Solving ambivalence in context: The experience and resolution of attitudinal ambivalence
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Chapter 1
General introduction
“Ambivalence [...] seems the optimal compromise”.

Humans can evaluate effortlessly, and evaluations help us behave appropriately in a given situation: we generally approach and explore positively evaluated stimuli and avoid or attack negatively evaluated ones (Chen & Bargh, 1999, but see Rotteveel et al., in press; Darwin, 1872). Often, though, evaluations are not that straightforward and we have to deal with contradictory information that makes us evaluate a stimulus positively and negatively at the same time: We are for and against higher taxes, we like and dislike thunderstorms (depending on your plans for the day), and we feel happy and sad reminiscing about good, but past times. This simultaneous existence of positive and negative associations with a stimulus (i.e. a person, object, topic, group, or event) has been labeled ambivalence (Kaplan, 1972; Katz & Hass, 1988; Thompson, Zanna, & Griffin, 1995).

Ambivalence has been investigated since the early 20th century (Riklin, 1911). While early research focused mostly on what ambivalence is and how it should be defined (e.g., Bleuler, 1911; de Liver, van der Pligt, & Wigboldus, 2007; Kaplan, 1972; Priester & Petty, 1996; Thompson et al., 1995), later research focused more on the consequences of ambivalence for the individual. Based on the assumption that ambivalence elicits negative affect as it violates a fundamental human motive to be consistent in thoughts, feelings, and behavior (Briñol & Petty, 2005; Festinger, 1957; Newby-Clark, McGregor, & Zanna, 2002; Proulx, Inzlicht, & Harmon-Jones, 2012), considerable attention was devoted to how people cope with ambivalence (for an overview, see van Harreveld, van der Pligt, & de Liver, 2009; van Harreveld, Nohlen, & Schneider, 2015). Yet, much remains unknown about whether and under which circumstances ambivalence actually elicits negative affect, why individuals experience ambivalence about the same attitude object under some, but not other circumstances, and how individuals respond when confronted with having to make a choice about an ambivalent subject. By combining physiological (fMRI, facial EMG), self-report, and behavioral methods in as well as outside of the lab, I aim to contribute to answering these questions.
Defining ambivalence

The psychiatrist Paul Eugen Bleuler first introduced the term *ambivalence* at a Swiss conference in 1910 (Riklin, 1911). He identified ambivalence as one of the symptoms of schizophrenia by suggesting that individuals suffering from schizophrenia are more likely to allow positivity and negativity to co-exist. This, he proposed, was contrary to healthy adults, whom he assumed more likely to try to reconcile and resolve ambivalence instead of letting conflicting evaluations exist at the same time. The introduction of the term ambivalence into psychology and psychiatry was well received by the scientific community. In a response to Bleuler’s presentation, Carl Gustav Jung, for instance, predicted that the term ambivalence “will probably be an enrichment to the field” (p. 267, Riklin, 1911). Soon, use of the term ambivalence spread and it was applied in other contexts such as that of psychoanalysis (e.g., Freud, 1926). Yet, definitions of ambivalence remained relatively vague.

Over the years, the definition of ambivalence has evolved and the term ambivalence made its way into social psychology. Interestingly, the suggestion that individuals are inherently motivated to resolve ambivalence is an idea that has persisted until today (cf., van Harreveld, van der Pligt et al., 2009). Nowadays, ambivalence is defined as an evaluative conflict on the valence dimension. Within the concept of ambivalence, we differentiate between *structural ambivalence* and the *experience of ambivalence* (cf. Jonas, Broemer, & Diehl, 2000; Priester & Petty, 1996; Thompson et al., 1995; van Harreveld, van der Pligt et al., 2009). *Structural ambivalence* refers to an ambivalent attitude structure, thus the positive and negative associations an individual has with a particular stimulus¹. Structural ambivalence can (but does not have to) result in an acute state of experienced conflict, referred to as *experienced ambivalence*, which develops when competing stimulus associations are simultaneously active and cannot easily be resolved (cf. van Harreveld et al., 2015). Ambivalence can result in affective and behavioral changes, influence information processing as well as decision outcomes. Notably, these effects are often driven by individuals’ experienced ambivalence, thus believed to be the ‘gold standard’ of ambivalence research (DeMarree,

¹ Note that the term *structural* does not imply that these associations are fixed, structural ambivalence toward a stimulus can change over time (cf. de Liver, 2007).
Wheeler, Briñol, & Petty, 2014; Thompson et al., 1995). Experiencing ambivalence has, for example, been shown to predict relapse in smokers (Menninga, Dijkstra, & Gebhardt, 2011), has been related to negative mood (Hass, Katz, Rizzo, Bailey, & Moore, 1992), is thought to create instability in the evaluation of political candidates (Lavine, 2001), and has been related to decreased customer loyalty (Olsen, Wilcox, & Olsson, 2005).

