Ambivalent and Dual Attitudes: Attitude Conflicts and their Impact on Decision Making and Behavior

A Thesis
Submitted to McGill University
in Partial Fulfillment of the Requirements of the Degree of
Doctor of Philosophy

By
Marie-Cécile Cervellon

Dissertation directors:

Dr. Laurette Dubé
Dr. Bärbel Knäuper

August 2005

Your file Votre référence
ISBN: 978-0-494-25112-6
Our file Notre référence
ISBN: 978-0-494-25112-6

Acknowledgements

First and foremost, I would like to thank my supervisors Laurette Dubé and Bärbel Knäuper. Laurette inspired me and guided me over my years at McGill University and my future career is directly indebted to her. She orientated my interests in the field of consumer psychology, and particularly in the domain of implicit attitudes. I am also grateful to Bärbel's wonderful support all along the development of the research projects and during the writing of my dissertation. I also thank the other members of my committee, Ulf Böckenholt and Jamshid Etezadi, for their valuable comments.
I would like to acknowledge my debt to the different research assistants who worked on the two research projects, recruiting participants and running experimental protocols, especially when I was back to France. A final and special thank to my colleague Catherine Paquet, for her help in statistics and for her friendliness.

Cette dissertation n'aurait pas vu le jour sans l'amour, le soutien, la confiance de mon mari. Je le remercie pour tout ce qu'il est, tout ce qu'il m'a apporté et tout ce qu'il m'apportera. Je remercie également mes deux merveilleux garçons pour leur patience ces dernières années... Enfin, je dédie cette dissertation à mes parents, mon père qui m'a poussée à reprendre mes études après des années de travail en entreprise, et ma mère, dont j'espère être toujours à la hauteur. Pour finir, j'ai une pensée spéciale pour mon frère chéri.

Abstract

Ambivalent and Dual Attitudes: Attitude Conflicts and their Impact on Decision Making and Behavior

This dissertation builds on two recent developments in attitude research, first the distinction made between two types of attitudes, i.e., explicit (deliberate, controlled) and implicit (unconscious, automatic) attitudes, and second, that made between two types of attitude conflicts, i.e., ambivalence (conflict between strong explicit positive and negative evaluative basis of the same attitude object) and duality (conflict between explicit and implicit attitudes). It uses the context of food for both its theoretical and empirical developments because there were reasons to expect that, in Western cultures, explicit attitudes are often ambivalent (i.e. positive on taste but negative on health dimensions), but might also be dual (e.g. for restrained eaters, resulting from the motivated overriding of positive attitudes toward tempting but forbidden food).

A first study (N = 199) focuses on the differences between ambivalent and dual attitudes and the influence of these conflicts on spontaneous and deliberate behavior. Results demonstrate that holding dual and ambivalent attitudes are two different constructs, although both ambivalence and duality lead to a subjective experience of conflict. Also, attitudes are weaker when ambivalent (i.e. less accessible, less stable and held with less certainty), and duality is a moderator at high levels of ambivalence, with explicit attitudes being even less accessible but nonetheless more certain when dual. Finally, the influence of, on one hand, both implicit and explicit attitudes in driving spontaneous choice and, on the other hand, the explicit attitude in determining deliberate

choice (behavioral intention as proxy) is corroborated. It also appears that the influence of the implicit attitude on spontaneous behavior is increased in presence of an attitude conflict. In a second study (N = 120), the hypothesis that the existence of dual attitudes stems from inhibitive processes is tested in the context of restrained eating, through a cognitive load manipulation. Results demonstrate that the influence of the implicit attitude on spontaneous choice is stronger for restrained eaters when cognitive capacities are impaired. The second study also highlights that implicit attitudes are stable and resistant to change despite direct experience manipulations (i.e. comparative and repeated tasting). Theoretical, methodological and practical contributions are discussed.

Résumé

Ambivalence et dualité: les conflits attitudinaux et leur influence sur la prise de decision et le comportement

Cette dissertation explore, au travers de deux études de laboratoire, le conflit dans les attitudes et leur impact sur les choix spontanés et délibérés, dans un contexte alimentaire. Une différence est introduite entre l'ambivalence (i.e. être sciemment et simultanément positif et négatif envers un produit) et la dualité (i.e. avoir deux attitudes de valence différente, dont l'une, l'attitude explicite, est consciente et activée délibérément et une autre, l'attitude implicite, est inconsciente et automatique). L'étude 1 (N = 199) explore les conséquences de ces deux conflits sur la force de l'attitude et sur le comportement. Particulièrement, les résultats démontrent une influence conjointe de l'attitude implicite et explicite sur le choix spontané alors que seule l'attitude explicite détermine le choix délibéré. De plus, l'influence de l'attitude implicite est amplifiée lorsque un conflit existe (ambivalence ou dualité). L'étude 2 (N = 120) s'attache à expliquer le mécanisme conduisant à l'existence d'une attitude implicite et inconsciente, et à la dualité, par un phénomène d'inhibition. L'hypothèse est testée dans le contexte de participants qui suivent des régimes amaigrissants de façon chronique. Dans des conditions d'accès restreint à leurs capacités cognitives, ce groupe de participants a plus de difficultés à contrôler son comportement. Le choix est alors plus fortement influencé par l'attitude implicite, en faveur d'un aliment enrichi contre un aliment appauvri en graisses. De plus, une manipulation visant à diminuer les conflits attitudinaux via une

expérience directe et répétée avec un aliment démontre que les attitudes implicites sont particulièrement résistantes à la persuasion. La contribution théorique, méthodologique et pratique de cette recherche est discutée.

Table of contents

List of Appendixes

INTRODUCTION

A long standing tradition within consumer research focuses on the explicit, deliberative and volitional aspects of behaviour and decision making. For instance, Ajzen's theory of reasoned action assumes that attitudes along side subjective norms and perceived behavioural control influence one's intention, which in turn drives the behaviour (Ajzen, 2001). Within this deliberative approach, conflict has predominantly been studied as arising from trade-offs between the advantages and disadvantages of one product compared to an alternative. For instance, Luce (1998) and Luce, Bettman and Payne (1997)'s work focus on difficult decisions involving the use of controlled processes i.e. making trade-offs between attribute values of different alternatives (*between-alternative conflict*; Luce, 1998; Luce, Bettman and Payne, 1997), which is the source of negative affect, or between attributes which are evaluatively distinct within a specific alternative (*within-alternative conflict*; Luce, Jia and Fischer, 2003), which increases judgment uncertainty. Also, in Wertenbroch and colleagues' research (Wertenbroch, 1998; Dhar and Wertenbroch, 2000), conflict is operationalized from a cognitive perspective, as trade-offs between short-term benefits and long-term consequences of hedonic and utilitarian alternatives. Shiv and Fedorikhin (1999; 2002) opened up new avenues for research on conflict and decision making through studying the interplay between affect (heart) and cognition (head) in influencing choice behavior. Their research suggests that choices might follow from a cognitive route, involving deliberative processes but also an automatic route, involving less control. This dissertation builds on these foundations, by integrating the existence of two possible conflicts in attitude, one

derived solely from cognitive processes (i.e. ambivalent attitudes) and one based on the interplay between cognitive and automatic processes (i.é. dual attitudes).

Ambivalence (i.e. the existence of inconsistent evaluations at the explicit level[1]) has received considerable attention since the 90's, and the subjective experience of conflict and lack of consistency between ambivalent attitudes and behaviours are well documented. Yet, recently, Wilson, Lindsey and Schooler (2000)'s *Model of Dual Attitudes* suggests another source of conflict, resulting from the coexistence in memory of two independent and antagonistic attitudes toward the same attitude object. The explicit attitude would be generated intentionally whereas the implicit one would be outside of awareness and control[2]. It is interesting to observe that, although both the ambivalence and implicit attitude paradigm originate from the same domain of research (i.e. the study of prejudiced attitudes and behavior), and despite their obvious similarities in conceptualization (i.e. conflicting evaluations for the same attitude object), both lines of research have evolved in parallel, with no or few cross-over, except for a paragraph in Wilson et al. (2000)'s article suggesting different antecedents and consequences to ambivalent and dual attitudes. Particularly, in their view, ambivalence is based on endorsement of both conflicting evaluations whereas dual attitudes are the consequence of the overriding of a response considered illegitimate and its substitution with a "more wanted" response.

---

[1] For instance, a respondent might be both positive toward chocolate because it provides energy and negative with same intensity because it is bad for her diet.
[2] For instance, a respondent might declare being negative toward chocolate because it puts on weight and at the same time ignore (or repress) an automatic drive or craving for chocolate.

The research presented in this dissertation is, to our knowledge, the first to investigate differences and similarities, antecedents and consequences of ambivalent and dual attitudes. The field chosen for this research is food attitudes. Indeed, food choices often lead to volitional decisions that are inconsistent with spontaneous behaviours. Consequently, it is reasonable to expect that certain populations (i.e. restrained eaters for instance) might experience dissociation between their implicit and explicit attitudes toward specific food items. In addition, food attitudes are relatively free of self-presentation bias, which eliminates a reason frequently invoked for the dissociation between implicit and explicit attitudes. Finally, ambivalence in food attitudes is well documented and food is traditionally used as target objects in the study of attitude conflict (e.g. Sparks, Hedderley and Shepherd, 1992; Povey, Welens and Conner, 2001).

The theoretical framework of this dissertation is exposed in the first chapter. It builds on recent research on the independence of positive and negative bases of evaluations as well as on the existence of implicit attitudes to conceptualize the differences between ambivalent and dual attitudes. Accordingly, hypotheses are presented on the influence of having ambivalent and dual attitudes on the subjective experience of conflict, strength of the explicit attitude and the interplay between implicit and explicit attitude on spontaneous and deliberate choice. These hypotheses are tested in a laboratory study involving a choice between chocolate and yoghurts as focal attitude objects. Results of this study are presented in the second chapter. A follow up study (chapter three) was designed in order to explore further the processes leading to holding dual attitudes. It is suggested that dual attitudes are the consequence of inhibitive processes, the implicit attitude being overridden and replaced by the explicit attitude. This hypothesis is tested in the context of restrained eating (Herman and Polivy, 1980) which involves self-

regulation. Specifically, Baumeister (2002) refers to self-control or self-regulation as the "*self's capacity to alter its own states and responses. Thus, self-control overrides one incipient pattern of response and replaces it with another*" (p. 670). Restrained eaters would tend to override an automatic response (e.g. temptation for high-fat products) and replace it with a competing response (e.g. bad for health) more instrumental to attain their goal (e.g. losing weight). Nonetheless, this group might not be able to repress their implicit attitude and its influence on spontaneous choice when under impairment of cognitive capacity. In addition, this second study investigates direct experience as a mean to change implicit and explicit attitudes and reduce attitude conflict. In the last chapter, results are discussed and the theoretical, methodological and practical contributions of this research are presented, together with research limitations and future research avenues.

CHAPTER I. Theoretical Framework

1. Conflict in attitudes: Duality and Ambivalence as Distinct constructs

The following sections build on the most recent views of attitudes with antagonistic positive and negative bases as well as implicit and explicit sources to explain the theoretical differences between ambivalence, based on discrepant attitude bases and duality, based on discrepant implicit and explicit attitudes.

1.1. Recent views on an old construct

1.1.1. The independence of positive and negative bases of evaluation

For long, attitudes were viewed as the net difference between the positive and negative valences aroused by a stimulus. Eagly and Chaiken (1993)'s definition of an attitude as a "*psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor*" resumes this long-standing view of attitudes as a bipolar construct. Accordingly, attitudes were measured on unidimensional scales, ranging from positive to negative along a continuum. Concerns on the meaning of the middlemost options of these scales were at the origin of a shift away from this traditional conceptualization of attitude, and opened the field to the conceptualization of attitudes as bidimensional, with independent positive and negative components.

