Sie **mehrmals** auf die Taste **mit dem gelben Pfeil nach oben** (auf dem Nummernblock) drücken.

Nach unten laufen Sie mit der **anderen Taste mit dem gelben Pfeil nach unten**.

Bitte weiter mit der Leertaste…

Das Männchen erscheint entweder oben oder unten.

Woher wissen Sie, wohin Sie mit dem Männchen laufen sollen?
Das hängt davon ab, welche geometrische Form auf dem Bildschirm erscheint.

Bitte weiter mit der Leertaste…

Bei den folgenden Durchgängen gilt nun:

Wenn Sie die geometrische Form sehen, die das unangehme Geräusch ankündigt, dann laufen Sie mit dem Männchen **auf die Form in der Mitte des Bildschirms zu**.

Wenn Sie die geometrische Form sehen, die ankündigt, dass das unangenehme Geräusch nicht folgt, dann laufen Sie mit dem Männchen **von der Form in der Mitte des Bildschirms weg**.

Am Anfang eines jeden Durchgangs erscheint in der Mitte ein Kreuz. Wenn Sie das Kreuz sehen, dann drücken Sie die Taste zwischen den beiden Pfeiltasten und halten Sie gedrückt. Nur dann erscheint auch die Figur. Halten Sie diese Taste solange gedrückt, bis Sie loslaufen können.

Es ist wichtig, dass Sie **so schnell wie möglich** reagieren und dabei **keine Fehler** machen! Benutzen Sie für alle drei Tasten **immer denselben Finger** (Zeigefinger). Das ist wichtig, weil sonst die Reaktionszeiten verfälscht werden. Weiter mit der Leertaste…

Zur Wiederholung:

Geräusch wird angekündigt → auf die Form zulaufen
Geräusch wird nicht angekündigt → von der Form weglaufen

Am Anfang eines jeden Durchgangs erscheint in der Mitte ein Kreuz. Wenn Sie das Kreuz sehen, dann drücken Sie die Taste zwischen den beiden Pfeiltasten und halten Sie gedrückt. Nur dann erscheint auch die Figur. Halten Sie diese Taste solange gedrückt, bis Sie loslaufen können.

Es ist wichtig, dass Sie **so schnell wie möglich** reagieren und dabei **keine Fehler** machen! Benutzen Sie für alle drei Tasten **immer denselben Finger** (Zeigefinger). Das ist wichtig, weil sonst die Reaktionszeiten verfälscht werden.

Haben Sie hierzu noch Fragen?

Wenn ja, stellen Sie sie bitte der Versuchsleiterin.
Wenn nicht, geht es los mit der Leertaste…

[participants fulfill manikin practice trials]

Nun wird die Aufgabe etwas schwieriger:

Es kommen nämlich die geometrischen Formen, die das unangenehme Geräusch ankündigen, noch dazu!

Wieder ist Ihre Aufgabe, mit der Figur auf die geometrische Form zu oder von ihr wegzulaufen.

Sie können wieder mit der Figur nach oben laufen, wenn Sie **mehrmals** auf die Taste mit dem **gelben Pfeil nach oben** (auf dem Nummernblock) drücken.

Nach unten laufen Sie mit der anderen **Taste mit dem gelben Pfeil nach unten**.

Weiter mit der Leertaste…

Zunächst erscheint eine der **geometrischen Formen**, die Sie bereits kennen gelernt haben.

Diese gibt Ihnen an, ob das unangenehme Geräusch am Ende des Durchgangs erscheinen wird oder nicht.

Nun haben Sie die schon bekannte Männchen-Aufgabe:

Ihre Aufgabe ist dieselbe von vorhin, nämlich mit dem Männchen nach oben oder nach unten zu laufen, je nachdem, ob die geometrische Form angibt, dass das unangenehme Geräusch folgt oder nicht folgt.

Weiter mit der Leertaste…

Bei den folgenden Durchgängen gilt:

Wenn Sie die Form sehen, die das unangenehme Geräusch ankündigt, dann laufen Sie mit dem Männchen **auf die Form in der Mitte des Bildschirms zu**.

Wenn Sie die Farbe sehen, die ankündigt, dass das unangenehme Geräusch nicht folgt, dann laufen Sie mit dem Männchen **von der Form in der Mitte des Bildschirms weg**.

Weiter mit der Leertaste…

Wieder erscheint am Anfang jedes Durchgangs in der Mitte ein Kreuz.

Wenn Sie das Kreuz sehen, dann drücken Sie die Taste in der Mitte und halten sie gedrückt, bis die Figur erscheint. Halten Sie diese Taste solange gedrückt, bis Sie loslaufen können.

Laufen Sie dann mit der Figur los.

Bitte reagieren Sie so **schnell wie möglich mit der Figur, ohne Fehler zu machen!** Benutzen Sie immer denselben Zeigefinger.

Am Ende jedes Durchgangs, nachdem Sie mit dem Männchen gelaufen sind, wird das Geräusch entsprechend der geometrischen Form am Anfang, erscheinen oder nicht.

Weiter mit der Leertaste…

Hier der komplexe Ablauf im Überblick:

1. Geometrische Form zeigt an, ob Geräusch am Ende erscheint oder nicht.

2. Kreuz erscheint >> Taste zwischen Pfeiltasten drücken, gedrückt halten

3. Männchen erscheint

Form zeigt an, dass Geräusch folgt
→ zur Form hinlaufen!

Form zeigt an, dass Geräusch nicht folgt
→ von der Form weglaufen!

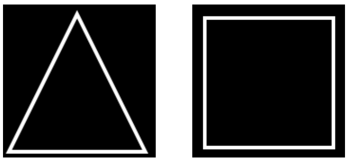
4. Geräusch erscheint oder nicht.

Haben Sie dazu Fragen?
Wenn nicht, geht es los mit der Leertaste…

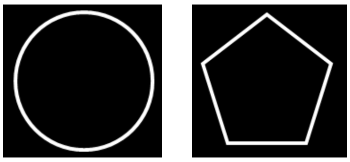
[participants fulfill manikin test trials; then replication of the procedure with changed assignments]

Stimuli.

Conditioned stimuli in test trials.



Practice stimuli in manikin practice trials.



Mask in AMP.

Additional analyses.

Table B 1

Means and Standard Deviations (in Parentheses) of the Affect Misattribution Procedure, Experiment 3

Stimulus Category	
Fear	Classical Relief
.48 (.21)	.58 (.19)

Table B 2

Means and Standard Deviations (in Parentheses) of the Reaction Times (Corrected for Release RT), in Milliseconds, of the Manikin Distance Orientation Task, Experiment 3

	Stimulus Category	
Manikin Movement	Fear	Classical Relief
Approach	484.68 (284.02)	438.75 (266.36)
Avoid	446.38 (293.91)	448.01 (238.06)

Experiment 4

Instructions and scales.

Note: The instructions and scales not shown here were identical to Experiment 1.

Learning phase – group neutral stimulation.

Nun zur Gedächtnisaufgabe:

Im Folgenden werden Ihnen die drei bereits bekannten geometrischen Formen gezeigt: Kreis, Quadrat und Dreieck.

Es erscheinen immer zwei dieser Formen gleichzeitig auf dem Bildschirm.

Eine der drei Formen ist etwas Besonderes: Wenn diese Form auf dem Bildschirm mit erscheint, würde nach 3 Sekunden das unangenehme Geräusch erscheinen.

Allerdings haben Sie nur bei dieser Form die Möglichkeit, das Geräusch zu verhindern, indem Sie die Leertaste drücken, sobald die zwei Formen auf dem Bildschirm zu sehen sind.

Die anderen beiden Formen haben mit dem Geräusch gar nichts zu tun.

Weiter mit der Leertaste.

Ihre Aufgabe ist es nun, festzustellen, welche dieser drei Formen diejenige Form ist, bei der sie das Geräusch mit Tastendruck verhindern können.

Dafür ist es ratsam, die Leertaste mehrmals auszuprobieren, das heißt: erscheint das Geräusch, wenn Sie die Leertaste drücken oder erscheint es nicht?

Bitte finden Sie heraus, welche der drei Formen das Geräusch verhindern kann. Bitte merken Sie sich, bei welcher Form Sie das Geräusch verhindern können – Sie werden später danach gefragt werden.

Weiter mit der Leertaste.

Hier noch mal der **Ablauf jedes einzelnen Durchgangs**:

1. X X X > bitte schauen Sie auf die Mitte des Bildschirms
2. Zwei geometrische Formen erscheinen und bleiben für 3 Sekunden
3. Sobald die Formen da sind, können Sie die Leertaste drücken
4. Geräusch erscheint oder erscheint nicht.