Measuring ambivalence

Ambivalence is usually assessed with self-report scales but until now the best way of measuring ambivalence remains a debate. A comprehensive overview of different methods has been published by Conner and Sparks (2002), who make a distinction between two trends in measuring ambivalence, one that they refer to as indirect measures, and one described as direct measures (see also Jonas et al., 2000).

Indirect measures consist of individuals’ self-reported positivity and negativity toward an attitude object as assessed by two separate scales (i.e. How positively do you evaluate X/ How negatively do you evaluate X?; Kaplan, 1972). These ratings are subsequently integrated using one of several formulas. The most common one has been developed by Thompson and colleagues’ (1995) and aims to capture the similarity and extremity of opposing evaluations: \( \text{Ambivalence} = (\text{PositiveRating} + \text{NegativeRating}) / 2 - |\text{PositiveRating} - \text{NegativeRating}| \). The higher the score on this measure, the more ambivalent are the evaluations of the stimulus. Conner and Sparks (2002) refer to such a formula-based approach as indirect, because individuals may not be aware of a conflict between evaluations and assessing ambivalence with two separate scales may reveal even such ambivalence individuals are unaware of in a given situation (see also Jonas et al., 2000). Consequently these measures are usually referred to as potential or objective ambivalence measures (Armitage & Arden, 2007; DeMarree et al., 2014).

Direct measures assess the degree to which individuals experience ambivalence. The two most well-known measures that fall into the category of direct measures of ambivalence are Jamieson’s felt ambivalence scale (1993) and Priester and Petty’s subjective ambivalence scale (1996). Jamieson’s scale assesses how torn and conflicted individuals feel about the attitude object and the scale has often been suggested to assess the affective side of ambivalence (e.g., Berndsen & van der Pligt, 2004). Priester and Petty’s scale consists of
three items assessing individuals’ mixed reactions, felt conflict, and indecision with regard to an attitude object. Scores on both scales are averaged to compute an overall felt or subjective ambivalence score, respectively.

Supported by the fact that direct and indirect measures have been shown to correlate only weakly ($r = .18$; Newby-Clark, McGregor, & Zanna, 2002), it has been suggested that indirect measures assess solely structural ambivalence and direct measures assess only experienced ambivalence. However, it remains unclear whether indirect measures indeed measure structural properties of the attitude that are not, or not as adequately, assessed by direct measures. In general, Priester and Petty’s subjective ambivalence scale is most widely used in research on ambivalence. In order to be consistent across studies, I will also rely on Priester and Petty’s subjective ambivalence scale to determine ambivalence in this dissertation.

**Similar, but distinguishable constructs**

Several constructs are related to, and sometimes confused with, ambivalence. In order to provide clarity about what is meant with ambivalence, four more prominent, related constructs and their differences with ambivalence need to be discussed: inconsistency, cognitive dissonance, ambiguity and uncertainty.

In his original theory on cognitive dissonance, Festinger suggests that “the existence of nonfitting relations among cognitions” leads to an aversive feeling, with cognitions referring to “any knowledge, opinion or belief about the environment, about oneself, or about one’s behavior” (p. 3; Festinger, 1957). This description of cognitive dissonance consists of two elements, inconsistency between cognitions on the one hand, and aversive feelings on the other. Whereas Festinger uses the term cognitive dissonance interchangeably for the mismatch between cognitions and the affective consequence of this mismatch (i.e. aversive feelings), for clarity reasons, others have suggested to refer to a mismatch between ‘cognitions’ as an inconsistency and reserve the term cognitive dissonance for the aversive feeling that is elicited by such an inconsistency (Gawronski, Peters, & Strack, 2008). Two cognitions, $x$ and $y$, are inconsistent “if not-$x$ follows from $y$” (Festinger, 1957, p. 13). For example, the propositions ‘Peter dislikes cats’ and ‘Peter has a cat’ would be inconsistent, because they refer to the same subject-object relation (Peter and cats), and are in conflict with each other (he dislikes cats, yet he owns a cat). Inconsistencies and dissonance are often studied in the context of induced
compliance paradigms, in which participants are motivated to behave against their own attitude by receiving either a small or large reward (Festinger & Carlsmith, 1959). Even though inconsistency generally refers to two or more beliefs that contradict each other, it is most commonly understood in terms of these induced compliance paradigms, and thought to reflect a mismatch between attitude and behavior. In their classic experiment, Festinger and Carlsmith found, for instance, that participants were more positive about a very tedious and boring task if they were given $1 for telling another (confederate) participant that the task was enjoyable compared to when they were given $20. This shift toward an attitude that is more in line with the displayed behavior has been ascribed to the motivation to reduce cognitive dissonance.