In investigating the problem of the "neutral" point of semantic differential scales, Kaplan (1972) pioneered the idea that individuals could have both positive and negative

evaluations of the same attitude object (see Thompson, Zanna and Griffin, 1995, for a review). Kaplan (1972) introduced the distinction between ambivalence (being both positive and negative), indifference (being neither positive nor negative) and non-attitude (no information on the attitude object) although these attitude positions were reflected in the same "neutral" response on a measurement scale. He opened the field to the measurement of positive and negative evaluations separately. Accordingly, Katz and Hass (1988) investigating the attitude toward Black people, developed two separate attitude scales to measure the pro-black and the anti-black substrates. The pro-black attitude scales contains sympathetic beliefs and feelings toward Black people as a *disadvantaged* minority group. The anti-black scale in contrast includes beliefs and related feelings about *deviant* characteristics or behaviors. They provided evidences that scores on these scales are largely unrelated, with some people scoring high on both scales (see also Hass, Katz, Rizzo, Bailey and Eisenstadt, 1991; Hass, Katz, Rizzo, Bailey and Moore, 1992). Also, more recently, Cacioppo, Gardner, and Berntson (1997; Cacioppo and Bernston, 1994) investigated the distinctiveness of these positive and negative bases of attitude and suggested that independent positive and negative bases underlie people's attitudes and might have antagonistic effects on the overall attitude (or summary evaluation) as well as on behavior (e.g. blood donation). These positive and negative bases seem characterized by distinct activation functions. The summary evaluation (or attitude) is either positive or negative when the activation of one basis is strongly dominant. When no basis strongly predominates, the summary evaluation tends to be neither positive nor negative. The attitude object will evoke ambivalence at high levels of both positive and negative activation, whereas low activation of positive and negative evaluative processes will reflect indifference.

This new line of research emphasizing the separation of positive and negative substrates of an attitude urges researchers to adopt an attitude framework and measurements allowing a more comprehensive investigation of the attitude structure and attitude-behavior relationship (see Cacioppo and Bernston, 1994, p. 403). It also highlights the source of an ambivalence conflict in the explicit evaluation of an attitude object, represented as the coactivation of positive and negative evaluative processes. Research on the ambivalence conflict will be reviewed later, but they all are based on the existence of these two separate bases of evaluation.

1.1.2. The Implicit Attitude Paradigm

Recent theorizing extends this view of attitudes as the result of conscious processing and makes a distinction between those evaluations generated intentionally (explicit attitude) and those generated without conscious awareness and control (implicit attitude). Attitude theorists generally conceptualize implicit attitudes as traces of past experience that indirectly influence responses to an attitude object "*in a fashion not introspectively known by the actor*" (Greenwald and Banaji, 1995, p.4). They are typically measured by assessing the automatic association between the attitude object and negative or positive valences (e.g. IAT Implicit Association Test; Greenwald, McGhee and Schwartz, 1998).

The relationship between these unconscious evaluations stored in memory (or implicit attitudes) and the conscious and more elaborated evaluation (or explicit attitudes) is the object of special scrutiny among social psychologists. One hypothesis examined is that implicit and explicit attitudes are in fact two facets of the same attitudinal construct.

"*According to this view, attitudes are similar to icebergs, with explicit attitudes residing above the surface of conscious control and implicit attitudes residing below it*" (Karpinski and Hilton, 2001, p. 774). Implicit attitudes would be the attitude non-altered by social desirability bias. Explicit attitudes would be perverted to serve social goals. Indeed, whereas explicit responses are easy to alter intentionally (e.g. faking the answer), implicit responses are supposed to be resistant to such demands. For instance, Kim (2003) demonstrated that even when participants are instructed to voluntarily control their implicit responses, they are unable to fake them without having been taught a strategy. Hence, for attitude objects for which social desirability might be high (i.e. racism, sexism, etc.), participants may hide their negative attitude in the presence of others whereas their true attitude would show up in the implicit measurement. Actually, Nosek (2003) reports an experiment which directly addresses the role of self-presentation demands in the relationship between implicit and explicit attitudes. Nosek (2003) manipulated the context of the attitude expression from a private to a public setting, the latter involving more self-presentation pressure. The results clearly demonstrate that explicit attitudes measured in private are more related to their implicit measures than those reported in a more public setting. Yet, if social demands might be at play in the lack of correspondence between explicit and implicit attitudes for socially sensitive issues, it cannot explain similar results for categories less subject to self-presentation bias. Nosek (2003) introduces as second moderator to this relationship the extent of cognitive elaboration about the attitude objects. He demonstrates (Study 2) that the mere fact of deep thinking on attitude objects or issues (e.g. such as special education vs. mainstream education) significantly improves the explicit-implicit correspondence.

Aside from this view of implicit and explicit attitudes as facts of the same construct, the position that implicit and explicit attitudes would be independent constructs starts to build considerable support among researchers (Devine, 1989; Dovidio, Kawakami, Johnson, Johnson and Howard, 1997; Karpinski and Hilton, 2001). According to these researchers, implicit and explicit attitudes are the product of two information-processing systems functioning in parallel. The explicit attitude would be the evaluation endorsed by the individual, controlled and consciously activated whereas the implicit attitude would reflect evaluations that are less subject to introspection. In particular, endorsement or the approval of the attitude by the holder was suggested as a potential source of dissociation between explicit and implicit attitudes. Hence, for Karpinski and Hilton (2001), implicit attitudes would reflect the associations a person has been exposed to in his or her environment rather than the extent to which the person currently endorses those evaluative associations. Wilson, Lindsey and Schooler (2000) also suggest that several attitudes might coexist in memory, with one attitude (the explicit) endorsed by the individual and one (the implicit) that might be judged inappropriate and thus consciously negated or unconsciously inhibited. For instance, Devine (1989) demonstrates that low-prejudice subjects tend to inhibit automatically activated stereotype-congruent thoughts and replace them with thoughts reflecting equality and negations of the stereotype. This rejected (implicit) attitude might not always be overridden and at times might be expressed and influence behavior. When the person lacks motivation or capacity to retrieve the attitude it approves and is willing to self-report, the implicit evaluation might reappear and influence her behavior. Devine (1989) argues that implicitly-established attitudinal representations are never completely eliminated from memory, thus even low-prejudice individuals are likely to fall into "old habits".

The research available comparing implicit and explicit attitudes tend to provide evidences for both perspectives and in fact, both views might be valid depending on the nature of the attitude object which is assessed. Self-presentation demands might explain, in part, the dissociation between implicit and explicit attitudes for socially sensitive issues. Cognitive elaboration could also explain this lack of correspondence, especially for a number of categories which require a certain level of mental processing in order to make an assessment. Yet, for candy bars and apples which are relatively free of social desirability pressures and do not require strong cognitive elaboration, Karpinski and Hilton (2001, Study 2) found a lack of relation between explicit and implicit measures of attitude i.e. non-significant correlations between the IAT and their two direct measures of explicit attitude with *r* ranging from -.10 to .16. Karpinski and Hilton (2001) interpret this lack of correspondence with what Wilson et al. call "dual attitudes" or the existence of an implicit-explicit discrepancy in a number of participants, with one attitude that tends to be more positive toward candy bars (based on its sensorial qualities) and another one that tends to be more negative (based on health-related consequences). Indeed, in the context of food, and especially in the context of restrained eating, the existence of two discrepant attitudes toward high-fat products is conceivable, one negative (explicit) and related to current dieting status and another that is positive (implicit) and overridden. Roefs and Jansen (2002) study on implicit and explicit attitude toward high fat food did not find such a discrepancy. In their study, both obese and normal weight participants displayed a negative implicit and explicit attitude toward high-fat food. Yet, Roefs and Jansen (2002) did not test specific high-fat products (e.g. chocolate) but rather the abstract category high-fat vs. low fat. It is likely that participants had a negative implicit

attitude toward the category high-fat but a positive attitude toward exemplars of the category, especially those with most cravings such as chocolate.

In summary, the implicit attitude paradigm set the stage for the existence of an additional attitude conflict aside from ambivalence, which will be called hereafter *dual conflict* or duality, stemming in the opposition of two attitudes, one implicit and overridden and another explicit and endorsed (Wilson et al. 2000).

1.2. Two types of attitudinal conflict: ambivalence and duality

Duality (Wilson et al. 2000) or implicit-explicit inconsistency can easily be related to ambivalence, as in both cases, people hold conflicting evaluations of an attitudinal object. Yet, empirical work by Wilson and Lindsey (1998 unpublished; cited in Wilson et al. 2000) tend to support the distinctiveness of both constructs. Individuals with dual attitudes were not any more ambivalent than those with non-dual attitudes. In line with Wilson and colleagues, it is proposed that duality and ambivalence are two distinct constructs that must be investigated concomitantly in order to gain a comprehensive picture of the attitude structure and attitude-behavior links. Current theoretical perspectives on both ambivalence and duality conflict are examined in the next two sections.

1.2.1. Ambivalent attitudes: Discrepancies between explicit evaluations

Over the last decade, social psychologists expanded the theoretical base of ambivalence and intended to clarify its definition (Maio, Esses and Bell, 2000; Thompson

et al. 1995). For instance, Thompson et al. (1995) argue that inconsistency is a necessary condition to experience ambivalence, but it is not sufficient. First, the inconsistent bases must be similar in magnitude. As the difference in magnitude increases, the attitude becomes polarized in the direction of the stronger basis. That is, the ambivalence conflict will be greater the more nearly equal are one's negative and positive bases of evaluation (e.g. being highly positive and at the same time mildly negative toward going on a diet produces no conflict). Second, ambivalence involves inconsistent evaluative bases of at least moderate intensity (e.g. attitudes both highly positive and highly negative toward going on a diet would produce more ambivalence than attitudes both mildly positive and negative). Maio et al. (2000) build on this model (referred to as the Similarity Intensity Model) to draw a clear distinction between ambivalence and inconsistency. According to their view, "*ambivalence is the amount of conflict or non-conflict within an attitude whereas inconsistency is simply a function of the magnitude of the difference between evaluations*" (p. 62). Maio and his collaborators point to the idea that ambivalence might be experienced with a threshold level of tension in the attitude, which Priester and Petty (1996; 2001) define as subjective ambivalence in their Gradual Threshold Model of ambivalence.

Specifically, Priester and Petty (1996; 2001) studied the relationship between objective and subjective measures of ambivalence. They demonstrate that subjective ambivalence is mainly driven by the amount of conflicting reactions (i.e. negative reactions associated with an attitude object evaluated more positively; positive reactions associated with an attitude object evaluated more negatively). Dominant reactions (i.e. positive reactions associated with an attitude object evaluated more positively; negative

reactions associated with an attitude object evaluated more negatively) matter only when conflicting reactions are below a threshold level, and even then, they are weighted less than conflicting reactions.

1.2.2. Dual attitudes: Discrepancies between implicit and explicit evaluations

If ambivalence involves discrepancies between evaluations at the explicit and conscious level, it has also been suggested that inconsistencies might occur between implicit and explicit evaluations (i.e. dual attitudes, Wilson et al. 2000). For instance, literature on prejudice suggests that people might have implicit and explicit evaluations of different valences toward the same group, and although endorsing consciously egalitarian values they might have negative feelings below awareness (Dovidio et al. 1997; Dovidio, Kawakami and Gaertner, 2002). Recently, Madon, Smith and Guyll (2005) also reported dual attitudes toward stigmatized individuals.

An interesting study by de Jong, van den Hout, Rietbroek and Huijding (2003) found such dual attitudes toward spiders in non-phobic people. Although both phobic and non-phobic participants were equally displaying a negative implicit attitude toward spiders, non-phobic nonetheless had a neutral explicit evaluation. Jong et al. (2003) explain these findings by the development of negative implicit attitudes toward spiders early in childhood. Later acquired beliefs that spiders are harmless might alter the explicit attitude but a change in the implicit attitude might require more extensive direct experience with spiders.

Wilson et al. (2000) classify dual attitudes into four groups depending on the level of awareness of the implicit attitude and the capacity and motivation required to override it. Although it is beyond the scope of this dissertation to test these four sources of duality, they are interesting in the comprehension of the processes that might be involved in the context of food. The first type of dual attitudes results from *repression.* In this case, an attitude might be a source of strong psychological tension and is replaced by an opposite attitude as a defense mechanism. In this type of duality, individuals are not aware of their implicit attitude, unless they remove their motive to repress it. The example given by Wilson et al. (2000) of individuals attracted to people of the same sex who block access to their impulses and develop homophobia is representative of repression. The second type of dual attitudes that has been proposed is *dissociation,* which is based on the existence of two independent systems of evaluation (Greenwald and Banaji, 1995), one influencing unconscious responses and the other conscious responses. Implicit and explicit attitudes are fully dissociated and people are not aware of their implicit attitudes, which might have developed through past experiences with the attitude object. For instance, an individual raised in a racist family might change her attitude when in contact with Black people, yet the traces of past experiences might remain at the unconscious level. The third type of dual attitudes is automatic overriding by which when people have the capacity and motivation to retrieve their explicit attitude, it automatically "short-circuits" (in Wilson et al. terms) the implicit one and prevent people to experience it consciously. If people lack the capacity or motivation to retrieve their explicit attitude, the implicit attitude might reach awareness and determine both explicit and implicit responses. Wilson et al. (2000) label their last type of dual attitudes *motivated overriding*. In contrast to repression and dissociation, individuals are fully aware of both

their implicit and explicit evaluations, yet the implicit attitude is unwanted or viewed as illegitimate, which leads people to override it. This type of dual attitudes is the one which is most subject to be interpreted as ambivalence. Indeed, in this case like for ambivalent attitudes, people are aware that they have conflicting evaluations of an attitude object. A major difference lies in the endorsement of the positive and negative evaluations. Interestingly however, virtually none of the definitions of ambivalence integrates endorsement of the positive and negative evaluations as part of the definition (Bell and Esses, 1997). If people view both positive and negative beliefs as relevant and legitimate, they will experience ambivalence and vacillate from a positive evaluation to a negative one. Yet, if people do not endorse one evaluation, it will be overridden. Nonetheless, it will not be completely eliminated and will remain at the unconscious level as an implicit attitude toward the object. For instance, restrained eaters might have at the same times a strong positive attitude toward chocolate justifying their temptations and a strong negative attitude linked to the negative consequences for their diet. Their attitude might be categorized as ambivalent along the current definition of ambivalence. Yet, taking into account their dedication to their diet, they might find that their positive evaluation is illegitimate and override it. Alternatively, these restrained eaters might have trained themselves to avoid chocolate and repress their natural inclination.