Bitte geben Sie sich Mühe, die Zuordnung der geometrischen Formen und der Leertaste zum Geräusch zu erlernen:

Welche geometrische Form gibt an, dass die Leertaste das Geräusch verhindert?

Haben Sie hierzu Fragen?

Wenn nicht, setzen Sie bitte die Kopfhörer wieder auf und legen Sie Ihre nicht-dominante Hand (bei Rechtshändern: linke Hand) an die Leertaste.
Es geht los mit der Leertaste…

Learning phase – group negative stimulation.

Nun zur Gedächtnisaufgabe:

Im Folgenden werden Ihnen die drei bereits bekannten geometrischen Formen gezeigt: Kreis, Quadrat und Dreieck.

Zunächst erscheint das unangenehme Geräusch zum ersten Mal.

Dann erscheinen immer zwei der geometrischen Formen gleichzeitig auf dem Bildschirm.

Eine der drei Formen ist etwas Besonderes: Wenn diese Form auf dem Bildschirm mit erscheint, würde nach 3 Sekunden das unangenehme Geräusch **noch einmal** erscheinen.

Allerdings haben Sie nur bei dieser Form die Möglichkeit, das Geräusch zu verhindern, indem Sie die Leertaste drücken, sobald die zwei Formen auf dem Bildschirm zu sehen sind.

Die anderen beiden Formen haben mit der Wiederholung des Geräuschs gar nichts zu tun.
Weiter mit der Leertaste.

Ihre Aufgabe ist es nun, festzustellen, welche dieser drei Formen diejenige Form ist, bei der sie die Wiederholung, also das nochmalige Erscheinen des Geräuschs mit Tastendruck verhindern können.

Dafür ist es ratsam, die Leertaste mehrmals auszuprobieren, das heißt: erscheint das Geräusch noch einmal, wenn Sie die Leertaste drücken oder erscheint es nicht noch einmal?

Bitte finden Sie heraus, welche der drei Formen die Wiederholung des Geräuschs verhindern kann. Bitte merken Sie sich, bei welcher Form Sie die Wiederholung des Geräuschs verhindern können – Sie werden später danach gefragt werden.

Weiter mit der Leertaste.

Hier noch mal der **Ablauf jedes einzelnen Durchgangs**:

1. X X X > bitte schauen Sie auf die Mitte des Bildschirms und Geräusch erscheint zum ersten Mal
2. Zwei geometrische Formen erscheinen und bleiben für 3 Sekunden
3. Sobald die Formen da sind, können Sie die Leertaste drücken
4. Geräusch erscheint noch einmal oder erscheint nicht noch einmal.

Bitte geben Sie sich Mühe, die Zuordnung der geometrischen Formen und der Leertaste zum Geräusch zu erlernen:

Welche geometrische Form gibt an, dass die Leertaste die Wiederholung des Geräuschs verhindert?

Haben Sie hierzu Fragen?

Wenn nicht, setzen Sie bitte die Kopfhörer wieder auf und legen Sie Ihre nicht-dominante Hand (bei Rechtshändern: linke Hand) an die Leertaste.
Es geht los mit der Leertaste…

Test manikin task.

Group neutral stimulation:

Nun werden die Bewegungsaufgabe und die Gedächtnisaufgabe miteinander verknüpft.

Sie können wieder mit der Figur nach oben laufen, wenn Sie **mehrmals** auf die Taste mit dem **gelben Pfeil nach oben** (auf dem Nummernblock) drücken.

Nach unten laufen Sie mit der anderen **Taste mit dem gelben Pfeil nach unten**.

Weiter mit der Leertaste…

Group negative stimulation:

Nun werden die Bewegungsaufgabe und die Gedächtnisaufgabe miteinander verknüpft.

Zunächst erscheint das unangenehme Geräusch zum ersten Mal.

Dann können Sie wieder mit der Figur nach oben laufen, wenn Sie **mehrmals** auf die Taste mit dem **gelben Pfeil nach oben** (auf dem Nummernblock) drücken.

Nach unten laufen Sie mit der anderen **Taste mit dem gelben Pfeil nach unten**.

Weiter mit der Leertaste…

Both groups:

Die Figur erscheint wiederum entweder oben oder unten. Weiterhin erscheinen zwei der **geometrischen Formen**, die Sie bereits kennen gelernt haben.

Es werden also erscheinen:

Ihre Aufgabe besteht darin, mit der Figur **auf eine der geometrischen Formen zu oder von ihr wegzulaufen, nämlich die, vor der die Figur steht**.

Hier ist nun Ihre **Erinnerung** an das unangenehme Geräusch von vorhin wichtig.

Weiter mit der Leertaste…

Beim folgenden Durchgang gilt:

Wenn die Figur bei der geometrischen Form steht, bei der Sie das Geräusch **mit der Leertaste verhindern** können, dann laufen Sie mit der Figur **auf die Form zu**.

Wenn die Figur bei einer anderen, also unwichtigen, geometrischen Form steht, dann laufen Sie mit der Figur **von der Form weg**.

Weiter mit der Leertaste…

Group neutral stimulation:

> Wieder erscheint am Anfang jedes Durchgangs in der Mitte ein Kreuz.
>
> Wenn Sie das Kreuz sehen, dann drücken Sie die rote Taste und halten sie gedrückt, bis die Figur erscheint. Halten Sie diese Taste solange gedrückt, bis Sie loslaufen können.
>
> Laufen Sie dann mit der Figur los.
>
> Bitte reagieren Sie so **schnell wie möglich mit der Figur, ohne Fehler zu machen!** Benutzen Sie immer denselben Zeigefinger.
>
> Außerdem können Sie die Leertaste drücken, um das Geräusch zu verhindern. Natürlich verhindern Sie das Geräusch nur dann, wenn die entsprechende geometrische Form auf dem Bildschirm zu sehen ist.
>
> Am Ende jedes Durchgangs wird das Geräusch entsprechend erscheinen oder nicht.
>
> Weiter mit der Leertaste…

Group negative stimulation:

> Wieder erscheint am Anfang jedes Durchgangs in der Mitte ein Kreuz, gleichzeitig mit dem ersten unangenehmen Geräusch.
>
> Wenn Sie das Kreuz sehen, dann drücken Sie die rote Taste und halten sie gedrückt, bis die Figur erscheint. Halten Sie diese Taste solange gedrückt, bis Sie loslaufen können.
>
> Laufen Sie dann mit der Figur los.
>
> Bitte reagieren Sie so **schnell wie möglich mit der Figur, ohne Fehler zu machen!** Benutzen Sie immer denselben Zeigefinger.
>
> Außerdem können Sie die Leertaste drücken, um die Wiederholung des Geräuschs zu verhindern. Natürlich verhindern Sie das Geräusch nur dann, wenn die entsprechende geometrische Form auf dem Bildschirm zu sehen ist.
>
> Am Ende jedes Durchgangs wird das Geräusch entsprechend noch einmal erscheinen oder nicht noch einmal erscheinen.
>
> Weiter mit der Leertaste…

Group neutral stimulation:

Hier dieser komplexe Ablauf im Überblick:

1. Kreuz erscheint >> rote Taste drücken, gedrückt halten

2. Formen erscheinen >>

Figur steht bei Form, bei der man per Leertaste das Geräusch **verhindern kann**
> hinlaufen

Figur steht bei einer anderen Form
> weglaufen

3. Je nachdem, ob die Form dabei ist, bei der man das Geräusch verhindern kann, können Sie die Leertaste drücken

4. Geräusch erscheint oder nicht.

Haben Sie dazu Fragen?
Wenn nicht, geht es los mit der Leertaste…

Group negative stimulation:

Hier dieser komplexe Ablauf im Überblick:

1. Kreuz und erstes Geräusch erscheinen >> rote Taste drücken, gedrückt halten

2. Formen erscheinen >>

Figur steht bei Form, bei der man per Leertaste das wiederholte Geräusch **verhindern kann**
> hinlaufen

Figur steht bei einer anderen Form
> weglaufen

3. Je nachdem, ob die Form dabei ist, bei der man das wiederholte Geräusch verhindern kann, können Sie die Leertaste drücken

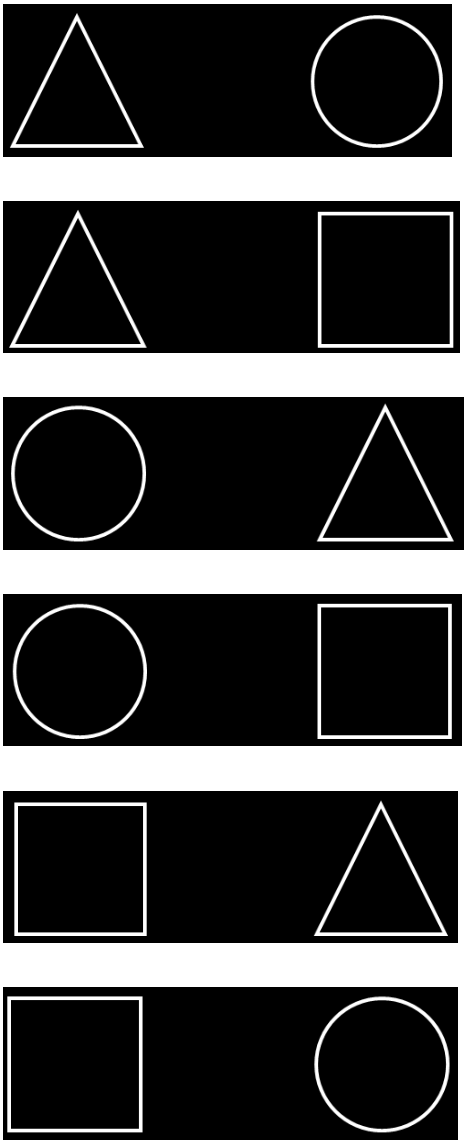
4. Geräusch erscheint noch einmal oder nicht.