The relatively broad definition of inconsistency as an informational conflict encompasses many phenomena, one of these is ambivalence (for reviews, see Gawronski and Strack, 2012). In the case of ambivalence the informational conflict is always on the valence dimension (positive vs. negative; van Harreveld, van der Pligjt, et al, 2009), which is not necessarily the case for all inconsistencies (see above example about Peter). Additionally, depending on evaluative construal, ambivalence can be present in the absence of an inconsistency. Consider you are ambivalent about Bob, because he is cold (which you evaluative negatively), but he is also intelligent (which is positive). First, your overall evaluation of Bob is thus inconsistent, you evaluate him positively and negatively at the same time. However, the evaluative aspects which create your overall ambivalent (i.e. inconsistent) evaluation are only of opposing valence, but not logically inconsistent. That is, Bob being cold does not imply that he cannot be intelligent, or the other way around (for a similar argumentation, see Gawronski, 2012).² Whether ambivalent information is inconsistent thus depends on the construal of the information in the context in which it is evaluated. If you evaluate Bob in order to decide whether he is a good analyst, his intelligence may be more important for your decision than his coldness. In this case, the evaluative aspects are consistent in the way that they suggest the same decision (‘yes, he may be a good analyst’) despite an overall inconsistent evaluation (Bob is positive and negative). However, if you evaluate Bob in order to decide

² Yet, if Bob was unfriendly and friendly, this would not only create an overall inconsistent evaluation of Bob, but the evaluative aspects which create ambivalence would also be inconsistent.
whether he is a good bartender, for example, both evaluative aspects (intelligent and coldness) are important for your decision, but they suggest different choices. This creates inconsistency (and should lead to aversive feelings) according to the definition of Festinger: either choice (yes or no) will go against one aspect of your evaluation of Bob (intelligent or cold). You think Bob is intelligent, but you have decided that he is not a good bartender even though he is intelligent (a prerequisite for being a good bartender). To use Festinger’s term, you thus behave inconsistently with your ‘cognitions’. Notably, this is a special case of inconsistency, because even though you behave inconsistently (intelligent, yet not a good bartender), you also behave consistently with your cognition at the same time (cold, hence not a good bartender). Even though ambivalence is thus an inconsistency on an overall attitude level (simultaneous positive and negative evaluation which is logically incompatible) and therefore represents an evaluative conflict, processing ambivalent information in context can resolve this inconsistency as well as result in a special case of inconsistency, namely that of simultaneous consistency and inconsistency among ‘cognitions’. Cognitive dissonance may then be the aversive arousal that is experienced after processing inconsistent evaluations or behaving inconsistently with one’s ‘cognitions’. It can be compared with the discomfort that is often thought to be the consequence of ambivalence. However, the last word on when and how this discomfort is experienced as a consequence of ambivalence has not yet been spoken.