This research tests the distinctiveness of both ambivalence and duality constructs through providing evidence that dual attitudes are not any more or less ambivalent than non-dual. It is proposed also that ambivalence stems from equivalent endorsement (i.e. importance and relevance as proxy) of both positive and negative bases of evaluation

whereas dual attitudes involve one basis of evaluation which is more important and relevant than the other.

Hypothesis 1: Duality and ambivalence are two distinct conceptualizations of attitude conflict

Hypothesis 2:

H2.1. For *ambivalent attitudes*, there is equivalent endorsement of both positive and negative bases of evaluation.

H2.2. For *dual attitudes*, one basis of evaluation is more important and relevant than the other.

2. Influence of attitudinal conflicts on attitude strength and behavior

The following sections expose the consequences of holding ambivalent and dual attitudes on the subjective experience of conflict. In addition, a number of predictions are presented on explicit attitude strength and attitude-behavior relations based on current knowledge on ambivalence and implicit processes.

2.1. Subjective experience of conflict

An additional aspect inherent to the definition of ambivalence is the related subjective experience of tension, expressed as a conscious experience of internal conflict, resulting from mixed beliefs or feelings (i.e. measured as subjective ambivalence or felt ambivalence). For instance, Hass et al. (1992) demonstrated that activating racial

ambivalence induces psychological discomfort and negative mood changes. Newby-Clark, McGregor and Zanna (2002) also advocate that inconsistency-related discomfort is likely to occur when individuals are aware of their contradictions.

Being aware of the evaluative inconsistencies seems necessary to experience negative affect. Yet, Devine, Monteith, and colleagues (Devine, Monteith, Zuwerink and Elliot, 1991; Monteith, Devine, and Zuwerink, 1993; Monteith and Voils, 1998; Zuwerink, Monteith, Devine and Cook, 1996) repeatedly found that many low-prejudice people sometimes violate their non-prejudice commitments and when they realize they do, they feel compunction or guilt. In addition, Plant and Devine (1998) argue that this negative affect is a form of "self-imposed punishment". People holding dual attitudes do not anticipate that they could have diverging reactions and when they react in a fashion opposed to their explicit goals or rules, they experience negative feelings. Hence, negative affect (e.g. guilt, shame) and discomfort is likely to be experienced when the behavior is performed, due to diverging spontaneous and controlled reactions. For instance, Dovidio et al. (1997) found that the implicit negative racial attitude was the best predictor of negative arousal, expressed as differences in rates of blinking and percentages of visual contact with a black compared to a white interviewer. Hence, the subjective experience of conflict is more likely to manifest itself when a behavior is initiated, when the drive of the implicit pre-disposition opposes a more rational response. This tension would be more similar to the psychological discomfort one experiences when acting contrary to one's attitude (i.e. similar to cognitive dissonance, Festinger, 1957). Hetherington and Macdiarmid (1993) report such a negative affect in dieters following the consumption of chocolate whereas non dieters retained their positive mood.

Thus, it is proposed that ambivalence and duality both entail an experience of conflict, but of a different nature. Whereas ambivalence leads to a conscious experience of conflict (i.e. related to inconsistent evaluations and measured as subjective ambivalence), duality entails a conflict and a discomfort which is more likely to be experienced in reaction to one's own behavior. For instance, restrained eaters report being guilty and ashamed after having broken their diet through overeating or simply eating a forbidden food. Hence, holding dual attitudes should not be experienced as subjective ambivalence.

Hypothesis 3:

H3.1. *Ambivalent attitudes* are associated with an experience of subjective ambivalence (i.e. expressed tension identified by individuals as resulting from conflicting evaluations).

H3.2. *Dual attitudes* also lead to an experience of conflict, but are less likely expressed as subjective ambivalence.

2.2. Strength of the summary evaluation

The moderating effect of ambivalence has been extensively studied on three dimensions of attitude strength (accessibility, stability and certainty). In addition, these measures were suggested as major dimensions of attitude strength in numerous researches (e.g. Krosnick, Boninger, Chuang, Berent and Carnot, 1993 for a review). In the following section, the moderating effect of ambivalence on these three dimensions of

attitude strength as well as the differential effects predicted when holding or not dual attitudes are reviewed.

2.2.1. Attitude accessibility

Accessibility refers to the object-evaluation link and ease of retrieval from memory (Krosnick et al., 1993). Increased attitude ambivalence has been generally associated with decreased overall *attitude accessibility* (Bargh et al., 1992; Bassili, 1996; Lavine et al., 1998). Thompson et al. (1995) suggest that this negative relation between ambivalence and attitude accessibility might be due to two highly accessible bases. Based on this line of reasoning, Bargh et al. (1992) provide evidence that the higher latency of response for ambivalent individuals is due to a response competition between the positive and negative bases of their evaluation. Newby-Clark et al. (2002) also found the strongest relation between potential ambivalence and felt ambivalence (or subjective feeling of tension) when simultaneous accessibility of the conflicting bases is highest.

Dual attitudes also involve a response competition between the implicit and explicit attitudes. Implicit attitudes are assumed to be activated automatically when encountering the attitude object, without mediation of cognitive processes. In contrast, explicit attitudes are supposed to be less automatic and requiring capacity and motivation to retrieve (Wilson et al., 2000). Nonetheless, Devine (1989) suggests that explicit attitudes must be well-established, elaborated and accessible enough in order to repress or override the automatically activated attitude and maintain the explicit position. Consistent with this

reasoning, Petty and Jarvis (1998) found that people with dual attitudes did not differ from those with non-dual attitudes on measures of accessibility.

Hypothesis 4:

H4.1. ***Ambivalence is a moderator of accessibility.*** **Attitudes will be less accessible at higher levels of ambivalence, due to equally high accessibility of both positive and negative bases of evaluation.**

H4.2. ***Duality is a moderator of accessibility only at high level of ambivalence.*** **At high level of ambivalence, the explicit attitude will be less accessible for dual than for non dual participants due to an increased demand in motivation and cognitive capacity in order to retrieve the attitude. At lower levels of ambivalence, the existence of one dominant basis of evaluation for both dual and non dual should result in equal accessibility.**

2.2.2. Attitude stability

Ambivalent attitudes were also found to be more likely to vary as a result of temporary shifts in the salience of their bases (Lavine et al., 1998; Bargh et al, 1992; Bassili, 1996), which creates instability, with overall evaluations either positive or negative, depending on contextual factors. Literature on prejudice provides ample evidence that depending on what aspects of the ambivalent attitude is made salient, different attitudinal positions and behaviors emerge (Hass et al. 1992; Katz and Hass, 1988). For instance, studies have found that people ambivalent toward a group respond more favorably when their positive feelings are primed than when their negative feelings

are primed (and conversely) whereas the attitude of non ambivalent subjects is more stable (Bell and Esses, 1997; MacDonald and Zanna, 1998; Glick, Diebold, Bailey-Werner, and Zhu, 1997). Jonas, Broemer and Diehl (2000) studied a variety of attitudes and behaviors and their results show a weak but reliable moderating effect of ambivalence on attitude stability. Thus, higher levels of ambivalence toward food should be related to higher instability of the summary evaluation.

In contrast, in the context of dual attitudes, explicit attitudes should be instrumental to people's internal goals (e.g. help restrained eaters not falling into temptation). Hence, these attitudes should be strong and particularly stable evaluations, strongly endorsed, in order to override the implicit attitude when activated.

Hypothesis 5:

H5.1. ***Ambivalence has a moderating effect on stability.*** **Attitudes will be less stable and should shift more easily at higher levels of ambivalence, due to equal legitimacy of both positive and negative bases of evaluations.**

H5.2. ***Duality should not be a moderator of attitude stability,*** **as the existence of one dominant and more legitimate basis of evaluation should make the evaluation less likely to vary.**

2.3.3 Attitude certainty

Attitude certainty refers to the degree to which people are confident that their attitude toward an object or an issue is correct (Krosnick et al., 1993). Ambivalence has been associated with a decreased level of confidence in one's evaluation (Jonas, Diehl and

Broemer, 1997; see also Bassili, 1996). For instance, in one of the few research studies in which ambivalence was manipulated in an experimental paradigm, Jonas et al. (1997) demonstrated that increased ambivalence is related to decreased confidence in individuals' attitudes toward buying a shampoo.

In parallel, the existence of a conflicting evaluation, either repressed or overridden, is likely to undermine the confidence of individuals holding a dual attitude. Tormala, Briñol and Petty (2003) findings suggest that if a persuasive communication is successful in changing implicit attitudes and reducing implicit-explicit dissociations, it also has an impact on the explicit level on the confidence with which the attitude is held. Hence for this dimension of attitude strength, it is proposed that dual attitudes might be held with less confidence due to the existence of two discrepant evaluations.

Hypothesis 6:

H6.1. ***Ambivalence is a moderator of certainty.*** **Attitudes will be held with less certainty at higher levels of ambivalence.**

H6.2. ***Duality is a moderator of certainty.*** **Attitudes will be held with less certainty in dual compared to non dual individuals.**

2.3. Attitude-behavior relationship

Most researchers agree that ambivalent attitudes should be poor predictors of behavior. Ambivalent attitudes, based on discrepant information, were shown to lead to lower attitude-intention consistency (Armitage and Conner, 2000; Povey, Wellens and

Conner, 2001; Sparks et al., 1992) and lower attitude-behavior consistency (Armitage and Conner, 2000; Conner et al. 2002). For instance, in a study comparing attitudes and intentions toward meat, vegetarian and vegan diets, Povey et al. (2001) found attitudes to be better predictors of following each diet at lower levels of ambivalence. Also, Armitage and Conner (2000) found that the less ambivalent attitudes toward low-fat diets predicted behavior directly whereas weaker attitudes exerted an indirect influence on behavior via intentions (see also Conner et al. 2002). The rational for low attitude-behavior consistency when holding ambivalent attitudes are twofold: First, because summary evaluations based on ambivalence are less accessible (Bargh et al. 1992; Bassili 1996; Lavine et al. 1998), they should be less likely to bias perceptions of the attitude object in behavioral situations. Second, behavior is controlled by the attitude at the moment the behavior is initiated. Yet, attitudes based on ambivalence are unstable (Bargh et al 1992; Bassili 1996) and they should be weakly linked to the subsequent behavior (Lavine et al., 1998). For instance, researchers showed that ambivalence might create extreme reactions and behaviors toward members of stigmatized groups either in a favorable or unfavorable direction dependent on contextual factors, in an effort to negate the positive or negative aspects of the evaluation (Hass et al. 1992; Katz and Hass, 1988). Also, Jonas, Broemer and Diehl (2000) precisely found such a relationship between ambivalence, temporal stability and behavior.

In contrast, when dual attitudes exist, the explicit attitude must be well established to serve as competitive responses to the automatically activated attitude (Devine, 1989). The explicit attitude must be elaborated and accessible enough such as to bias or negate the implicit information in such a way as to maintain the explicit position. Studies on

prejudices provide evidence that the explicit evaluation of non-prejudiced people is strongly related to their behavioral intention, as well as their overt and controlled behavior (Dovidio et al. 1997; Fazio et al. 1995).