Haben Sie dazu Fragen?
Wenn nicht, geht es los mit der Leertaste…

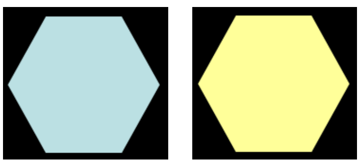
[Participants fulfill test trials with the indicated assignment. Then replication with changed assignment]

Stimuli.

Conditioned stimuli in test trials.



Practice stimuli in manikin practice trials.



Additional analyses.

Table C

Means and Standard Deviations (in Parentheses) of the Reaction Times (Corrected for Release RT), in Milliseconds, of the Manikin Distance Orientation Task, Experiment 4

	Stimulus Category	
Manikin Movement	Valid Relief	Invalid Relief
Approach	562.24 (306.80)	728.88 (345.45)
Avoid	713.72 (319.99)	663.09 (333.22)

Experiment 5

Note: The instructions and scales not shown here were identical to Experiment 1 (consent and US pretest) or Experiment 2.

Instructions and scales.

Goal task practice trials.

Das Männchen-Spiel!

Im nächsten Teil können Sie in einem „Männchenspiel“ Punkte gewinnen oder verlieren.

Ihre Aufgabe ist es, möglichst viele Punkte zu gewinnen und möglichst wenige Punkte zu verlieren. Die Punkte, die Sie in diesem Spiel erhalten, werden am Ende des Versuchs in zusätzliche Belohnungen eingetauscht, also: es lohnt sich, sich hier anzustrengen!

Ihre Aufgabe ist es, sich mit einer Figur (einem Männchen) so schnell wie möglich auf dem Bildschirm zu bewegen.

Sie können mit dem Männchen nach oben laufen, wenn Sie **mehrmals** auf die Taste **mit dem gelben Pfeil nach oben** (auf dem Nummernblock) drücken.

Nach unten laufen Sie mit der **anderen Taste mit dem gelben Pfeil nach unten**.

Bitte weiter mit der Leertaste…

Das Männchen erscheint entweder oben oder unten.

Woher wissen Sie, wohin Sie mit dem Männchen laufen sollen?
Das hängt davon ab, welches Bild auf dem Bildschirm erscheint.

Bitte weiter mit der Leertaste…

Es gibt in diesem Spiel 2 Farben, die folgendes bedeuten:

Wenn Sie in der Mitte des Bildschirms einen **blaues Feld** sehen, bedeutet das, dass Sie in diesem Durchgang Punkte gewinnen können.

Wenn Sie in der Mitte des Bildschirms einen **gelbes Feld** sehen, bedeutet das, dass Sie in diesem Durchgang Punkte verlieren können.

Bitte merken Sie sich das gut:

Blau = Punkte gewinnen
Gelb = Punkte verlieren.

Bitte weiter mit der Leertaste…

Bei den folgenden Durchgängen gilt nun:

Wenn Sie die Farbe sehen, mit der Sie **Punkte gewinnen** können, dann laufen Sie mit dem Männchen **auf das farbige Feld in der Mitte des Bildschirms zu**.

Wenn Sie die Farbe sehen, mit der Sie **Punkte verlieren** können, dann laufen Sie mit dem Männchen **von dem farbigen Feld in der Mitte des Bildschirms weg**.

Am Anfang eines jeden Durchgangs erscheint in der Mitte ein Kreuz. Wenn Sie das Kreuz sehen, dann drücken Sie die Taste zwischen den beiden Pfeiltasten und halten Sie gedrückt. Nur dann erscheint auch die Figur. Halten Sie diese Taste solange gedrückt, bis Sie loslaufen können.

Es ist wichtig, dass Sie **so schnell wie möglich** reagieren und dabei **keine Fehler** machen! Benutzen Sie für alle drei Tasten **immer denselben Finger** (Zeigefinger). Das ist wichtig, weil sonst die Reaktionszeiten verfälscht werden. Weiter mit der Leertaste…

Zur Wiederholung:

Punkte gewinnen → auf das farbige Feld zulaufen
Punkte verlieren → vom farbigen Feld weglaufen

Am Anfang eines jeden Durchgangs erscheint in der Mitte ein Kreuz. Wenn Sie das Kreuz sehen, dann drücken Sie die Taste zwischen den beiden Pfeiltasten und halten Sie gedrückt. Nur dann erscheint auch die Figur. Halten Sie diese Taste solange gedrückt, bis Sie loslaufen können.

Es ist wichtig, dass Sie **so schnell wie möglich** reagieren und dabei **keine Fehler** machen! Benutzen Sie für alle drei Tasten **immer denselben Finger** (Zeigefinger). Das ist wichtig, weil sonst die Reaktionszeiten verfälscht werden.

Haben Sie hierzu noch Fragen?

Wenn ja, stellen Sie sie bitte der Versuchsleiterin.
Wenn nicht, geht es los mit der Leertaste…

[Participants fulfill the goal task practice trials]

Goal task test trials.

Nun wird die Aufgabe etwas schwieriger:

Es kommen nämlich die geometrischen Formen, die das unangenehme Geräusch ankündigen, noch dazu!

Wieder ist Ihre Aufgabe, mit der Figur auf das farbige Feld zu oder vom farbigen Feld wegzulaufen.

Sie können wieder mit der Figur nach oben laufen, wenn Sie **mehrmals** auf die Taste mit dem **gelben Pfeil nach oben** (auf dem Nummernblock) drücken.

Nach unten laufen Sie mit der anderen **Taste mit dem gelben Pfeil nach unten**.

Weiter mit der Leertaste…

Zunächst erscheint eine der **geometrischen Formen**, die Sie bereits kennen gelernt haben.

Diese gibt Ihnen an, ob das unangenehme Geräusch am Ende des Durchgangs erscheinen wird oder nicht.

Bitte merken Sie sich, ob das Geräusch am Ende kommen wird oder nicht kommen wird!

Davon unabhängig haben Sie dann die schon bekannte Männchen-Aufgabe:

Sie können wieder mit dem Männchen Punkte gewinnen oder verlieren!

Ihre Aufgabe ist dieselbe von vorhin, nämlich mit dem Männchen nach oben oder nach unten zu laufen, je nachdem, ob die Farbe angibt, dass Sie gerade Punkte gewinnen oder verlieren können.

Weiter mit der Leertaste…

Bei den folgenden Durchgängen gilt:

Wenn Sie die Farbe sehen, mit der Sie **Punkte gewinnen** können, dann laufen Sie mit dem Männchen **auf das farbige Feld in der Mitte des Bildschirms zu**.

Wenn Sie die Farbe sehen, mit der Sie **Punkte verlieren** können, dann laufen Sie mit dem Männchen **von dem farbigen Feld in der Mitte des Bildschirms weg**.

Weiter mit der Leertaste…

Wieder erscheint am Anfang jedes Durchgangs in der Mitte ein Kreuz.

Wenn Sie das Kreuz sehen, dann drücken Sie die Taste in der Mitte und halten sie gedrückt, bis die Figur erscheint. Halten Sie diese Taste solange gedrückt, bis Sie loslaufen können.

Laufen Sie dann mit der Figur los.

Bitte reagieren Sie so **schnell wie möglich mit der Figur, ohne Fehler zu machen!** Benutzen Sie immer denselben Zeigefinger.

Am Ende jedes Durchgangs, nachdem Sie mit dem Männchen gelaufen sind, wird das Geräusch entsprechend der geometrischen Form am Anfang, erscheinen oder nicht.