Ambiguity is another construct closely related to ambivalence. A stimulus is ambiguous when it cannot be identified or categorized due to a lack of sufficient cues (Budner, 1962). Imagine walking alone through a park at night and you see a figure in the dark that could be a tree or a person. The tree/person is an ambiguous stimulus, because you lack information to clearly categorize it - it may be a tree, or it may be a person. Contrary to ambiguity, ambivalence is not (necessarily) caused by a lack of information, but is characterized by strong positive and negative information (de Liver et al., 1997; Kaplan, 1972; Thompson et al., 1995). Ambivalence thus represents a conflict between opposingly valenced information, whereas ambiguity is not inherently characterized by conflicting valence but by insufficient information. Both ambiguity and ambivalence can result in uncertainty about which categorization of a stimulus is the correct one. Whereas there is always uncertainty in ambiguity, this is not the case for ambivalence: individuals are certain about their opposing evaluations – they find the stimulus positive and
negative at the same time instead of not knowing whether they find the stimulus positive or negative. As Clarkson, Tormala, and Rucker (2008) explained, someone can be very certain that chocolate tastes good (i.e. positive) and be certain that it has a lot of calories (i.e. negative). This person would thus be highly certain of his or her ambivalence toward chocolate, yet may be uncertain about which behavioral response (e.g., approach or avoid; for or against; yes or no) he or she should give based on the opposing evaluations.\footnote{Interestingly, reflecting on ambivalent evaluations of a topic can even increase attitude certainty even though it activates opposing evaluations (Rucker & Petty, 2004; Rucker, Petty, & Briñol, 2008).} Uncertainty can thus be a consequence of ambivalence, and as such is reflected in the behavioral component (i.e. indecision) of the subjective ambivalence measure (cf. Priester & Petty, 1996).

**Consequences of ambivalence**

According to Festinger (1957), humans strive for consistency among thoughts, feelings, and behavior. Most consequences of ambivalence are ascribed to this human need for consistency, the primary consequence thought to be negative affect which is often suggested to be the driving force behind strategies to cope with ambivalence (e.g., van Harreveld, van der Pligt et al., 2009).

*Affect as a response to ambivalence: the role of choice conflict*

It is often suggested that ambivalence elicits negative affect based on the general idea that inconsistent thoughts about a stimulus produce negatively valenced arousal (i.e. cognitive dissonance; McGregor, Newby-Clark, & Zanna, 1999). Similarly, it can be argued that ambivalence elicits negative affect because conflicts are generally “aversive signals” (Dreisbach & Fischer, 2012): Processing conflicting information requires more cognitive effort (e.g., Botvinick, 2007), and conflicts disrupt processing fluency, resulting in negative affect (Phaf & Rotteveel, 2012; Topolinski & Strack, 2015; Winkielman & Cacioppo, 2001). Yet, evidence about affect as a response to ambivalence is somewhat inconclusive. In research on this matter, affect is often used in the broad sense of the word and includes “feelings, mood, emotion, and sympathetic nervous system activity that people experience in relation to an attitude object” (Eagly & Chaiken, 1998, p. 272).\footnote{Because of this broad approach, researchers often refer to discomfort instead of negative affect when describing negative affective responses to ambivalence (van Harreveld, van der Pligt et al., 2009). In this dissertation, we will use the terms negative affect and discomfort interchangeably.} Taking this broad approach,
Hass and colleagues (1992) were among the first to report data that linked ambivalence to negative affect. They showed that exposing individuals who were ambivalent about racial issues to controversial (pro and con) racial statements about an incident in which a group of white teenagers had attacked three Black men, subsequently reported more negative mood than individuals who were not exposed to the statements. In order to explain the circumstances under which ambivalence leads to negative affect, Newby-Clark and colleagues (2002) suggested that negative affect occurs when conflicting evaluations are simultaneously accessible and conflict is thus salient. They repeatedly asked individuals to indicate their positive and negative evaluations about abortion on a potential ambivalence measure. Subsequently they assessed how torn and conflicted participants felt about abortion (cf. Jamieson, 1993). They reported that if both conflicting evaluations were made more accessible, participants experienced more conflict and felt more torn. Notably, Newby-Clark and colleagues used conflict experience as an indication of negative affect, but unfortunately did not specifically assess negative affect or emotions (Newby-Clark et al., 2002).