Yet, implicit attitudes were found to be better predictors of spontaneous responses that lie outside of conscious awareness and control (e.g. non verbal behaviors such as blinking and visual contact, Dovidio et al., 1997; frequency of handing a pen to an African American vs. placing it on the table, Wilson et al., 2000). Similarly, Fazio and collaborators (1995) demonstrated that an implicit measure of prejudice predicts how smoothly white subjects will interact with black partners. Amodio, Harmon-Jones and Devine (2003) also demonstrate that controlled processes are more involved in determining deliberative responses (i.e. self-report) whereas implicit affective race biases are more exhibited in eyeblink responses. In the same vein, Dovidio, Kawakami and Gaertner (2002) found that whites' explicit attitudes toward blacks were better reflected in their verbal behaviors whereas their implicit attitudes predicted their non-verbal friendliness. Such antagonistic effects of the implicit and explicit attitudes are particularly apparent in the case of temptations, where impulses resulting from an activation of the implicit attitude facilitate behaviors incompatible with deliberate evaluations (Karpinski and Hilton, 2000). Recently, Perugini (2005) tested this "double dissociation pattern" (p. 39) in an experiment offering participants the choice between a snack and a fruit and using the recollection of their past behavior as proxy for controlled choice. His conclusions are strongly in favor of implicit preferences influencing spontaneous choice with no significant influence of explicit preference whereas explicit preferences clearly show the opposite pattern, with strong influences on deliberative behavior and no

influence on spontaneous choice (study 1). Nonetheless, Perugini (2005) also found that the prediction of being a smoker or not (Study 1) is more effective when having both the implicit and explicit attitude entered as predictors, especially when explicit and implicit attitudes are congruent (i.e. non dual). Perugini proposes that spontaneous behaviors involve a mix of both automatic and controlled components, with the controlled components more likely to act as an overriding mechanism. His results also suggest that when attitudes are not congruent, the influence of the implicit might be magnified. Unfortunately, Perugini was not able to fully test his hypothesis in the context of his research (see p. 39 Study 2), mainly because of a small sample size.

Hypothesis 7: Spontaneous (immediate) choice

H7.1. Spontaneous choice will be influenced by both the implicit and explicit attitude.

H7.2. Ambivalence is not a moderator of spontaneous choice.

H7.3. Duality is a moderator of spontaneous choice. The influence of the implicit attitude on spontaneous choice will be stronger when holding dual attitudes.

Hypothesis 8: Controlled (intentional) choice

H8.1. Controlled choice will be influenced by the explicit attitude.

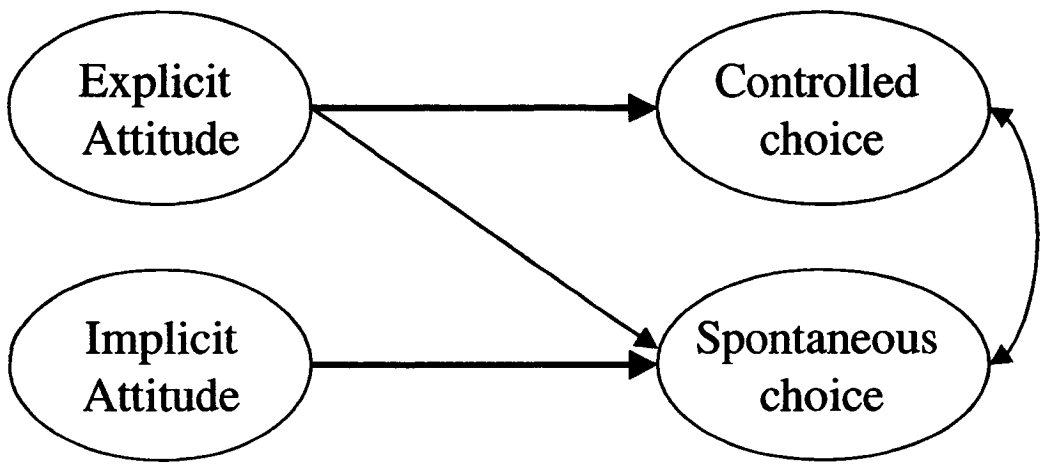
H8.2. Ambivalence will be a moderator of the attitude-controlled choice relation. Attitude will be more predictive of behavior at lower levels of ambivalence.

H8.3. Duality will have no influence on the attitude-controlled choice relation.

Figure 1 illustrates this view that the explicit attitude – through the devotion of more cognitive capacity and motivation – will influence primarily controlled and deliberate

behaviors (i.e. behavioral intention as proxy for overt and deliberate behavior) whereas the implicit attitude influences responses that are more spontaneous and uncontrollable (i.e. spontaneous responses will be elicited as proxy by a real choice between two alternatives, one eliciting more immediate and intense affect and one eliciting more positive cognitions). Shiv and Fedhorikin (1999; 2002) give credit to this view through demonstrating that when decisions are made quickly and under impairment of processing resources, choices are driven by automatic affective processes, otherwise choices are influenced by the higher-order (more controlled) processes.

Figure 1: The interplay between implicit and explicit attitude in driving controlled and spontaneous behavior



CHAPTER II: Empirical Findings

The hypotheses presented in chapter I were tested in a laboratory session with a sample of 199 participants. In order to determine the focal attitude object as well as the contrast category and alternative choice to be introduced in this first study, a pilot study was conducted on a smaller sample (N = 40). First, results of this pilot study are reviewed, followed by method and results for study 1.

1. Pilot Study

The pilot study included an assessment of the preference (implicit via the IAT and explicit) between first, a soda and a water brand and second, chocolate and yoghurt. The water and yoghurt were a-priori chosen as contrasting categories for their neutral properties. A positive implicit attitude toward both chocolate and soda was expected in addition to high levels of ambivalence toward both products.

1.1 Method

Participants. 40 participants were recruited on McGill campus. 60% were female. 67.5% were aged 18-24 and 27.5% were between 25-34 years old. 70% were undergraduate students and 20% graduate students. 50% had English as first language and 22.5% French. 22.5% had spent less than three years in Canada. Participants received a $10 compensation for their participation in the study.

Overview. The cover story for the experiment was the assessment of word categorization as an automatic skill. After filling out an informed consent form and a one-page demographic questionnaire, participants were assigned to one of two desktop computers running Inquisit software. Subjects were seated at about 65 cm from the computer display. The experimenter showed the participants the keys on the keyboard that would be used during the experiment. Participants were required to practice several times the use of the appropriate keys. During the IATs phase, participants had to press the "E" key with their left index finger and the "I" key with their right index finger. During the explicit phase, participants had to use the numeric keypad with their right index finger. No other keys were active during the test. At the end of the computer session, participants moved to another room where the experimenter was giving them the $10 contribution. The entire experiment took no longer than 30 minutes.

IAT measures. Each subject completed two IATs in counterbalanced order. The IATs were using as target-concept discrimination soda vs. bottled water and chocolate bars vs. yoghurts.

Materials. The chocolate and soda IATs used the same sets of adjectives (five pleasant and five unpleasant) selected from Ottaway, Hayden and Oakes (2001). 10 target brands were used for each IAT (five per category). Each set of five brands was selected in two pre-tests. In the first pre-test (n=38), participants had to rate a set of brands on familiarity (How familiar are you with the following brands? Very unfamiliar = -3; very familiar = 3) and association with the product categories (How much would you associate the following brands with chocolate bars / yoghurts / sodas / water? Not at all = 0; Very

much = 6). In the second pre-test (n=20), participants had to rate the set of brands simultaneously on association with the target category and dissociation from the contrasting category (e.g. How much would you associate the following brands with either the category yoghurts or the category chocolate bars? Strongly associated with yoghurts = -3; neither associated with yoghurts nor with chocolate bars = 0; strongly associated with chocolate bars = 3). The sets of brands selected for the contrasting categories (e.g. soda vs. bottled water) were perfectly matched on word length, familiarity, and association with the target category (e.g. soda) and dissociation with the contrasting category (e.g. water) (see Appendix 3 and 4).

Procedure. The first IAT used a complete sequence of seven blocks (similar to that presented in Appendix 7): (a) evaluative attribute discrimination (b) initial target discrimination (c) practice initial combined task (d) test initial combined task (e) reversed target discrimination (f) practice reversed combined task (g) test reversed combined task. The following IATs did not include practice on the evaluative attribute discrimination (see Greenwald, McGhee and Schwartz, 1998). The order of the initial and reversed combinations was counterbalanced for all IATs. The evaluative attribute block included all pleasant and unpleasant words. Each target discrimination block included all 10 target words. Each practice combined block included 20 trials including 10 evaluative attributes and the 10 target words. Each test combined block included 40 trials including twice each target word and twice each evaluative attribute. Each target word was repeated 8 times in each IAT. All participants responded to pleasant words with the left key and unpleasant words with the right key, as key assignment does not affect IATs results (see Greenwald

et al., 1998). When participants made an error, a black X was appearing under the word until the answer was corrected.

Explicit measures. After the sequences of IATs, participants read on the screen that the next questions would assess variables that could have an impact on the speed with which they categorized the words. Explicit measures were administered in four blocks and questions within blocks were randomized. The first block was assessing the attitude toward each category and the fourth block the past behavior. The second and third blocks included questions on ambivalence with positive and negative evaluations presented in a counterbalanced order. Attitude was measured on a seven-point scale "how favorable is your attitude toward" anchored by very unfavorable-very favorable. Next, following Kaplan (1972), ambivalence was measured on unidimensional 4 points scales. For the positive evaluation, participants were asked to consider only the positive aspects of the product and ignore the negative aspects. Afterwards, they indicated how favorable the attitude toward the products are on a scale anchored by not at all favorable-very favorable. In turn, for the negative evaluation, they were asked to consider only the negative aspects, and indicated how unfavorable was their attitude, on a scale anchored by not at all unfavorable-very favorable. Finally, past behavior was assessed with a seven point scale on how frequently did you use (drink, eat etc.) this product in the past week anchored by never-very frequently.

1.2. Results

Implicit attitude measure. The analysis proceeds according to Greenwald, Nosek and Banaji (2003) improved scoring algorithm which uses individual participants SD to provide the scale unit. This algorithm presents strong advantages over the conventional 1998 one (Greenwald et al., 1998), for instance resistance to contamination due to slower speed responding. But in particular, taking into account the characteristics of this study which involves multiple IATs, the improved algorithm provides measures that are more resistant to prior experience with the IAT. Also, the required sample size for power of .80 to reject H_0 is reduced from 63 to 39 participants (see Greenwald et al., 2003).

Following Greenwald et al. (2003), latencies lower than 300ms were recoded to 300ms and latencies higher than 3000ms were recoded to 3000ms. A log-transformation was computed on the latencies in order to improve stability of variance. The average error rate was below 8% in all IATs.

Soda IAT effect. Table 1 displays the average latencies (Av.Lat.) and the mean differences between the initial condition and the reversed condition (c and d and f and g steps) in log-transformed values (ConvLog.) and in milliseconds (ConvMs). d is the difference between block means divided by the standard deviation of latencies in the blocks. By convention, 0.2 is considered a small IAT effect, 0.5 a medium effect and 0.8 a large effect (Greenwald et al., 1998).

As one can notice, the IAT effect for the soda IAT (d = 0.022) is not significantly different from 0. This result shows that there is no implicit preference at the aggregate level between water and soda.

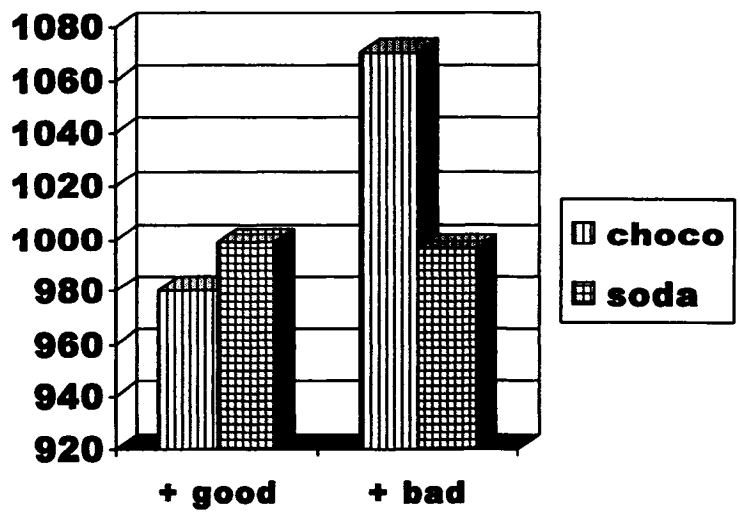
Chocolate IAT effect. The IAT effect (d = 0.212) for chocolate is low but significantly different from 0. This effect indicates more positive attitudes toward chocolate bars than yoghurts.