Weiter mit der Leertaste…

Hier der komplexe Ablauf im Überblick:

1. Geometrische Form zeigt an, ob Geräusch am Ende erscheint oder nicht.

2. Kreuz erscheint >> Taste zwischen Pfeiltasten drücken, gedrückt halten

3. Farbiges Feld erscheint >>

Farbe zeigt an, dass Sie Punkte gewinnen können
→ zum Feld hinlaufen!

Farbe zeigt an, dass Sie Punkte verlieren können
→ vom Feld weglaufen!

4. Geräusch erscheint oder nicht.

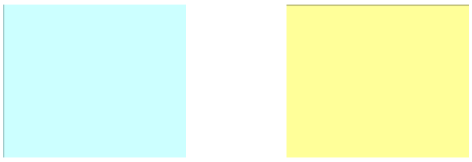
Haben Sie dazu Fragen?
Wenn nicht, geht es los mit der Leertaste…

[Participants fulfilled the Goal Task test trials; then replication of instructions and trials with changed assignment]

Stimuli.

Note. The stimuli not shown here were the same as in Experiment 2.

Colored stimuli indicating the gaining- vs. losing-points information during a trial.



Additional analyses.

Table D 1

Means and Standard Deviations (in Parentheses) of the Expectancy Rating, Experiment 5

Experiment	Stimulus Category	
	Fear	Classical Relief
5A	98.66 (5.28)	6.61 (22.69)
5B	97.14 (14.48)	1.39 (7.62)
5C	93.98 (22.15)	3.80 (17.71)

Table D 2

Means and Standard Deviations (in Parentheses) of the Positivity Index of the Affect Misattribution Procedure, Experiment 5

Experiment	Stimulus Category	
	Fear	Classical Relief
5 (A, B, and C)	.50 (.19)	.56 (.19)
5A	.51 (.21)	.56 (.17)
5B	.52 (.19)	.57 (.24)
5C	.47 (.18)	.55 (.18)

Table D 3

Analysis of Variance for Expectancy Rating, Experiment 5A

Source	*df*	*F*	η^2	*p*
Within subjects				
Stimulus Category (SC)	1	437.95**	.92	< .01
SC within-group error	37	(367.62)		

Note. Values enclosed in parentheses represent mean square errors.

** $p < .01$.

Table D 4

Analysis of Variance for Expectancy Rating, Experiment 5B

Source	*df*	*F*	η^2	*p*
Within subjects				
Stimulus Category (SC)	1	1165.39**	.96	< .01
SC within-group error	43	(173.07)		

Note. Values enclosed in parentheses represent mean square errors.

** $p < .01$.

Table D 5

Analysis of Variance for Expectancy Rating, Experiment 5C

Source	*df*	*F*	η^2	*p*
Within subjects				
Stimulus Category (SC)	1	252.80**	.86	< .01
SC within-group error	40	(659.35)		

Note. Values enclosed in parentheses represent mean square errors.

** $p < .01$.

Table D 6

Analysis of Variance for AMP and Goal Task Index, Experiments 5

Source	*df*	*F*	η^2	*p*
Between subjects				
Experiment (Exp)	2	1.25	.02	.29
Exp between-groups error	115	(1.12)		
Within subjects				
Stimulus Category (SC)	1	2.74	.02	.10
SC X Exp	2	0.10	< .01	.90
Measure (Me)	1	0.02	< .01	.89
Me X Exp	2	1.90	.03	.15
SC X Me	1	3.75†	.03	.06
SC X Me X Exp	2	1.02	.02	.37
SC within-group error	115	(0.88)		
Me within-group error	115	(1.10)		
SC X Me within-group error	115	(0.87)		

Note. Values enclosed in parentheses represent mean square errors.

† $p < .10$.

Table D 7

Analysis of Variance for AMP and Goal Task Index, Experiment 5A

Source	*df*	*F*	η^2	*p*
Within subjects				
Stimulus Category (SC)	1	0.72	.20	.40
Measure (Me)	1	1.39	.03	.32
SC X Me	1	0.64	.02	.43
SC within-group error	35	(0.79)		
Me within-group error	35	(1.36)		
SC X Me within-group error	35	(0.73)		

Note. Values enclosed in parentheses represent mean square errors.

Table D 8

Analysis of Variance for AMP and Goal Task Index, Experiment 5B

Source	*df*	*F*	η^2	*P*
Within subjects				
Stimulus Category (SC)	1	1.70	.04	.20
Measure (Me)	1	2.48	.06	.12
SC X Me	1	0.11	< .01	.74
SC within-group error	42	(0.97)		
Me within-group error	42	(1.01)		
SC X Me within-group error	42	(1.08)		

Note. Values enclosed in parentheses represent mean square errors.

Table D 9

Analysis of Variance for AMP and Goal Task Index, Experiment 5C

Source	*df*	*F*	η^2	*P*
Within subjects				
Stimulus Category (SC)	1	0.53	.01	.47
Measure (Me)	1	0.30	< .01	.59
SC X Me	1	5.74*	.13	.02
SC within-group error	38	(0.85)		
Me within-group error	38	(0.95)		
SC X Me within-group error	38	(0.76)		

Note. Values enclosed in parentheses represent mean square errors.

* $p < .05$.

Table D 10

Means and Standard Deviations (in Parentheses) of the Reaction Times (Corrected for Release RT), in Milliseconds, of the Goal Task, Experiment 5

Experiment	Goal Orientation	Stimulus Category: Fear	Stimulus Category: Classical Relief
Experiment 5 (A, B, C)	Gain Points	440.74 (223.21)	433.87 (227.48)
	Lose Points	448.39 (236.04)	434.78 (232.45)
Experiment 5A	Gain Points	435.81 (230.86)	432.30 (240.65)
	Lose Points	451.63 (253.94)	452.83 (269.11)
Experiment 5B	Gain Points	479.71 (217.01)	458.35 (225.21)
	Lose Points	477.06 (223.57)	445.10 (204.75)
Experiment 5C	Gain Points	404.32 (221.58)	409.59 (220.51)
	Lose Points	415.26 (233.62)	407.29 (226.90)

Experiment 6

Note: The instructions and scales not shown here were identical to Experiment 5. The stimuli were the same as in Experiment 5.

Instructions and scales.

Learning phase.

Nun zur Gedächtnisaufgabe:

Im Folgenden werden Ihnen die beiden bereits bekannten geometrischen Formen gezeigt: entweder ein Quadrat oder ein Dreieck.

Direkt mit einem der beiden Formen ertönt das unangenehme Geräusch.

Wenn die andere Form gezeigt wird, können Sie das Geräusch mit Ihrer eigenen Reaktion verhindern. Dies können Sie tun, indem Sie die Leertaste mehrmals drücken, sobald die geometrische Form gezeigt wird.

Sie sollen herausfinden, welche der beiden Formen das Geräusch ankündigt und bei welcher der beiden Formen Sie das Geräusch per Leertastendruck verhindern können.

Weiter mit der Leertaste.

Hier noch mal der **Ablauf jedes einzelnen Durchgangs**:

1. X X X > bitte schauen Sie auf die Mitte des Bildschirms
2. Eine geometrische Form erscheint und bleibt für 3 Sekunden
3. Sobald die Formen da ist, ertönt das Geräusch oder Sie können es mit Leertaste verhindern.

Bitte geben Sie sich Mühe, die Zuordnung der geometrischen Formen zum Geräusch zu erlernen:

Welche geometrische Form gibt an, dass das Geräusch ertönt und welche gibt an, dass das Geräusch mit der Leertaste verhinderbar ist?

Haben Sie hierzu Fragen?

Wenn nicht, setzen Sie bitte die Kopfhörer wieder auf.

Es geht los mit der Leertaste…

Goal task.

Note: The instruction slides 1-5 were the same as for the learning phase in Experiment 5.

Nun wird die Aufgabe etwas schwieriger:

Es kommen nämlich die geometrischen Formen, die das unangenehme Geräusch ankündigen, noch dazu!

Wieder ist Ihre Aufgabe, mit der Figur auf das farbige Feld zu oder vom farbigen Feld wegzulaufen.

Sie können wieder mit der Figur nach oben laufen, wenn Sie **mehrmals** auf die Taste mit dem **gelben Pfeil nach oben** (auf dem Nummernblock) drücken.

Nach unten laufen Sie mit der anderen **Taste mit dem gelben Pfeil nach unten**.

Weiter mit der Leertaste…

Zunächst erscheint eine der **geometrischen Formen**, die Sie bereits kennen gelernt haben.

Diese gibt Ihnen an, ob Sie das unangenehme Geräusch am Ende des Durchgangs verhindern können oder nicht.