Yet there are also studies showing no association between ambivalence and negative affect, and there is even some evidence that ambivalence can result in less physiological arousal measured by skin conductance (GSR) than processing positive or negative information (Maio, Greenland, Bernard, & Esses, 2001). Maio and colleagues found that peak physiological arousal was lower in the seconds after participants had been told they would interact with a person, if they had been asked to think of positive and negative aspects of interacting with that person compared to when they thought of positive or negative aspects. However, measuring affect solely by physiological arousal may be misleading, as physiological arousal seems less related to (negative) affective valence than to affective extremity (Cacioppo, Berntson, Larsen, Poehlmann, & Ito, 2000; Larsen, Berntson, Poehlmann, Ito, & Cacioppo, 2008). It may thus be that positive and negative stimuli created more extreme affective responses, and thus more arousal, than ambivalent stimuli. Interestingly, Maio and colleagues found no effect of their ambivalence manipulation on specific, self-reported emotions (e.g., unhappy, glad), which led them to suggest that situational variables may determine whether ambivalence is experienced as negative. Having to make a choice about an ambivalent attitude object and anticipating negative consequences of this choice has been put forward as one such situational factor (van Harreveld,
Rutjens, Rotteveel, Nordgren, & van der Pligt, 2009). As Cohen and Basu remarked: “Since categorization produces a reduction in uncertainty, positive affect may result from a successful fit and negative affect from an inability to categorize an item – particularly if the resulting judgments [...] are important” (1987, p. 40). Van Harreveld and colleagues indeed observed that if participants were given ambivalent information on a societal topic, and subsequently forced to make a dichotomous (for/against) choice about the opinion they wanted to convey in a public article on the topic, they experienced more physiological arousal after having made the choice compared to when they could write a balanced article. Additionally, physiological arousal was mediated by self-reported uncertainty about decision outcomes, suggesting that in this study physiological arousal was related to negative feelings.

All in all, there seems to be preliminary evidence that ambivalence can, but does not have to result in negative affect. Identifying the circumstances under which ambivalence results in negative affect is consequential, because affect is thought to be the driving force behind individuals’ desire to resolve ambivalence and other coping mechanisms (Bleuler, 1911). In line with this idea, Nordgren, van Harreveld, and van der Pligt (2006) reported, for example, that ambivalent participants who felt more negative affect were more likely to engage in biased information processing such as generating more one-sided thoughts in order to reduce ambivalence. One of the aims of this dissertation is to further investigate the circumstances under which ambivalence elicits negative affect. We suggest that ambivalence only results in negative affect and changes in information processing when ambivalent evaluations are logically inconsistent in a choice situation (e.g., “Do you like Bob?” - “I like and dislike Bob”), thus creating choice conflict and impairing decision-making.

Coping with ambivalence

The conception that ambivalence can result in negative affect has led to an investigation of ways in which individuals cope with ambivalence. The Model of Ambivalence-Induced Discomfort (MAID) categorizes coping mechanisms into problem-focused and emotion-focused strategies, with problem-focused coping aimed at resolving ambivalence (and as a consequence reduce negative affect), and emotion-focused coping aimed at reducing negative affect without necessarily resolving ambivalence (van Harreveld, van der Pligt et al., 2009).
Problem-focused coping mostly refers to changes in information processing, such as more systematic processing or searching for new information that can help reduce ambivalence. Research has shown, for instance, that individuals process messages to a greater extent when it helped reduce ambivalence rather than when the message could potentially increase ambivalence (Clark, Wegener, & Fabrigar, 2008; see also Briñol, Petty, & Wheeler, 2006). Similarly, ambivalent individuals show a preference for unfamiliar information (indicated by self-reported desired exposure) that is expected to be effective in reducing ambivalence (Sawicki, Wegener, Clark, Fabrigar, Smith, & Durso, 2013). Resolving structural ambivalence (i.e. underlying associations) instead of temporarily resolving experienced ambivalence (i.e. current state of evaluative conflict) may be more difficult since changing the associative structure of one’s attitude is thought to be a slow process (e.g., Gawronski & Strack, 2004; Rydell & McConnell, 2006). In most situations, temporarily resolving evaluative conflict may be sufficient to reduce negative affect and alleviate the subjective experience of ambivalence. Based on the Iterative Reprocessing Model of Evaluation (IR Model; Cunningham, Zelazo, Packer, & van Bavel, 2007), I suggest in the current dissertation that when evaluative conflict (i.e. ambivalence) needs to be resolved (e.g., when having to make a choice), individuals use situational cues in order to change the evaluative weight of aspects of the stimulus which can help represent the stimulus in a less conflicted way. Consider, for example, you are standing in the supermarket having to decide whether or not to buy organic dinner ingredients. On the one hand, you may believe that buying organic products is positive because it is better for the environment; on the other hand, you may believe that buying organic products is negative because they are more expensive. The conflict between your evaluations of organic products (environmentally friendlier vs. more expensive) may trigger a search for cues in the situation that can help you make a choice (e.g., you have just gotten a pay check) by shifting the weight of your evaluations and temporarily reduce conflict (i.e. you can afford buying organic products today: the price of organic products becomes less important for your choice). In the present dissertation, the effect of situational information on negative affect (Chapter 3) and neurological networks activated by ambivalent decision-making will be investigated in an aim to identify networks involved in the detection and resolution of ambivalence (Chapter 4).
In general, resolving attitudinal ambivalence in order to create a one-sided evaluation requires cognitive effort (e.g., Cunningham et al., 2007; van Harreveld, Rutjens et al., 2009). Neuroimaging studies have, for example, shown that processing ambivalent information in order to make a valence-based choice (good vs. bad) is associated with greater activation in prefrontal regions including the ventrolateral prefrontal cortex (vPFC) and anterior cingulate cortex (ACC) than processing univalent information or making non-valence judgments (Cunningham, Johnson, Gatenby, Gore, & Banaji, 2003; Cunningham, Raye, & Johnson, 2004). Also, evaluating ambivalent attitude objects seems to take more time than evaluating univalent (i.e. positive or negative) objects (Bargh, Chaiken, Govender, & Pratto, 1992; van Harreveld, van der Pligt, de Vries, Wenneker, & Verhue, 2004). This may especially be the case when evaluative context cannot help resolve conflict in the immediate decision moment. Because resolving ambivalence requires cognitive effort, the MAID (van Harreveld, van der Pligt et al., 2009) suggests that, if given the chance, ambivalent individuals try and delay a choice before engaging in processes aimed to effortfully resolve ambivalence. Delaying a choice is the most prominent emotion-focused coping mechanism described by the authors, yet evidence is still lacking indicating that being confronted with an ambivalent choice makes individuals more likely to delay a choice. Finally, this dissertation thus aims to answer the question whether ambivalent individuals indeed spontaneously delay a choice about a topic they are ambivalent about (Chapter 5). Additionally, we will take a step toward determining the effects of choice delay on negative affect and experienced ambivalence around the moment when a choice has to be made.