Table 1 : Implicit attitude measures

	Av. Lat.	ConvLog	ConvMs	d
Soda_water	999ms	0.0225	13.25	0.022
Yoghurt_choco	1030ms	0.0897	78.019	0.212

The bar chart in figure 2 presents the average response latency in milliseconds when chocolate bars and soda where associated on the same key as good words and when they were associated on the same key as bad words. Participants found easier to associate chocolate bars with good words (as indicated by the slower response latency) than to associate chocolate bars with bad words, indicating a positive implicit attitude toward chocolate bars. For soda, the difference is not significant.

Figure 2: response latencies (in milliseconds) for the two IATs



Explicit attitude measure.

Soda vs. Water. There is a significant difference in the mean explicit attitude between water and soda showing a "preference" for water (mean = 4.60, S.D. 1.582 vs. mean = 3.70, S.D. 1.620, t(39)=2.504, p=0.017). A difference score between attitude toward water and attitude toward soda was also computed (Greenwald et al., 2003; Karpinski and Hilton, 2001). Through this score, 55% indicated a preference for water, 30% a preference for soda and 15% equal preference for the two drinks.

Chocolate vs. Yoghurts. There is no difference in means between explicit attitude toward chocolate bars and yoghurts (mean = 5.00, S.D. 1.468 vs. mean= 4.77, S.D. 1.593, t(39)=0.640, p=0.526). The difference score indicated that 47.5% of participants preferred yoghurts, 40% preferred chocolate and 12.5% had equal explicit preference for the two snacks.

Relationship between implicit and explicit attitude

The correlations between the IATs and the explicit attitude measures are low and non significant ($p > 0.10$), both for the drinks ($r = 0.024$) and for the snacks ($r = 0.197$), indicating that explicit and implicit measures are weakly related, and giving credit to an implicit-explicit dissociation toward these products.

Ambivalence measures

Estimates of positive and negative evaluations were combined into a numerical index using Griffin Similarity-Intensity formula $(P + N)/2 - |P - N|$ (Thompson, Zanna

and Griffin, 1995). This formula constantly proved highest validity over alternative measures (see Riketta, 2000, Breckler, 1994).

The mean ambivalence index for soda (mean = 1.275, S.D. 0.784) is significantly higher than that for water (mean = 0.300, S.D. 0.853, t(39)= 5.420, p=0.000). The mean ambivalence index for chocolate (mean= 1.237, S.D. 0.974) is also significantly higher than that for yoghurt (mean= 0.312, S.D. 0.867, t(39)=4.725, p=0.000). The ambivalence level for chocolate bars is equal to that for soda (t(39)=0.205, p=0.839). In summary, both soda and chocolate raise high levels of ambivalence.

1.3. Summary

As predicted, there is a significant IAT effect for the chocolate-yoghurt option. In addition, it appears that more participants would prefer at the explicit level the yoghurt, which gives credit for the existence of an implicit-explicit dissociation (i.e. dual attitudes) toward chocolate. Yet, there is no implicit preference between the soda and the water option. Contrary to intuitive thinking, it is likely that both water and soda yield to a positive implicit attitude of same intensity. Last, both soda and chocolate raise high levels of ambivalence.

In line with these findings, study 1 will focus on chocolate. It is expected that this food item would yield a positive implicit attitude, and might create conflicted attitudes (i.e. both dual and ambivalent) in certain populations. Accordingly, Hetherington and Macdiarmid (1993) report that chocolate is the food item that is most likely to produce conflict and ambivalence and trigger loss of control. Especially, they report that dieters "*experience the greatest conflict between the desire for chocolate and feelings of reproach or regret following consumption of chocolate*" (p. 243).

2. Study 1: Influence of attitude conflicts on attitude and behavior

2.1 Method study 1

2.1.1 Sample

201 participants were recruited through an announcement in local English-speaking newspapers in Montreal, Canada. Proficiency in English was a requirement in order to be able to take the implicit attitude tasks which are based on English words categorization. The sample was highly fluent in English, with a mean of 6.55 out of 7 (S.D. 0.92). A minimum of one year of residency was also required, in order to be familiar with the chocolate bars and yoghurt brands. Accordingly, two participants were excluded from the analyses due to less than a year of residency in Canada (mean residency = 20.32 years, S.D. 13.86). The sample was evenly distributed on gender, with 53.7% female participants. The average age was 28.2 y.o. (S.D. 9.75). All participants had a normal vision (or corrected to normal) except for two participants who reported themselves as color blind and will be excluded of several analyses involving color discrimination (e.g. EAST). Participants received a $25 compensation for their participation in the study.

2.1.2. Procedure

The cover story for the experiment was the assessment of word categorization as an automatic skill (same cover story as in the pilot study). After filling out an informed consent form and a demographic/screening questionnaire, participants were seated in front of a desktop computer running the Inquisit software.

The participants undertook first the implicit tasks and afterwards the explicit task, as it was demonstrated that implicit tasks have no effect on the following explicit ones whereas eliciting explicit first might have an impact (Karpinski and Hilton, 2001). Four implicit tasks (IAT, GNAT, EAST, Evaluative Priming, see Appendix 1 for details) were included, for two reasons: first, each of these measures has a different interest in terms of the assessment of an implicit preference relative to a contrasting category (IAT), or an implicit attitude without requiring a contrasting category (GNAT, EAST). Second, the reliability of the implicit measures has frequently been debated in the literature (see Cunningham, Preacher and Banaji, 2001). For several tests, the reliability is unknown (EAST, evaluative priming) or is very low according to the handful studies in which it was tested (e.g. GNAT split-half reliability 0.20, Nosek and Banaji, 2001).

Before undertaking each test, the experimenter showed the specific keys to be used and the participants were requested to practice the use of these keys. At the end of the computer session, participants moved to another room where the experimenter gave them the cash contribution plus a choice of products. They also had to fill out a post-choice paper and pencil questionnaire. The entire experiment took between 50 and 60 minutes to complete.

Demographics and screening questionnaire. Participants started by filling out a questionnaire including demographic questions as well as specific questions on their health, including their vision (normal or corrected to normal; ability to discriminate colors) and specific food disorders (diabetes; specific diets; food allergies). They also reported their height and weight (BMI), their level of hunger and thirst, and their mood before starting the experiment.

Implicit measures.

One out of four subjects had a different sequence for indirect measures in ordinal positions (see Appendix 5). The experiment's four indirect tasks used the same set of stimulus words (see Appendix 6). Ten adjectives - five pleasant and five unpleasant - were selected from Ottaway, Hayden and Oakes (2001) and the pleasant and unpleasant sets were matched on word length (average length 8.6 for pleasant words, 8.8 for unpleasant words). The ten target brands were the same as those used for the pilot study. Each target brand is repeated 8 times in the IAT, 6 times in each color in the EAST and 9 times as signal in the GNAT (6 times as noise). In the evaluative priming test, only the two most familiar umbrella brand names for each category were included as primes (e.g. Hershey and Cadbury vs. Yoplait and Danone).

IAT. The procedure is the same as implemented in the pilot study. The first IAT used a complete sequence of seven blocks (similar to that presented in Appendix 7): (a) evaluative attribute discrimination (b) initial target discrimination (c) practice initial combined task (d) test initial combined task (e) reversed target discrimination (f) practice reversed combined task (g) test reversed combined task. The evaluative attribute block included all pleasant and unpleasant words. Each target discrimination block included all target words. Each practice combined block (blocks c and f) included 20 trials including 10 evaluative attributes and the 10 target words. Each test combined block (blocks d and g) included 40 trials including twice each target word and twice each evaluative attribute. All participants responded to pleasant words with the left key and unpleasant words with the right key, as key assignment does not affect IATs results (see Greenwald et al., 1998).

When participants made an error, a black X appeared under the word until the answer was corrected.

EAST. In the Extrinsic Affective Simon Task (De Houwer, 2003), participants see white words that need to be classified on the basis of their positive or negative valence and colored words that need to be classified on the basis of their color. It is expected that performance (speed and accuracy like in the IAT and GNAT) will be superior in evaluatively consistent trials (i.e. pressing the key already assigned to a positive white attribute when encountering a colored positive target word) than in evaluatively inconsistent trials (i.e. pressing the key assigned to a negative attribute when encountering a colored positive word). This EAST task uses a sequence of five blocks (see Appendix 8): (a) practice attributes in white (b) practice targets in blue and green (c) practice mixed colored and white words (d-e) test mixed colored and white words. The practice attribute block includes all evaluative words in white. The practice colored target words includes all 10 target words presented twice (each in blue and green). The practice mixed white and colored includes all 10 evaluative words in white plus all 10 target words in both blue and green. Each test block includes 60 trials of both white and colored words. Overall, each participant completes 180 trials. The blue color is created by setting the red, green and blue values at 0, 125, 150 respectively. The red, green and blue values for the green color were 0, 150, 125. As a result, the green and blue colors were very similar, and participants were warned they are quite hard to discriminate. The default white color was used for evaluative words. All words were presented on a black background.

Participants responded by pressing the "A" (pleasant) or "L" (unpleasant) keys with their left and right index fingers. If the word was white, participants were told the

meaning of the word is important, and all of them had to press "A" when the word had a pleasant meaning and "L" when the word had an unpleasant meaning. If the word was colored, participants were told the color of the word is important. Half participants had to press "A" (associated with pleasant) for words in a blue-ish color and "L" (associated with unpleasant) for words in a green-ish color. The other half of the participants received the reverse color-response assignment. When participants made an error, a red X appeared under the word till the answer was corrected. Each word presentation was preceded by a white fixation "*" for 500ms. Participants were asked to respond as fast (but also as accurately) as possible.

GNAT. The Go-No Go Association Test (Nosek and Banaji, 2001) requires participants to respond to stimuli that represent the target category and the valenced attribute e.g. good (signal) and ignore other stimuli e.g. bad words (noise). Response latency and errors are compared between blocks presenting target + good and target + bad. The GNAT task was compounded of 8 blocks (see Appendix 9). First, four blocks of practice trials were presented at random. For one block, participants had to hit the spacebar for any words with a pleasant meaning (signal) and not to press any key for words with an unpleasant meaning (noise). Another block had the reverse assignment. A third block presented the brands related to one category (e.g. chocolate) as signal and the brands related to the contrasting category (e.g. yoghurts) as noise. A fourth block had the reverse assignment. Each practice block was compounded of 10 trials, such as all evaluative and target words would be used once as signal and once as noise. Next, another set of four blocks mixes evaluative and target words as signal and noise. These four blocks appeared in randomized order. Each of these test blocks was compounded of

70 trials, and was preceded by 8 trials used as practice. Each participant completed 352 trials in total.

The ratio of signal to noise was set at 1:1 for practice block, but 4:3 for test blocks to reduce the length of the test (see Nosek and Banaji, 2001, Experiment 3). Signal stimuli appeared for 1000ms whereas noise stimuli appeared for 500ms (see Nosek and Banaji, 2001, Experiment 5). The reasons for this choice are: 1. Increase the possibility to catch words (hence, decrease the frustration associated with not catching enough words, especially taking into account the sample of non-students participants, not necessarily used to completing tasks on computers and playing video games) 2. Give the opportunity to use response latency in addition to errors as dependent variable.

Participants received feedback on their accuracy. When they were correctly hitting a signal word or letting go a noise word, a green O appeared on the screen. When they were falsely hitting a noise word or letting go a signal word, a red X appeared on the screen, below the word.

Evaluative Priming. The evaluative priming task (Draine and Greenwald, 1998) requires participants to classify attributes in bad or good categories while having a prime flashed right before appearance of the attribute. Response latencies are compared between consistent trials (i.e. categorizing a good word with a good prime) and inconsistent trials (i.e. categorizing a bad word with a good prime). The evaluative priming task was compounded of three blocks. During the first block of 20 trials, all attribute words were presented twice so as to be associated with a prime of each category (e.g. both with a chocolate brand and a yoghurt one). The next two blocks of 40 trials each were used as test.

Participants responded to words with a pleasant meaning by pressing the "Z" key with their left index finger and the "M" key with their right index finger. Immediately preceding each evaluative word, a word prime (either chocolate or yoghurt) appeared for 200ms, followed by a blank screen for 100ms. The words flashed were marginally perceptible. Participants were instructed not to pay attention to these words, and to respond to the final, clearly readable word. After each block, participants received feedback on their accuracy and their response latency. After the first test block, participants received the instruction that they were not going fast enough and should try harder. No error (cross) feedback was provided in the two test blocks until the end of the 40 trial-blocks.

Computer Assisted Explicit measures

After the sequences of indirect measures, participants read on the screen that the next questions assess variables that could have an impact on the speed with which they categorized the words. Note that explicit questions administered right before choice does not affect the final choice (see Karpinski and Hilton, 2001 Experiment 2 with a choice between candy bars and apples). The explicit questions started with the overall assessment of the attitude toward yoghurt and chocolate (accessibility measures with positive and negative options). Afterwards, attitude and attitude strength scales (importance, certainty, and stability) were administered. Then the subjective and objective ambivalence questions appeared in a counterbalanced order. The questions about past behavior and behavioral intention appeared last.