Bitte merken Sie sich, ob Sie das Geräusch am Ende verhindern können oder nicht!

Davon unabhängig haben Sie dann die schon bekannte Männchen-Aufgabe:

Sie können wieder mit dem Männchen Punkte gewinnen oder verlieren!

Ihre Aufgabe ist dieselbe von vorhin, nämlich mit dem Männchen nach oben oder nach unten zu laufen, je nachdem, ob die Farbe angibt, dass Sie gerade Punkte gewinnen oder verlieren können.

Weiter mit der Leertaste…

Bei den folgenden Durchgängen gilt:

Wenn Sie die Farbe sehen, mit der Sie **Punkte gewinnen** können, dann laufen Sie mit dem Männchen **auf das farbige Feld in der Mitte des Bildschirms zu**.

Wenn Sie die Farbe sehen, mit der Sie **Punkte verlieren** können, dann laufen Sie mit dem Männchen **von dem farbigen Feld in der Mitte des Bildschirms weg**.

Weiter mit der Leertaste…

Wieder erscheint am Anfang jedes Durchgangs in der Mitte ein Kreuz.

Wenn Sie das Kreuz sehen, dann drücken Sie die Taste in der Mitte und halten sie gedrückt, bis die Figur erscheint. Halten Sie diese Taste solange gedrückt, bis Sie loslaufen können.

Laufen Sie dann mit der Figur los.

Bitte machen Sie **möglichst KEINE FEHLER**, ohne dabei zu langsam zu sein**!** Geschwindigkeit ist nicht so wichtig wie Genauigkeit.
Benutzen Sie immer denselben Zeigefinger.

Am Ende jedes Durchgangs, nachdem Sie mit dem Männchen gelaufen sind, können Sie per Leertaste das Geräusch entsprechend der geometrischen Form am Anfang verhindern oder nicht. Drücken Sie hierzu die Leertaste mehrmals, sobald Sie mit dem Männchen gelaufen sind.

Weiter mit der Leertaste…

Hier der komplexe Ablauf im Überblick:

1. Geometrische Form zeigt an, ob Geräusch am Ende erscheint oder nicht.

2. Kreuz erscheint >> Taste zwischen Pfeiltasten drücken, gedrückt halten

3. Farbiges Feld erscheint >>

Farbe zeigt an, dass Sie Punkte gewinnen können
→ zum Feld hinlaufen!

Farbe zeigt an, dass Sie Punkte verlieren können
→ vom Feld weglaufen!

4. Direkt danach können Sie ggf. das Geräusch verhindern (bei richtiger geometrischer Form). Dafür mehrmals die Leertaste drücken.

5. Geräusch erscheint oder nicht.

Haben Sie dazu Fragen? Wenn nicht, geht es los mit der Leertaste…

Additional analyses.

Table E 1

Means and Standard Deviations (in Parentheses) of the Expectancy Rating, Experiment 6

	Stimulus Category	
Experiment	Fear	Self-Induced Relief
6A (uncertain relief)	90.15 (20.81)	22.95 (32.83)
6B (certain relief)	93.19 (21.61)	25.20 (34.78)

Table E 2

Means and Standard Deviations (in Parentheses) of the Affect Misattribution Procedure, Experiment 6

	Stimulus Category	
Experiment	Fear	Classical Relief
6 (A and B)	.47 (.20)	.59 (.20)
6A (uncertain relief)	.46 (.21)	.57 (.21)
6B (certain relief)	.47 (.19)	.59 (.19)

Table E 3

Analysis of Variance for Expectancy Rating, Experiment 6A (Uncertain Relief)

Source	*df*	*F*	η^2	*p*
Within subjects				
Stimulus Category (SC)	1	78.72**	.67	< .01
SC within-group error	39	(1147.29)		

Note. Values enclosed in parentheses represent mean square errors.

** $p < .01$.

Table E 4

Analysis of Variance for Expectancy Rating, Experiment 6B (Certain Relief)

Source	*df*	*F*	η^2	*p*
Within subjects				
Stimulus Category (SC)	1	150.75**	.71	< .01
SC within-group error	63	(981.09)		

Note. Values enclosed in parentheses represent mean square errors.

** $p < .01$.

Table E 5

Analysis of Variance for AMP and Goal Task Index, Experiments 6

Source	*df*	*F*	η^2	*p*
Between subjects				
Relief Certainty (Cer)	1	1.15	.01	.29
Cer between-groups error	95	(0.93)		
Within subjects				
Stimulus Category (SC)	1	5.40*	.05	.02
SC X Cer	1	5.19*	.05	.03
Measure (Me)	1	< 0.01	< .01	.95
Me X Cer	1	0.07	< .01	.79
SC X Me	1	11.74**	.11	< .01
SC X Me X Cer	1	3.52†	.04	.06
SC within-group error	95	(0.79)		
Me within-group error	95	(0.09)		
SC X Me within-group error	95	(0.84)		

Note. Values enclosed in parentheses represent mean square errors.

† $p < .10$, * $p < .05$, ** $p < .01$.

Table E 6

Analysis of Variance for AMP and Goal Task Index, Experiment 6A (Uncertain Relief)

Source	*df*	*F*	η^2	*p*
Within subjects				
Stimulus Category (SC)	1	< 0.01	< .01	.97
Measure (Me)	1	0.03	< .01	.87
SC X Me	1	9.28**	.20	< .01
SC within-group error	37	(0.66)		
Me within-group error	37	(2.19)		
SC X Me within-group error	37	(1.04)		

Note. Values enclosed in parentheses represent mean square errors.

** $p < .01$.

Table E 7

Analysis of Variance for AMP and Goal Task Index, Experiment 6B (Certain Relief)

Source	*df*	*F*	η^2	*p*
Within subjects				
Stimulus Category (SC)	1	12.23**	.17	< .01
Measure (Me)	1	0.06	< .01	.82
SC X Me	1	1.82	.03	.18
SC within-group error	58	(0.88)		
Me within-group error	58	(0.68)		
SC X Me within-group error	58	(0.71)		

Note. Values enclosed in parentheses represent mean square errors.

** $p < .01$.

Table E 8

Means and Standard Deviations (in Parentheses) of the Reaction Times (Corrected for Release RT), in Milliseconds, of the Goal Task, Experiment 6

		Stimulus Category	
Experiment	Goal Orientation	Fear	Self-Induced Relief
Experiments 6	Gain Points	608.57 (237.57)	587.83 (230.06)
	Lose Points	606.69 (240.51)	592.84 (236.53)
Experiment 6B	Gain Points	591.35 (268.95)	564.86 (258.29)
(uncertain relief)	Lose Points	585.83 (269.10)	578.80 (268.57)
Experiment 6A	Gain Points	635.30. (178.42)	623.50 (174.91)
(certain relief)	Lose Points	639.08 (186.54)	614.66 (176.86)

Experiment 7

Note: The instructions and scales not shown here were identical to Experiment 5. The stimuli were the same as in Experiment 5.

Instructions and scales.

Learning phase.

Nun zur Gedächtnisaufgabe: Im Folgenden werden Ihnen die bereits bekannten geometrischen Formen gezeigt: entweder ein Quadrat oder ein Dreieck oder ein Fünfeck. Eine der drei Formen kündigt an, dass das unangenehme Geräusch, das Sie auch bereits kennen, immer folgt, egal, was Sie tun. ● Eine andere der drei Formen kündigt an, dass Sie das Geräusch mit Ihrer eigenen Reaktion **immer** verhindern können. Dies tun Sie, indem Sie die Leertaste mehrmals drücken, sobald die geometrische Form gezeigt wird. ● Die dritte der drei Formen kündigt an, dass Sie das Geräusch per Leertastendruck **fast immer** verhindern können. Sie sollen herausfinden, welche der Formen das Geräusch immer ankündigt und bei welcher der Formen Sie das Geräusch per Leertastendruck immer und bei welcher fast immer verhindern können. Weiter mit der Leertaste.

Hier noch mal der **Ablauf jedes einzelnen Durchgangs**:

1. X X X > bitte schauen Sie auf die Mitte des Bildschirms
2. Eine geometrische Form erscheint und bleibt für 3 Sekunden Währenddessen können Sie die Leertaste drücken
3. Geräusch ertönt, je nachdem, ob Sie es verhindern können und ob Sie es verhindert haben (Leertaste).

Bitte geben Sie sich Mühe, die Zuordnung der geometrischen Formen zum Geräusch zu erlernen:

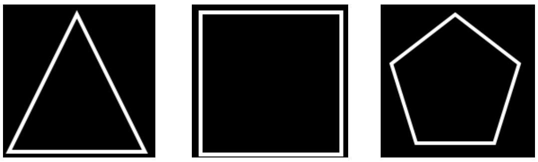
Welche geometrische Form gibt an, dass das Geräusch <u>immer ertönt</u>, welche gibt an, dass das Geräusch mit der Leertaste <u>immer verhinderbar</u> ist und welche gibt an, dass das Geräusch <u>fast immer verhinderbar</u> ist?