**Integrating diverse methods**

We use a diverse range of methods to study ambivalence and its consequences, including physiological (fMRI, facial EMG), self-report, and behavioral measures. Most of them do not require further introduction. Two physiological measures, however, are not regularly applied in social psychological research: facial EMG and fMRI. The advantage of physiological measures is that they assess an individual’s response continuously during an experimental session without interrupting the individual from the task at hand. Additionally, compared to self-report measures they are less susceptible to social desirability effects on the side of the participants.
Facial EMG

Affective states are often (willingly or unwillingly) communicated through facial expressions. A reliable and precise way to measure such affective responses is through facial EMG (van Boxtel, 2010). Even specific emotions may be inferred from facial muscle activity by looking at patterns of activation in different muscles. In this dissertation, recordings from two facial muscles will be used, the zygomaticus major and the corrugator supercilii, to infer general positive and negative affect in response to ambivalence. The zygomaticus major pulls the mouth up into a smile and reflects positive affect. The corrugator supercilii pulls the brows together into a frown and reflects negative affect. Recordings from both muscles are used to reliably distinguish between positive and negative affective states (Larsen, Norris, & Cacioppo, 2003). Next to the general advantage of physiological measures mentioned above, the specific advantage of facial EMG compared to self-report measures is that it allows to assess even those affective responses that are not visible to the human eye, indicating small but significant changes in affect.

Functional Magnetic Resonance Imaging

Additionally, fMRI will be used in two empirical chapters to further examine processes underlying ambivalent decision-making. fMRI is a non-invasive method that can monitor neural functioning relatively continuously during a task. It uses strong magnetic fields to assess changes in blood oxygenation in the brain during specific experimental tasks. This is based on the knowledge that active brain regions use more oxygen and such changes can be detected by fMRI. By assessing blood oxygenation changes across tasks, we aim to link mental processes to different neural networks. Exploring neural activity which underlies certain tasks and linking this activity to behavioral outcomes can inform us on similarities and differences between certain tasks that are not necessarily observable on behavioral data alone (Aue, Lavelle, & Cacioppo, 2009). It may, for example, be that a process – choosing between two different objects (i.e. approach-approach conflict) or choosing between taking or leaving one object (i.e. approach-avoidance conflict) - may result in the same behavioral outcome (e.g., longer response times), but engage different neural networks pointing toward different processes being involved in both tasks. In this dissertation, we will use fMRI to gain insight into the similarities and differences between processing of ambivalent and univalent information as
well as to investigate the neural processes underlying the situational resolution of evaluative conflict.