Accessibility. Accessibility was measured for the attitude toward yoghurt (first in sequence) and afterwards through two questions on chocolate bars. The latency measured for yoghurt is used as a baseline to control for individual differences in response speed (Fazio, 1990). Only the E (negative) and I (positive) keys were active. Before starting the test, the experimenter showed the appropriate keys and highlighted that only the index fingers should be used. The participants practiced the keys before proceeding to the test. Before the blocks of question for which accessibility was assessed, participants saw a warning indicating that for the next few questions, time was recorded to provide for a baseline of their speed, and they should go as quickly and accurately as possible.

Attitude scales. Attitude was assessed through "My attitude toward ___ is" on three seven-point scales anchored by "unfavorable-favorable", "positive-negative" and "bad-good" (at random). Next, questions for the assessment of several attitude strength variables appeared at random. Attitude importance was assessed through two questions "How much do you care about " (anchored by not at all-very much) and "How important is your attitude toward ____ to you, personally" (anchored by not at all important – very important). Attitude certainty was assessed through two questions "How confident are you in your evaluation of" (anchored by not at all confident- very confident) and "How certain are you in your evaluation of" (anchored by not at all certain – very certain). Attitude stability was assessed by three questions "How much do you think your attitude varies from occasion to occasion" (anchored by "do not vary at all – vary a great deal"), "How stable is your attitude toward" (anchored by not at all stable – very stable), "At times my attitude toward __ is more negative and at other times more positive" (anchored

by strongly disagree – strongly agree). Liking was assessed with one question "how much do you like" (7-point scale anchored with not at all – very much).

Objective ambivalence. Positive and negative blocks of questions were counterbalanced. For the positive block, participants were asked to consider only the positive aspects and ignore the negative aspects of the product. Positive ambivalence was assessed through three questions on unidimensional 6-point scales (see Thompson et al., 1995): "How favorable is your attitude toward" (from not at all favorable – very favorable), "My attitude toward___ is" (not at all good – very good), "How positive is your evaluation" (not at all positive – very positive) in randomized order. Next, an open-ended question appeared which required the participants to write all positive words that came to their mind about the product. Next, two additional questions appeared at random, one is "How important are these positive aspects to your evaluation of" (not at all important – very important) and one is "How relevant are these positive aspects to your evaluation of" (not at all relevant – very relevant). The negative ambivalence questions were designed in the same fashion. Estimates of positive and negative evaluations will be combined into a numerical index using Griffin formula (for details, see description of the pilot study).

Subjective ambivalence. Subjective ambivalence questions appeared in randomized order. For the cognitive aspects of subjective ambivalence, the questions were "I have strong mixed thoughts toward chocolate bars ___, both positive and negative, all at the same time" and "eating chocolate bars has disadvantages as well as advantages" (anchors strongly disagree-strongly agree). For the affective side, the

questions are "When I eat chocolate bars, I have conflicted feelings" and "When I eat chocolate bars, I find myself feeling torn" (anchors strongly disagree – strongly agree).

Past behavior and behavioral intentions. Behavior was assessed through four questions in a fixed sequence. The first question is "How much do you desire to eat __ at this moment" (anchors not at all – very much). Then, "To what extent do you expect to eat ___ in the upcoming week" (anchors definitively do not – definitively do) and "How likely is it that you will eat ___ in the upcoming week" (very unlikely – very likely). Finally, "How many ___ do you eat on average in a week" (anchors 1 or less – 7 or more).

Behavioral choice

At the end of the section on the computer, participants were brought to another room where they were asked to make a choice between two products (i.e. a chocolate bar by Cadbury and a yoghurt in tube by Yoplait). These two products had the same convenience level (e.g. no spoon needed for the yoghurt) and similar perceptual aspect. Both products were also presented at the same price value per unit ($1.25). They were stored in the same ice-bag during the experiment and were not visible except when participants made their choice. Time taken to make their decision was below 5 seconds.

Post-Choice Questionnaire

After choice, participants had to fill out a last paper and pencil questionnaire compounded of a set of scales: Shiv and Fedorikhin's (1999) reasons for choice 7 point-scales "My final decision about which snack to choose was driven by": my thoughts/my

feelings; my desire/my willpower; my impulsive self/my prudent self; my rational side/my emotional side; my heart/my head; the Compensatory beliefs 10 items subscale (Knäuper, Rabiau, Cohen, and Patriciu, 1994) and the Dutch Eating Behavior Questionnaire to assess typical eating behaviors (Van Strien, Frijters, Bergers, and Defares, 1986). Participants also reported their level of hunger, thirst and mood and a set of ancillary variables.

2.2 Results study 1

2.2.1. Analysis of implicit attitude measures

The four implicit attitude measures were analyzed along their respective defined algorithms. It was expected that the four tests would indicate a positive implicit attitude toward chocolate and a more neutral implicit attitude toward yoghurts.

Implicit Association Test

The analyses use Greenwald, Nosek and Banaji (2003) improved scoring algorithm and proceed as described for the pilot study. The % of error in the test was low (6.38%) and will not be discussed further. Table 2 displays the average latencies (Av.Lat.) and the mean differences between the initial condition and the reversed condition (c and d and f and g steps) in log-transformed values (ConvLog.) and in milliseconds (ConvMs). d is the difference between block means divided by the pooled standard deviation of latencies in the blocks. As can be noticed, there is a small IAT effect, showing an implicit preference in favor of chocolate bars compared to yoghurts. This IAT level is very similar to that found in the pilot test.

Table 2: Implicit attitude measures

	Av. Lat.	ConvLog	ConvMs	D
Yoghurt-chocolate	1151ms	0.1127	114.358	0.2733

Extrinsic Affective Simon Task

Analyses were conducted according to the algorithm defined by de Houwer (2002). Two participants were excluded from the analysis because they were defining themselves as color-blind. Eight additional participants were also removed because they did not finish the test or started the test several times. Hence, analyses were conducted on $N = 189$. Reaction times below 300ms or above 3000ms were recoded to 300ms and 3000ms respectively and reaction times on trials with an incorrect response were discarded. Latencies were log-transformed. We calculated the mean reaction time and the percentage of errors for trials on which chocolate bars and yoghurts were associated with extrinsically negative responses vs. extrinsically positive ones. Along de Houwer (2002), EAST scores were computed through deducting the means on trials with an attached positive response to the means on trials with an attached negative response i.e. a positive score indicating a positive attitude.

The latency-EAST score for chocolate bars indicates a tendency toward a positive implicit attitude, Ms = 8.003 ms, $t(188) = 2.131$, $p = 0.034$, but nonetheless with a low Cohen's d of 0.0350. On the other hand, the latency-EAST score for yoghurt is clearly non significant, Ms = 1.201ms, $t(188) = 1.156$, $p = 0.249$, $d = 0.0052$. The error-EAST

scores are non significant, neither for chocolate bars nor for yoghurts (respectively M=0.9312, t(188)=1.313, p=0.191 and M=0.6349, t(188)=1.004, p=0.316). The results on both dependent measures (latencies and error rates) tend to indicate a neutral implicit attitude toward yoghurts. The results for chocolate are non-significant, but they go in the direction of a more positive implicit attitude toward chocolate bars than towards yoghurts.

Go-No Go task

Analyses proceeded according to the algorithm defined by Nosek and Banaji (2000). First, d-prime was calculated as first dependent variable. D-prime indicates the ability to discriminate targets (or signal) from noise. Along Nosek and Banaji recommendation, empty cells due to false alarms or misses were replaced by a correction of 0.35 divided per 70 (number of eligible trials). Afterwards, d-prime was calculated as the difference in the proportion of hits (correct hit to signal) and false alarms (incorrect hit for noises) for each of four combinations of targets (chocolate or yoghurt) and attributes (good or bad) as signals. Two individuals with d-prime values below 0 were removed from the analysis as this score indicate that either participants were unable to discriminate any signal from noise or they were not performing the task as they were instructed to. Hence, sensitivity analyses were conducted with N=197.

As expected, sensitivity was greater when subjects were jointly discriminating chocolate and good from distracters (d'= 1.794) than jointly discriminating chocolate and bad (d'=1.705, t(196)=2.656, p=0.009). This result suggests that chocolate and good are more strongly associated than chocolate and bad. On the other hand, when the target concept was yoghurts, there was no significant difference in sensitivity between yoghurts

+ good (d'= 1.692) and yoghurts + bad (d'=1.742, t(196)=-1.582, p=0.115). The GNAT corroborates the IAT results in favour of an automatic positive attitude towards chocolate and tends to indicate a rather neutral attitude toward yoghurts. In addition, a MANOVA demonstrates that sensitivity did not vary by the target concept (chocolate or yoghurts, F(1,196)=2.139, p=0.145) nor by the evaluative category (good or bad, F(1,196)= 0.591, p=0.443). The sensitivity score is a unique reflection of the association between category and valence (F(1,196)=11.353, p=0.001).

Second, the latencies to categorize the target words when associated with bad compared to when associated with good were analyzed as second dependent variable. Reaction times were log-transformed and subsequent analyses are based on log-transformed data, although presented in ms for meaningful purposes. The difference in reactions times when chocolate is associated with bad (Ms=587) and when chocolate is associated with good (Ms=544) is significant (t(196)=7.517, p=0.000), indicating a positive attitude toward chocolate (Cohen's d=0.4134). On the other hand, for yoghurt, the difference in reactions time when yoghurt is associated with bad (Ms=547) vs. good (Ms=542) is non-significant (t(196)=0.531, p=0.596), indicating a neutral attitude toward yoghurt (Cohen's d=0.0428). Overall for the GNAT, both dependent variables (sensitivity and latencies) are internally consistent and in line with the IAT and EAST results, with a positive implicit attitude toward chocolate and a neutral attitude toward yoghurts.

Evaluative priming

The evaluative priming analysis (Draine and Greenwald, 1998) was conducted on the two blocks serving as test blocks. Trials involving the chocolate brands as prime were

analyzed separately from trials using yoghurt brands as prime. For each prime category, the latencies taken by participants to categorize pleasant words compared to unpleasant words were analyzed. The hypothesis was that for positive primes, consistent trials would be faster (i.e. facilitated) compared to inconsistent trials. For chocolate as a prime, we did not find any significant difference between positive (Ms= 632) vs. negative trials (Ms=638) with t(198)=0.962, p=0.337. For yoghurts used as prime, we got similar results, with no significant difference between categorization of pleasant (Ms=648) vs. unpleasant (Ms=639) words (t(198)=-1.223, p=0.219).[1] These results tend to indicate either that the attitude toward both chocolate and yoghurt is neutral or that the method selected (priming with words rather than pictures, speed chosen for the prime) is not sensitive enough to detect differences between consistent and inconsistent trials for these product categories.[2]

2.2.2 Differentiating ambivalent from dual attitudes

In the following sections, hypothesis (H1) that holding dual attitudes does not mean being any more ambivalent will be tested. Also, analyses will intend to demonstrate that the difference between ambivalent and dual attitudes lie in a different endorsement of both evaluations (H2). Finally, the moderating effect of holding ambivalent and dual attitudes on the experience of subjective ambivalence (H3) is investigated.

---

1 . All latencies were log-transformed and analyses proceeded on the transformed values. Results are presented in milliseconds in order to ease interpretation.

2 . The results of this evaluative task will not be discussed further.

Correlations between measures

The three measures of explicit attitude toward chocolate (alpha=0.966) and the three measures of explicit attitude toward yoghurt (alpha=0.947) were averaged. Afterwards an index of explicit preference toward chocolate was created by subtracting the attitude toward yoghurt from that of chocolate. This index allows the assessment of the correlation between the explicit preference and the IAT (i.e. implicit preference). As one notices in the table 3, this correlation is not significantly different from zero (r=0.067). Similarly, the correlations between the explicit attitude toward chocolate and the two implicit attitude measures (GNAT, r=-0.076 and EAST, r=-0.098, $p > 0.10$) are near to zero. Nonetheless, the correlations between the IAT and the GNAT as well as between the IAT and the EAST are significant at p=0.000, even if the internal consistency between these three measures remains low (alpha=0.3738). Altogether, these results are in line with expectations of an implicit-explicit dissociation for chocolate.