Haben Sie hierzu Fragen?
Wenn nicht, setzen Sie bitte die Kopfhörer wieder auf.

Es geht los mit der Leertaste…

Stimuli.

Conditioned stimuli in test trials.



Additional analyses.

Table F 1

Analysis of Covariance for AMP and Goal Task for Fear, Certain and Uncertain Relief Stimuli, with z-Transformed Learning Success as Covariate, Experiment 7

Source	*df*	*F*	η^2	*P*
Between subjects				
Learning Success (Suc)	1	< 0.01	< .001	.96
Suc between-groups error	59	(1.28)		
Within subjects				
Stimulus Category (SC)	2	13.73**	.19	< .001
SC X Suc	2	3.92*	.06	.02
Measure (Me)	1	0.00	.00	1.00
Me X Suc	1	0.84	.01	.36
SC X Me	2	1.88	.03	.16
SC X Me X Suc	2	5.19**	.08	< .01
SC within-group error	118	(0.60)		
Me within-group error	59	(1.44)		
SC X Me within-group error	118	(0.84)		

Note. Values enclosed in parentheses represent mean square errors.

* $p < .05$, ** $p < .01$.

Table F 2

Means and Standard Deviations (in Parentheses) of the Reaction Times (Corrected for Release RT), in Milliseconds, of the Goal Task, Experiment 7

	Stimulus Categroy		
Goal Orientation	Fear	Certain Relief	Uncertain Relief
Gain Points	564.59 (270.10)	543.61 (267.73)	551.79 (282.83)
Lose Points	550.57 (270.82)	548.79 (272.72)	548.90 (282.28)

Erklärung gemäß §4 Abs. 4 Nr. 3 der PromO vom 08.06.2001

Hiermit versichere ich an Eides statt, dass ich die Dissertation selbständig angefertigt und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt habe.

Würzburg, 7.12.2010 ______________________

Robert Kordts-Freudinger

Zusammenfassung

Theoretischer Teil

Die Arbeit behandelt die Frage, mit welcher motivationalen Richtung, Annäherung oder Vermeidung, die Emotion Erleichterung verbunden ist. Löst Erleichterung Annäherung aus oder löst Erleichterung Vermeidung aus? Basierend auf in der Literatur beschriebenen Konzepten von Erleichterung (z.B. Derryberry & Rothbart, 1988; Feather, 1963; Lazarus, 1991; Roseman 2008) wird Erleichterung dabei als eine positive, niedrig-erregende Emotion verstanden, die durch eine erwartete oder unerwartete Motiv-konsistente Veränderung zum Besseren, also die Abwesenheit einer aversiven Stimulation, verursacht wird.

Als weiteres zentrales Konzept wird Annäherungs- (vs. Vermeidungs-)motivation in Anlehnung an Elliot (2008) definiert als die „Energetisierung des Verhaltens durch, oder die Ausrichtung des Verhaltens in Richtung, positiver (vs. negativer) Reize (Objekte, Ereignisse, Möglichkeiten)“ (Elliot, 2008, S. 8). Damit liegt Annäherung-Vermeidung im Herzen des Konzepts Motivation; Annäherung und Vermeidung werden als getrennte, übergreifende Systeme verstanden und variieren von positiv (Annäherung) bis negativ (Vermeidung).

Zur Klärung der zentralen Forschungsfrage werden die in der Literatur vertretenen Theorien zwei Theorieklassen zugeordnet: Valenztheorien und Zieltheorien. Während nach Valenztheorien Annäherung-Vermeidung durch die Valenz des vorherrschenden affektiven Zustandes determiniert wird (z.B. Bradley & Lang, 2007; Gray, 1987; Lewin, 1935; R. Neumann & Strack, 2000; Schneirla, 1959), determinieren nach Zieltheorien aktive Ziele die Annäherungs-Vermeidungs-Motivation (z.B. Carver, 2001; Higgins, 1997, regulatorischer Fokus). Nach den Valenztheorien ist Erleichterung demnach mit einer Annäherungs-Motivation verbunden; nach den Zieltheorien ist Erleichterung mit einer Vermeidungs-Motivation verbunden. Valenztheorien ist dabei die Definition von Annäherung-Vermeidung als „tatsächliche Veränderung der Distanz zu einem spezifischen Reiz“ zu eigen, während die Zieltheorien Annäherung-Vermeidung als die „Erreichung positiver Endzustände versus Vermeidung negativer Endzustände“ verstehen.

Für beide Vorhersagen wurden in der Literatur Belege gefunden: Für die Annäherungsvorhersage eine Reihe von Studien aus der Konditionierungsliteratur mit Tieren (z.B. Dickinson, 1977; Haraway et al., 1984; Ray & Stein, 1959; Weisman & Litner, 1972) und Menschen als Probanden (z.B. Grillon & Ameli, 2001; Migo et al., 2006; Rossiter &

Thornton, 2004), für die Vermeidungsvorhersage einige Studien aus der sozialkognitiven Literatur (z.B. Carver, 2009; Foerster et al., 1998, 2001; Werth & Foerster, 2007a).

Basierend auf der in der Literatur vertretenen Idee, mehrere Ebenen der Annäherungs-Vermeidungs-Motivation zu postulieren, wird das Reflektiv-Impulsiv Modell menschlichen Verhaltens (RIM, Strack & Deutsch, 2004) auf die Erleichterung und Annäherung-Vermeidung angewendet. Im RIM wird zwischen einem impulsiven und einem reflektiven System der Informationsverarbeitung unterschieden, beide Systeme arbeiten dabei relativ unabhängig voneinander. Zwei zentrale Variablen moderieren danach den Zusammenhang zwischen Erleichterung und Annäherungs-Vermeidung. Der erste Moderator ist das psychologische System, in dem Annäherung-Vermeidung verarbeitet und gemessen wird. Hierzu werden zwei Ebenen von Annäherung-Vermeidung unterschieden: eine impulsive Distanzveränderungsorientierung (Distanzveränderung bezüglich spezifischen Reizes) und eine reflektive Zielorientierung (Erreichung positiver oder Vermeidung negativer Endzustände). Der zweite Moderator ist das psychologische System, in dem die Erleichterung entsteht: Im impulsiven System entsteht Erleichterung als an die Abwesenheit negativer Zustände konditionierter Affekt; im reflektiven System entsteht Erleichterung als Resultat zielgesteuerten Verhaltens bei der Kontrolle oder Verhinderung einer negativen Stimulation. Die Arbeit betrachtet dabei beide Moderatoren (Ebene der Annäherung-Vermeidung und Entstehungssystem der Erleichterung) gleichzeitig.

Für die impulsive Distanzorientierung werden daraus die folgenden zentralen Vorhersagen abgeleitet: Erleichterung löst eine Annäherungs-Distanzorientierung (Distanzverringerung) aus, unabhängig davon, ob Erleichterung im impulsiven oder im reflektiven System entsteht. Für die reflektive Zielorientierung wird abgeleitet: Erleichterung löst eine Vermeidungs-Zielorientierung (Vermeidung negativer Endzustände) aus. Diese letzte Vorhersage gilt allerdings nur dann, wenn die Erleichterung im reflektiven System entsteht, also durch eigenes, zielgeleitetes Verhalten entsteht; außerdem ist es für eine Vermeidungs-Zielorientierung nötig, dass die Erleichterung nicht sicher erreicht werden kann, sondern immer ein Anteil Unsicherheit bei der Vermeidung negativer Zustände bestehen bleibt.

Die in der Arbeit verwendete Methodik basiert auf Studien zur aversiven Konditionierung. In der Arbeit wird mehrheitlich ein Differenzierungsparadigma gewählt. Die im impulsiven System entstehende Erleichterung wird dabei mit einer klassischen Konditionierung hergestellt (als aversiver CS-), die im reflektiven System entstehende

Erleichterung wird mit einem aktiven Vermeidungs-Paradigma hergestellt, das die methodische Vergleichbarkeit der „reflektiven Erleichterung“ mit der „impulsiven Erleichterung“ sicherstellt.

Um zu kontrollieren, dass die Erleichterungs-Konditionierung positiven Affekt, speziell Erleichterung, auslöst, wird in den Studien die Valenz des durch die konditionierten Reize ausgelösten Affekts mit gemessen und die spezifische Emotion in einem ersten Experiment direkt getestet.