The present dissertation

The aim of the present dissertation is to enhance understanding of how individuals are affected by and subsequently deal with attitudinal ambivalence. I will especially focus on three aspects: the when and how of negative affect elicited by ambivalence, (neural) processes underlying the resolution of ambivalence in choice situations, and coping with ambivalence by delaying an ambivalent choice. First, the circumstances under which ambivalence elicits negative affect will be examined using physiological (fMRI, facial EMG) methods (Chapter 2 and 3). Second, the role of evaluative context (i.e. situational cues) in processing of ambivalence will be examined with a specific focus on the development and resolution of choice conflict (Chapter 3 and 4). Third, choice delay will be examined as a way of coping with ambivalence that does not necessarily involve resolving ambivalence, but is thought to reduce negative affect by distraction from ambivalence (Chapter 5).

Overview of the chapters

Chapter 2 will provide the basis for this dissertation and report a study in which functional Magnetic Resonance Imaging (fMRI) was used to map the engagement of brain regions activated when processing ambivalent information. The goal is to find support for the idea that processing ambivalent information in a choice situation does not only recruit higher order regions indicating more complex decision processes, but also engages brain regions associated with affective processes. This would indicate that making ambivalent choices is a complex informational and affective process, thereby complementing previous research on the involvement of affect in ambivalent decision-making (e.g., Hass et al., 1992; Newby-Clark et al., 1999; van Harreveld, Rutjens et al., 2009). Additionally, the effect of choice consequences (mild vs. severe) on neural networks engaged by ambivalent decision-making will be tested, to examine whether the anticipation of negative consequences of making a wrong choice is the driving factor for negative affect in ambivalent decision-making.

Whereas evidence on negative affect elicited by ambivalence has been mixed so far (e.g., Hass et al., 1992; Maio et al., 2001), in Chapter 3 the aim is to
further clarify the circumstances under which ambivalence elicits negative affect by introducing the concept of inconsistency and choice conflict as determining factor. Using a person perception paradigm, the idea is tested that having to make a choice is necessary for negative affect as a response to ambivalence. This idea is subsequently extended by testing the hypothesis that ambivalent information has to be inconsistent in the current choice situation in order to elicit negative affect. This will be done by presenting evaluative contexts which either put more emphasis on some evaluative aspect over another or keep both opposing evaluations equally relevant for the choice, under the hypothesis that ambivalence only results in negative affect if the opposing evaluations are inconsistent and create a choice conflict. Affect will be measured using facial electromyography (facial EMG), and experienced conflict by Priester and Petty’s (1996) subjective ambivalence scale.

Again taking a neuroimaging approach in Chapter 4, it will be investigated how presenting different evaluative contexts influences processing of ambivalent information in a choice context. After investigating whether affect and experienced ambivalence are indeed affected by evaluative context in which the ambivalent stimulus is encountered, we were especially interested in how the resolution of ambivalence is reflected by neural activation. This study served as a partial replication of findings reported in Chapter 2 and 3, as well as an extension to understanding brain regions involved in the situational resolution of ambivalence.

In Chapter 5 it will be examined how individuals deal with ambivalent choices if evaluative context cannot help resolve ambivalence. In the last empirical chapter, we thus turn to emotion-focused coping strategies and investigate choice delay as a coping strategy in the context of ambivalent decision-making. Four studies are reported, two studies conducted in the field, and two studies conducted in the lab. The first two studies test the hypothesis that ambivalent choices are more often delayed than choices on univalent topics. Subsequently, the third study investigates why individuals delay ambivalent choices, whether it is for distraction from or deliberation about the ambivalent topic. In the last study, we will examine whether distraction or deliberation is more successful during choice delay in reducing negative affect and experienced conflict around the choice moment if no new information is given.
Using diverse methods and different experimental approaches across studies, I hope to shed some further light on attitudinal ambivalence, its consequences, and the way individuals cope with ambivalence - be it through resolving ambivalence or delaying a commitment regarding the ambivalent topic. Of course, these chapters are not the final word on the affective and neural response to ambivalence, neither are they the final response on how individuals cope with ambivalence. Yet, I believe that the present studies will bring us a step further toward ‘solving ambivalence’. Thus in the final chapter our results will be integrated with earlier findings and I will discuss some issues and remaining questions that may provide directions for future research. Finally, please note that the chapters were written with the aim to make them comprehensible outside of the context of this dissertation. The reader may thus find some overlap between theoretical background discussed in each of the chapters.