Table 3: correlations between explicit and implicit attitude measures

	Explicit Preference	Attitude	IAT	GNAT	EAST
Explicit preference	1	0.731	0.067	-0.047	-0.009
Attitude		1	-0.003	-0.076	-0.098
IAT			1	**0.323**	**0.192**
GNAT				1	0.072

Dual and non-dual clusters

The GNAT measurement was selected to analyze dual attitudes toward chocolate. First, this test is internally consistent for both the chocolate and the yoghurt (see section 2.2.1) and it correlates significantly with the widely used IAT. Second, contrary to the IAT, it assesses the implicit attitude toward chocolate separately from yoghurt (i.e. it delivers an implicit attitude rather than an implicit preference).

A K-means cluster analysis was conducted in order to identify groups of participants holding dual attitudes toward chocolate. Three homogeneous groups were created on the basis of the explicit attitude toward chocolate (mean attitude, $F(2,194)=184.605$, $p=0.000$) and the implicit attitude (GNAT chocolate, $F(2,194)=37.478$, $p=0.000$). The three clusters could be interpreted as grouping dual positive (explicit positive and implicit negative, N=24), dual negative (explicit negative and implicit positive, N=38) and non-dual subjects (N=135). Table 4 displays the final cluster centers. In addition, I compared the scores for each cluster on two additional implicit measures, the IAT and the EAST. Although the difference on these variables is not significant between groups (IAT, $F(2,194)=1.126$, $p=0.326$; EAST, $F(2, 184)=1.406$, $p=0.248$), the direction of effects is consistent with the results on the GNAT.

Table 4: Cluster centers on explicit and implicit attitude measures

	Cluster 1 Dual +	Cluster 2 Dual -	Cluster 3 Non dual
Mean attitude	**6.68**	**2.54**	**5.74**
GNAT – d	**-0.63**	**0.29**	**0.64**
IAT – d	*0.16*	*0.30*	*0.29*
EAST – d	*-0.02*	*0.15*	*0.01*

Objective ambivalence

Hypothesis 1 was predicting that holding dual attitudes does not imply being any more ambivalent. To test this hypothesis, an index of objective ambivalence was computed through combining estimates of positive (alpha=0.809) and negative (alpha=0.807) evaluations using the Griffin Similarity-Intensity formula ((P + N)/2 - |P – N|) (Thompson, Zanna and Griffin, 1995). A oneway ANOVA indicates that the three clusters do not differ on this measure of objective ambivalence ($F(2,194)=0.966$, $p=0.382$). As shown in table 5, neither cluster 1 (dual +) nor cluster 2 (dual -) are more ambivalent compared to cluster 3 (non dual). There is even a tendency to be less ambivalent when being part of the cluster 1 (dual positive), although the difference with the two other clusters is not significant. Overall, these results give credit to the first hypothesis (H1) that holding dual attitudes is not related to ambivalence when ambivalence is measured objectively (through computation of positive and negative evaluations).

Table 5: Summary of Griffin ambivalence index for dual and non dual clusters

	Mean	S.D.
Cluster 1- Dual +	1.368	1.808
Cluster 2- Dual -	2.013	1.899
Cluster 3- Non dual	1.818	1.768
Total	1.801	1.798

Relevance and importance of positive and negative bases of evaluation

Hypothesis H2 was predicting that ambivalent and dual attitudes entail a different endorsement of the positive and negative bases of evaluation. In order to test this hypothesis, two groups were created (i.e. high and low in ambivalence; see for instance Armitage and Conner, 2000) according to a median split (median = 1.833).

A MANOVA was conducted on the importance and relevance of the positive and negative bases of evaluation introducing as fixed factors the 3 clusters (non dual, dual with positive explicit and dual with negative explicit) as well as the two ambivalence groups. On one hand, there is a main effect of ambivalence on the negative basis of the evaluation, the negative basis of evaluation being more important and relevant for the high ambivalence group compared to the low ambivalence group (respectively $F(1,191)=14.183$, $p=0.000$ and $F(1,191)=14.700$, $p=0.000$). On the other hand, the ambivalence level has no effect neither on the importance nor on the relevance of the positive basis of evaluation (respectively, $F(1,191)=0.784$, $p=0.377$ and $F(1,191)=0.000$, $p=0.987$). Yet, overall, as expected (H2.1), results show that in the high ambivalence group, bases of evaluation are equally endorsed i.e. there is no significant difference between importance and relevance of the positive and negative bases of evaluation for the group high in ambivalence ($p > 0.10$).

However, there is no clear support for hypothesis H2.2 that when holding dual attitudes, one basis of evaluation is more important and relevant. Actually, there is a main effect of the cluster membership on both the importance and relevance of the negative and positive bases of evaluation (respectively for importance $F(2,191)=2.380$, $p=0.095$ and $F(2,191)=4.213$, $p=0.016$; for relevance, $F(2,191)= 5.217$, $p=0.006$ and $F(2,191)=4.098$,

p=0.018). A post-hoc test using Hochberg's GT2 procedure (due to inequality in cluster sample sizes) indicates differences between the dual negative group and the non-dual group, with the negative basis of evaluation being both more important and relevant for the dual group (respectively mean difference= 0.89, p=0.047 and 1.17, p=0.003) and the positive basis of evaluation being less important and relevant (respectively mean difference=-0.76, p=0.049 and -0.87, p=0.014). These results indicate that dual attitudes tend to involve bases of evaluation that are equally endorsed.

Finally, there is no interaction between cluster memberships and ambivalence, neither for the negative basis (F(2,191)=0.441, p=0.644 for importance and F(2,191)=0.116, p=0.890 for relevance) nor for the positive basis (F(2,191)=0.355, p=0.702 for importance and F(2,192)=0.867, p=0.422 for relevance).

Figure 3: Importance and relevance of positive and negative bases between ambivalence groups

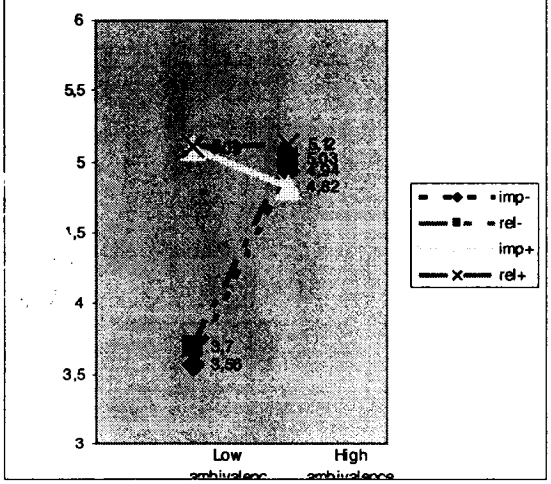
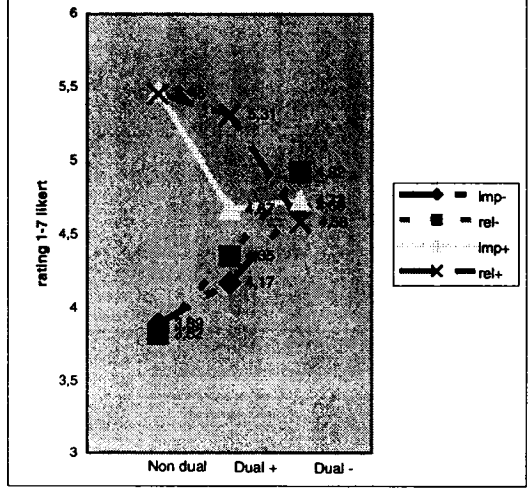


Figure 4: Importance and relevance of positive and negative bases between dual groups



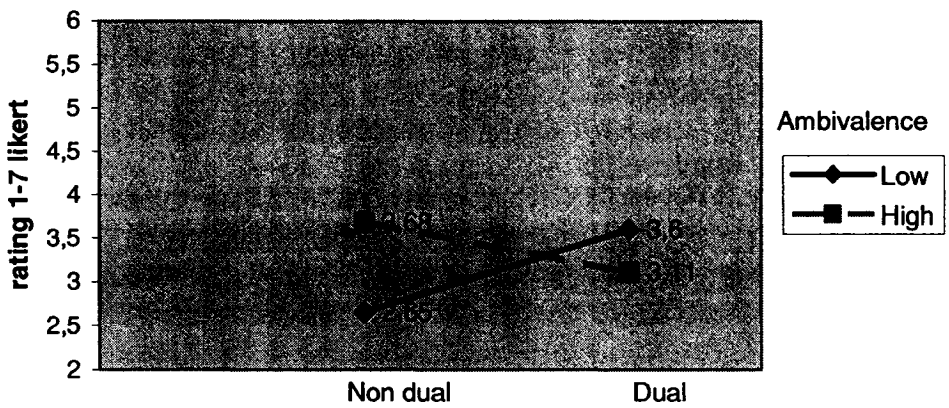
Overall, these results partially support the second hypothesis. Ambivalence involves equivalent endorsement and importance of both positive and negative bases of evaluation (H2.1). Nonetheless, when dual, there is no clear support that one basis of evaluation is considered as more important and legitimate (H2.2). Actually, for dual negative, it even appears that both bases are equally important and relevant. An additional and rather unexpected result lies in the difference in importance and relevance of the negative basis between participants high in ambivalence (compared to low) and participants holding dual attitudes (compared to non dual). This result points out the role played by negativity in the activation of an attitudinal conflict (see general discussion).

Subjective ambivalence

In order to test hypothesis H3 that ambivalent and dual attitudes do not lead to the same experience of tension (measured as subjective ambivalence), the four items measuring subjective ambivalence were averaged (alpha= 0.8067) and an ANOVA was conducted on this variable with objective ambivalence and duality as fixed factors. Neither ambivalence nor duality had a main effect on subjective ambivalence (respectively, $F(1,193)= 1.275$, $p=0.260$ and $F(1,193)=0.654$, $p=0.420$). Yet, the interaction between ambivalence and duality is significant ($F(1,193)=10.550$, $p=0.001$). In the low ambivalence group, participants are more subjectively ambivalent when they are dual compared to when they are non dual (contrast estimate difference in means 0.955, $p=0.007$). In the high ambivalence group, participants tend to be less subjectively ambivalent when they are dual compared to non-dual (contrast estimate difference in means -0.574, $p=0.077$). These results suggest that high ambivalence leads to an

experience of tension (when being non dual), giving credit to H3.1. But, contrary to the prediction H3.2, holding dual attitudes also leads to an experience of tension (when non ambivalent). It appears that in both cases individuals are aware that they experience a conflict and feel discomfort with it.

Figure 5: Subjective ambivalence



2.2.3 Measures of attitude strength

In the following analyses, hypotheses H4 to H6 on the moderating effect of ambivalent and dual attitudes on measures of attitude strength (accessibility, stability and certainty) are tested. For these analyses, the valence of the duality is not relevant. Consequently, analyses are conducted on the whole group of 62 dual participants (cluster 1 and 2) in order to get a bigger sample size, more comparable to that of non dual.

Attitude Accessibility

Hypothesis H4 was predicting that attitudes would be slower to retrieve at higher levels of ambivalence and that duality would be a moderator, with attitudes being even less accessible when being dual in addition to ambivalent. In order to test this hypothesis, attitude accessibility, measured as the latencies in ms, was analyzed along Fazio's (1990) recommendations. The attitude responses provided during the dichotomous tasks were compared to those given on the seven-point Likert scale measure for which speed of responding was not an issue. For yoghurt (filler measure, first in sequence), 183 (out of 186) answers were correctly identified as positive or negative both in the forced choice and on the measure on scale, which results in an "error rate" below 2%. For the 13 answers in the middle point on the scale (exactly 4), 8 were negative and 5 positive in the reaction task. For chocolate bars (two measures), 174 (out of 178) answers were correctly identified as both positive or negative, which results in a low "error rate" of 2.25%. For the 21 answers on the middle point of the Likert scale (exactly 4), 15 turned out to be negative in forced choice and 6 positive. Altogether, these results indicate a good correlation between the responses recorded under time pressure and those taken on traditional Likert scales (respectively phi=0.895 for yoghurts and 0.902 for chocolate bars). It also provides an indication that responses on the middle point, which might be considered as neutral or ambivalent tend to display a negative orientation.