Die Vorhersagen sind wie folgt:

Vorhersage A: Sowohl impulsive als auch reflektive Erleichterung löst eine positive affektive Valenz und eine impulsive Annäherungs-Distanzorientierung aus.

Vorhersage B: Die positivere Valenz von Erleichterung, die durch eine größere affektive Veränderung verursacht wird, verstärkt die Annäherungs-Distanzorientierung.

Vorhersage C: Impulsive Erleichterung beeinflusst die Zielorientierung nicht.

Vorhersage D: Unsichere reflektive Erleichterung löst eine Vermeidungs-Zielorientierung aus.

Empirischer Teil

Experiment 1 testete die methodische Annahme, dass das aktive Vermeidungs-Paradigma tatsächlich Erleichterung auslöste und keine andere positive Emotion, z.B. Freude. Hierfür wurde das aktive Vermeidungsparadigma – mit einem unangenehmen Geräusch als unkonditioniertem Reiz (US, D. L. Neumann & Waters, 2006) und geometrischen Figuren als konditionierten Reizen (CS) – an N = 75 Versuchspersonen durchgeführt. Als unabhängige Variablen (uV) wurden die Emotionen Angst und Erleichterung im aktiven Vermeidungs-Paradigma innerhalb der Versuchspersonen variiert. Als Manipulationskontrolle wurden die subjektiven Erwartungen des US bei Präsentation der CS erfasst. Als abhängige Variablen (aV) wurden die Intensitäten der Emotionen Erleichterung, Freude, Angst und Ärger mit Ratingskalen erfasst. Die Manipulationskontrolle zeigt, dass die Versuchspersonen die Bedeutung der Reize erfolgreich lernten (n = 62 Versuchspersonen zeigen einen Lernerfolg). Die aV zeigen, dass der Erleichterungsreize tatsächlich signifikant stärkere Erleichterung auslöst als der Angstreiz. Allerdings zeigen die Ergebnisse auch, dass der Angstreiz stärkeren Ärger auslöst als Angst. Als Resultat des Experiments wird das aktive Vermeidungs-

Paradigma für die Herstellung reflektiver Erleichterung für die Studien in dieser Arbeit ausgewählt. Ferner wird die Validität von Theorien infrage gestellt, die Ärger als durch einen Annäherungsprozess verursacht sehen (z.B. Carver, 2001; Harmon-Jones & Allen, 1998).

Experiment 2 testete Vorhersage A. Hierfür lernten $N = 56$ sowohl im klassischen Paradigma als auch im aktiven Vermeidungs-Paradigma Erleichterung und Angst. Als uV wurden dabei innerhalb der Versuchspersonen die Angst, klassisch gelernte Erleichterung und aktiv gelernte Erleichterung variiert. Als aV gemessen wurde zum einen die mit den CS assoziierte affektive Valenz (mithilfe eines Joystick-Maßes) als auch die entsprechende Distanzveränderungsorientierung (mithilfe der Manikin-Aufgabe von De Houwer et al., 2001, bei der die Versuchspersonen eine Manikin-Figur über den Bildschirm zu den CS hin oder von den CS weg bewegen mussten; erfasst werden die Reaktionszeiten [RT] der Bewegungen). Das Lernen war erfolgreich ($n = 38$ Versuchspersonen lernten die spezifische Bedeutung der aktiv gelernten Erleichterungsreize). Die aV zeigen, dass beide Erleichterungsreize sowohl einen positiveren Affekt als auch eine stärkere Annäherungs-Distanzorientierung auslösten als der Angstreiz. Die Valenzdaten zeigten allerdings auch, dass klassisch gelernte Erleichterung positiveren Affekt auslöste als der aktiv gelernte Erleichterungsreiz, während die Erleichterungsreize sich auf dem Distanzveränderungsmaß nicht unterschieden. Dieser Unterschied war stärker bei den Versuchspersonen, die die Bedeutung der aktiv gelernten Erleichterung sehr gut lernten, was auf ein geringes Ausmaß des evaluativen Lernens bei dieser Lernart und eine niedrige Validität des Valenzmaßes hinweist.

Experiment 3 wiederholte die klassische Lernanordnung von Experiment 2 mit einer verbesserten Messung der affektiven Valenz, mit der affektiven-Misattributions-Prozedur (AMP, Payne et al., 2005). In dem Experiment mit $N = 38$ Versuchspersonen wurde als uV variiert die Reizbedeutung (Angst versus klassisch gelernte Erleichterung), als aV gemessen wurde die Valenz mit der AMP sowie die Distanzveränderungsorientierung auf die einzelnen spezifischen Reize (siehe Experiment 2). Das Lernen war erfolgreich ($n = 33$ Versuchspersonen lernten die Bedeutung der Reize). Die Ergebnisse zeigen, dass der Erleichterungsreiz sowohl einen positiveren Affekt als auch eine stärkere Annäherungs-Distanzorientierung auslöste als der Angstreiz, somit wurde Experiment 2 für die klassischen Erleichterungsreize mit einem anderen Valenzmaß repliziert.

Experiment 4 testete Vorhersage B. Hierfür lernten $N = 50$ Versuchspersonen die Bedeutung von Erleichterungsreizen in einem aktiven-Vermeidungs-Paradigma (Experiment

2) mit einer kleinen oder einer großen Veränderung des affektiven Zustandes: Schon zu Beginn jedes Durchgangs erlebten die Versuchspersonen entweder den US (große Veränderung von „negativ“ zu Erleichterung = „neutral“) oder sie erlebten ihn nicht (niedrige Veränderung von „neutral“ zu Erleichterung = „neutral“). Um den in den vorhergehenden Studien konfundierenden Faktor der allgemeinen Verhaltensaktivierung auf die Distanzorientierung zu kontrollieren, lernten die Versuchspersonen die Bedeutung der Erleichterungsreize im Vergleich zu weiteren Reize, die zwar gleichzeitig mit auf dem Bildschirm erschienen, aber nicht prädiktiv für Erleichterung waren (subjektiv invalide Vorhersagereize). Die uV waren demnach zum einen die Vorhersagekraft der Reize für Erleichterung (subjektiv valide versus subjektiv nicht valide Erleichterungsvorhersage), zum anderen das Ausmaß der affektiven Veränderung (niedrig versus hoch). Als aV gemessen wurde die Distanzveränderungsorientierung auf die einzelnen spezifischen Reize (siehe Experiment 2). Das Lernen war erfolgreich (n = 39 Versuchspersonen lernten die Bedeutung der Reize). Die aV zeigen, dass das hohe Ausmaß der affektiven Veränderung zu einer marginal signifikant stärkeren Distanzannäherungs-Orientierung (Distanzverringerung) führte (Vorhersage B). Ferner zeigte sich, dass – bei der Substichprobe der erfolgreich Lernenden - die subjektiv validen Erleichterungsreize eine stärkere Distanzannäherungs-Orientierung (Distanzverringerung) auslösten als die subjektiv invaliden Reize. Das Experiment zeigt also, dass die Distanzveränderungsorientierung direkt von der positiven Valenz beeinflusst wird, und dass die Annäherungsorientierung der Erleichterungsreize im impulsiven System nicht mit einer allgemeinen Verhaltensaktivierung erklärbar ist.

Experiment 5 testete Vorhersage C mit drei Experimenten mit zusammen N = 123 Versuchspersonen, die das klassische Erleichterungslernen durchliefen. Als uV variiert wurde die Reizbedeutung (Angst versus klassisch gelernte Erleichterung). Als aV gemessen wurden die affektive Valenz der Reize (AMP, siehe Experiment 3) sowie die Zielorientierung der Reize mithilfe einer neu entwickelten Zielaufgabe. In der Zielkompatibilitäts-Aufgabe wurde – nach Präsentation der CS – mit einer Punkte-Gewinn- versus Punkte-Verlust-Aufgabe ein sekundäres Annäherungs- versus Vermeidungsziel induziert. Die Verhaltensausführung zu diesem sekundären Ziel (Manikin-Bewegungen) wurde als RT erfasst. Das Lernen war erfolgreich (n = 118 Versuchspersonen lernten die Bedeutung der Reize). Die AMP-Ergebnisse zeigen, dass der klassisch gelernte Erleichterungsreiz positiven Affekt auslöste als der Angstreiz. Die Zielaufgabe zeigte, dass es keinen Unterschied zwischen Angst- und klassischem Erleichterungsreiz auf der Zielorientierung gab, p = .84. Dieser Ergebnisse mit einer relativ großen Stichprobe weisen daraufhin, dass die Valenz der Reize keinen Einfluss auf die Zielorientierung hat; klassisch gelernte, d.h. im impulsiven System erzeugte Erleichterung hat keinen Effekt auf die reflektive Zielorientierung.

Experiment 6 testete Vorhersage D mit zwei Teilexperimenten mit zusammen *N* = 104 Versuchspersonen. Hierfür durchliefen alle Versuchspersonen das aktive-Vermeidungs-Paradigma (siehe Experiment 2), wobei sie die Erleichterung entweder sicher oder unsicher erreichen konnten. In einem Teilexperiment wurden den Versuchspersonen die sicheren CS dabei über den gesamten Durchgang hinweg präsentiert (sichere Erleichterung), während die anderen Versuchspersonen sich die präsentierten CS über einen Durchgang hinweg merken mussten (unsichere Erleichterung). Die uV waren demnach die Reizbedeutung (Angst versus Erleichterung) und die Sicherheit, die Erleichterung zu erreichen (sicher versus unsicher), wobei die Reizbedeutung innerhalb und die Sicherheit zwischen den Versuchspersonen variiert wurde. Als aV gemessen wurden die Valenz der CS mit der AMP (siehe Experiment 3) und die Zielorientierung der CS mit der Zielaufgabe (siehe Experiment 5). Das Lernen war erfolgreich (*n* = 97 Versuchspersonen lernten die Bedeutung der Reize). Die Ergebnisse zeigen, dass sowohl die sicheren als auch die unsicheren Erleichterungsreize einen positiveren Affekt auslösten als die Angstreize. Gleichzeitig löste nur der unsichere Erleichterungsreiz eine stärkere Vermeidungsziel-Orientierung aus als der Angstreiz. Der sichere Erleichterungsreiz löste sogar eine stärkere Annäherungsziel-Orientierung aus als der Angstreiz. Die Ergebnisse deuten daraufhin, dass es entscheidend für die Zielorientierung ist, ob die Erleichterung sicher oder unsicher hergestellt werden kann. Allerdings sind wegen der methodischen Umsetzung alternative Erklärungen möglich.

Experiment 7 repliziert Experiment 6 mit einer verbesserten Methodik mit *N* = 61 Versuchspersonen. Im aktiven-Vermeidungs-Paradigma wurden unsichere und sichere Erleichterung der Angst entgegengesetzt. Die Sicherheit wurde über die Veränderung der objektiven Kontingenz von Erleichterungsreiz zu Erleichterungserleben manipuliert: Sichere Erleichterungsreize führten in 100% der Fälle zu Erleichterung, während unsichere Erleichterungsreize in 67% der Fälle zu Erleichterung führten. Als uV innerhalb der Versuchspersonen variiert wurde demnach die Reizbedeutung (Angst versus sichere Erleichterung versus unsichere Erleichterung). Als aV gemessen wurden die CS-Valenz mit der AMP (siehe Experiment 3) sowie die CS-Zielorientierung (siehe Experiment 5). Das Lernen war weniger erfolgreich als in den vorhergegangenen Experimenten (*n* = 38 Versuchspersonen lernten die Bedeutung der Reize), weshalb die Daten kovarianzanalytisch ausgewertet wurden (Kovariate Lernerfolg der Erleichterungsreize, berechnet aus den US-Erwartungen). Beide Erleichterungsreize lösten einen positiveren Affekt aus als der Angstreiz. Dabei wiesen sowohl gut als auch schlecht lernende Versuchspersonen keinen Valenzunterschied zwischen den beiden Erleichterungsreizen auf. Dagegen zeigten die Zielorientierungs-Daten systematische Unterschiede zwischen gut und schlecht Lernenden. Die gut Lernenden zeigten eine stärkere Vermeidungsziel-Orientierung bei unsicherer Erleichterung als bei sicherer Erleichterung. Die schlecht Lernenden zeigten diesen Effekt nicht. Diese Daten belegen die Hypothese, dass nur unsichere selbst ausgelöste (reflektive) Erleichterung mit einem stärkeren Vermeidungsziel zusammenhängt, sichere Erleichterung dagegen nicht. Ferner zeigt sich, dass beide Erleichterungsreize ein stärkeres Annäherungsziel als der Angstreiz auslösten, was als Folge erhöhter Selbstkontrolle bei den Erleichterungsreizen interpretiert werden kann (z.B. Schmeichel et al., 2010).

Diskussion

Die vorliegenden Experimente unterstützen alle im Theoretischen Teil gemachten Vorhersagen. Sie haben darüberhinaus Implikationen für Studien über evaluatives, affektives Lernen. Hier konnte zum ersten Mal gezeigt werden, dass Erleichterung zuverlässig mit zwei verschiedenen Konditionierungsparadigmen – klassischem Lernen und aktivem Vermeidungslernen – hergestellt werden kann. Außerdem konnte erstmalig gezeigt werden, dass der konditionierte Affekt in einem Paradigma der aversiven Konditionierung reliabel mit der AMP (Payne et al., 2005) erfasst werden kann.

Die vorliegende Arbeit hat ferner Implikationen für die Annahmen über das impulsive System sowie das reflektive System im RIM (Strack & Deutsch, 2004). Im impulsiven System ist die affektive Valenz entscheidend für die Annäherungs-Vermeidungs-Orientierung (z.B. R. Neumann & Strack, 2000), das reflektive Ziel spielt dabei keine Rolle. Impulsiv löst Erleichterung eine Annäherungs-Orientierung aus. Im reflektiven System dagegen ist das aktive Ziel entscheidend für die Annäherungs-Vermeidungs-Orientierung. Reflektiv löst nur unsichere selbst bewirkte Erleichterung eine Vermeidungsorientierung aus.

Verschiedene Alternativerklärungen werden für die Ergebnisse auf Distanz- und Zielorientierung diskutiert, überwiegend aber als unplausibel oder nicht datengestützt zurückgewiesen. Einzig die Kritik der arbiträren Messung (z.B. Blanton & Jaccard, 2006) kann mit den vorliegenden Daten nicht zurückgewiesen werden. Demnach ist sowohl für das Distanzorientierungs- als auch für das Zielorientierungs-Maß unklar, ob die Effekte jeweils als erhöhte Annäherungs- oder verminderte Vermeidungs-Orientierung (verminderte Annäherungs- versus erhöhte Vermeidungs-Orientierung) zu interpretieren sind. Hierfür werden Verbesserungen der Methodik vorgeschlagen. Für die in dieser Arbeit erstmals verwendete Zielaufgabe werden mögliche zugrunde liegende Mechanismen diskutiert, u.a. Implementierungs-Intentionen (z.B. Gollwitzer, 1999), Rekodierung (z.B. Rothermund & Wentura, 2004) und regulatorische Passung (Higgins, 2000). Diese Mechanismen zu untersuchen bleibt Aufgabe zukünftiger Forschung.

Die vorliegenden Studien unterstützen und validieren damit die Annahmen des RIM (Strack & Deutsch, 2004) auf dem spezifischen Feld der motivationalen Richtung. Für die im Theoretischen Teil aufgeführten Valenz- und Zieltheorien kann auf der Basis der vorliegenden Daten festgestellt werden, dass beide Theorieklassen jeweils nur zu einem Teil valide sind. Der Gültigkeitsbereich der Valenztheorien muss auf basale, biologisch determinierte reflexartige Verhaltensprädispositionen reduziert werden; die Befunde der reflektiven Zielorientierung erklären sie nicht. Zieltheorien dagegen müssen die hier diskutierten Moderatorvariablen (Eigenaktivität und Sicherheit) mit aufnehmen. Nur so können sie den aktuellen Zielorientierungs-Daten entsprechend interpretiert werden. Die Befunde auf der impulsiven Distanzveränderungs-Orientierung erklären die Zieltheorien hingegen nicht.

Es wird ferner diskutiert, ob zwei Annäherungs-Vermeidungs-Ebenen genügen. Aufbauend auf den Forschungen von Krieglmeyer und Kollegen (in Vorbereitung) könnte die impulsive Distanzveränderungs-Orientierung weiter in zwei unabhängige Konstrukte – immediate und ultimate Distanzveränderung – aufgeteilt werden. Dieser Ansatz sollte in zukünftiger Forschung mit der hier vertretenen Unterscheidung zwischen Distanzveränderungs- und Ziel-Orientierung verglichen werden. Schließlich haben die aktuellen Ergebnisse auf Implikationen für angewandte Forschungen, z.B. der Schmerzforschung. Aufbauend auf den aktuellen Befunden lässt sich schließen, dass es zentral für erfolgreiche Schmerztherapien ist, den Schmerz (negative Stimulation) mit bestimmten Mitteln vollständig auszuschalten. Nur so kann eine Annäherungs-Orientierung und damit eine Verbesserung der Lebensqualität der Betroffenen erreicht werden.

(2520 Wörter)