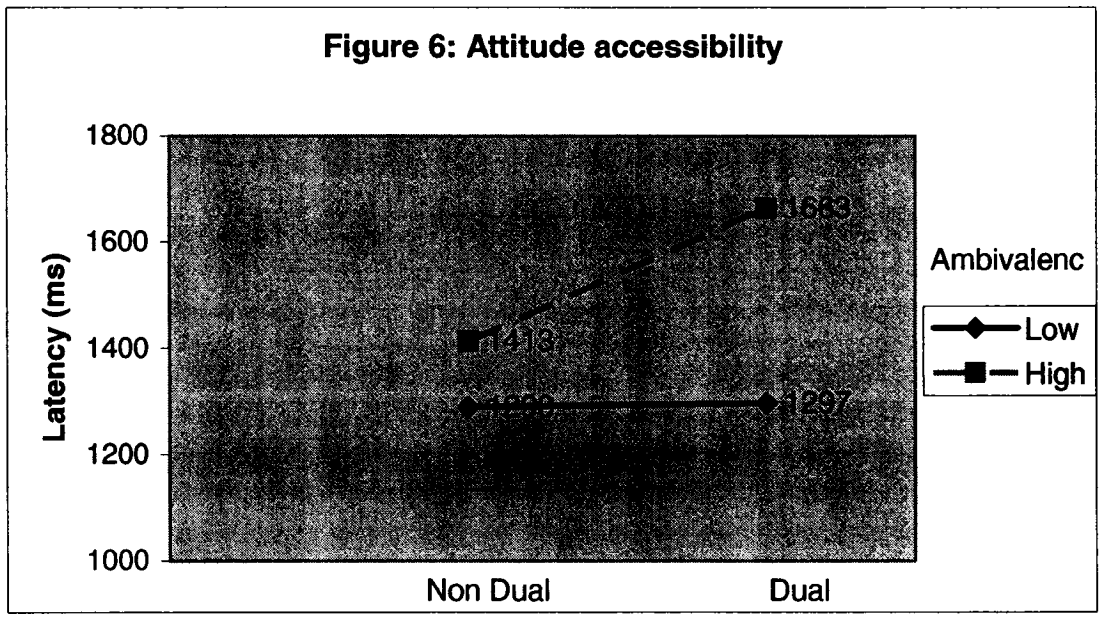
Second, the response latencies were analyzed (see figure 6). Response latencies below 500ms were recoded to 500ms, as it might indicate that the subject answered without reading the question. These responses were rare for the first item (below 2%) and

accounted for 6% of all responses for the second chocolate item. As the attitude toward yoghurt was measured first in sequence, the answers were much slower (mean=2776 ms, S.D. 1279ms) than the focal measures for chocolate (mean=1395 ms, S.D. 557 ms). Along Fazio (1990)'s recommendations, the latency measures for yoghurt (filler item) provided a means of controlling for individual differences in speed of responding when eliciting an attitude, and served as a covariate in the subsequent analyses. The latency measures for attitude toward chocolate bars (alpha=0.618) and attitude toward yoghurt were log-transformed in order to make the mean a more accurate reflection of the central tendency of the skewed distribution. However, the following results are presented on non-transformed latencies to ease interpretation.

An ANCOVA was conducted on the mean latency for attitude toward chocolate, with objective ambivalence (median split) and dual status (dual or non dual) as between-subject factors, and the latency measure for yoghurt as covariate. There is a main effect of the covariate measure ($F(1,192)=31.889$, $p=0.000$), a main effect of the ambivalence factor ($F(1,192)=12.951$, $p=0.000$) and an interaction effect of ambivalence X duality ($F(1,192)=5.805$, $p=0.017$). The main effect of duality was not significant ($F(1,192)=1.303$, $p=0.255$). A contrast analysis demonstrates that the attitude toward chocolate is less accessible at higher levels of ambivalence (contrast estimate difference in log-transformed means 0.193, $p=0.000$) and at higher level of ambivalence, it is even slower to retrieve when subjects have a dual attitude toward chocolate compared to when they are non dual (contrast estimate in log-transformed means 0.180, $p=0.018$).

These results corroborate hypothesis H4. Ambivalence is a moderator of accessibility, with attitudes being longer to retrieve at higher levels of ambivalence. In addition, at high levels of ambivalence, holding dual attitudes increases the time taken for the explicit attitude to be retrieved.

Figure 6: Attitude accessibility



Attitude stability and certainty

In order to test hypotheses H5 and H6 on the moderating role of ambivalence and duality on attitude stability and certainty, the two items measuring attitude stability (alpha=0.7129) and attitude certainty (alpha=0.8653) were averaged and the aggregated measures were used as dependent variables in a MANOVA with ambivalence and duality as fixed factors. For both attitude stability and attitude certainty, ambivalence had a significant main effect ($F(1,193)=7.344$, $p=0.007$ and $F(1,193)=7.326$, $p=0.007$respectively) and duality no main effect ($F(1,193)=0.410$, $p=0.523$ and

F(1,193)=0.255, p=0.614). The interaction effect was not significant for attitude stability (F(1,193)=0.002, p=0.964) yet there was an interaction for attitude certainty (F(1,193)=5.134, p=0.025). As illustrated by the two graphs below (figures 7 and 8), the attitude is more likely to vary (more unstable) at higher levels of ambivalence and duality is not a moderator. A contrast analysis also demonstrates that the attitude is held with less certainty at higher levels of ambivalence (contrast estimate difference in means -0.627, p=0.007), especially for those non-dual subjects (contrast estimate difference in means 0.642, p=0.050).

Figure 7: Attitude variability

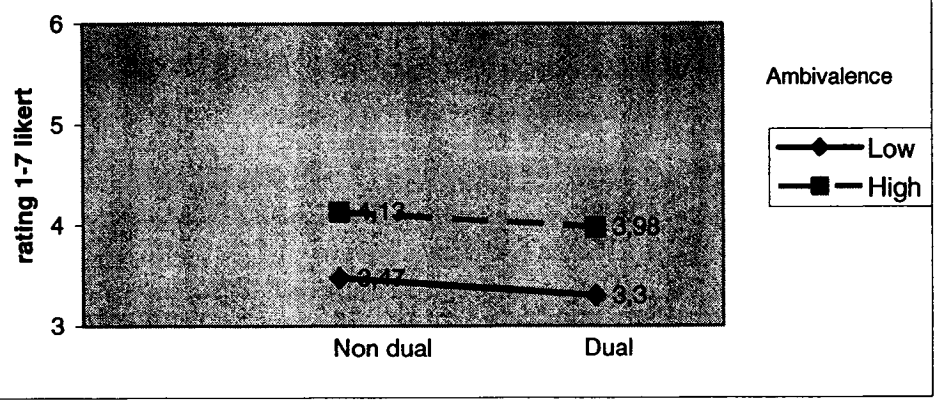
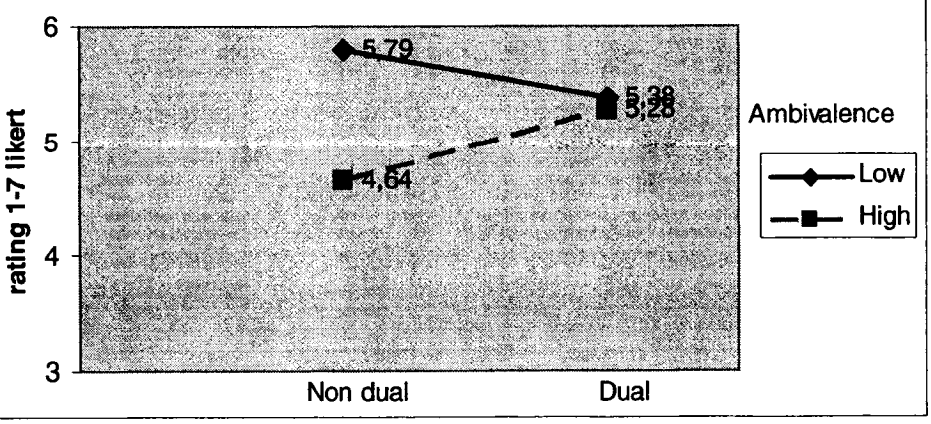


Figure 8: Attitude certainty



H5 and H6 are fully supported for ambivalent attitudes. Ambivalence has a moderating effect on both attitude stability and attitude certainty, with attitudes being less stable and less certain at higher levels of ambivalence. For dual attitudes, it appears as predicted that duality is not a moderator of attitude stability (H5.2). Yet for certainty, dual attitudes are held with more certainty at higher levels of ambivalence (contrary to predictions) and tend to be less certain at lower levels of ambivalence (H6.2).

2.2.4 Predictors of choice

In this section, the hypothesis 8 and 9 on the interplay between the implicit and explicit attitude in predicting volitional vs. spontaneous choice and the moderating effects of holding dual and ambivalent attitudes are tested. The two measures of behavioural intention for chocolate bars (alpha=0.945) and for yoghurts (0.951) were aggregated and formed an index of deliberative choice (as proxy) and the actual binary choice between the yoghurt stick and the chocolate bar was entered as measure of spontaneous choice[1]. First, the influence of the explicit preference, the implicit preference (IAT) and the implicit attitude toward chocolate (GNAT) on spontaneous and deliberative choice were fitted separately, respectively through a logistic and a linear regression model. Duality and ambivalence group membership were included as moderating categorical variables. Second, to be able to test the full model (with both spontaneous and deliberate choice as outcomes), obtain an overall test of goodness of fit and take into account measurement error (especially for the implicit measures), a structural equation approach was adopted.

[1] Overall, in the binary choice task, 59.3% of participants chose the chocolate.

The logistic regression model predicting the actual choice performs fairly well with these five predictors (chi-square(5)=45.839, p=0.000) and helps predict 70.6% of the choices. There is a marginally significant influence of the duality group (odds=0.471, Wald=3.296, p=0.059) and, as predicted (H7.1), there is a significant influence of both the explicit preference (odds=1.449, Wald=17.614, p=0.000) and the implicit preference IAT (odds=2.728, Wald=5.300, p=0.021) in determining the final (spontaneous) choice. In addition, conforming to H7.2., there is no effect of the ambivalence group on choice (Wald=1.850, p=0.174). Finally, there is no main effect of the GNAT measure (Wald=2.151, p=0.142). The differential influence of each variable between the dual groups was investigated further through entering each variable in the form of interactions. This model does not make a major improvement on the previous model with main effects only (72.6% of choices correctly predicted). The only significant interaction is the Dual X GNAT interaction (odds=2.914, Wald=5.072, p=0.024) which indicates an increased influence of the implicit attitude toward chocolate on choice in the group of dual participants, in line with the hypothesis H7.3.

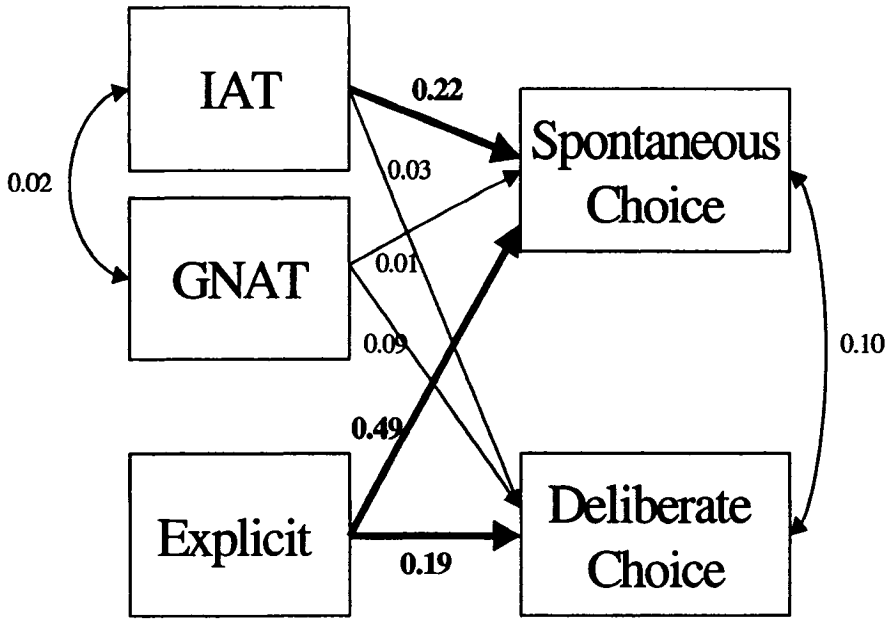
In parallel, the linear model predicting the "volitional" choice between the chocolate and the yoghurt was fitted (R=0.640, Adjusted R^2 = 0.394, F(5, 191)=26.536, p=0.000) and indicates no effect of the dual (p=0.291) or ambivalent (p=0.547) variables, and no significant influence of the IAT (p=0.315) or the GNAT (p=0.566). The only significant influence on deliberative choice is the explicit preference (B=0.664, t=10.985, p=0.000), which gives credit to H8.1.

The structural equation model predicting simultaneously the spontaneous and the deliberative choice was fitted using the Mplus software[1]. First, a Confirmatory Factor Analysis was conducted to assess the existence of a latent implicit construct with the three measures (IAT, GNAT and EAST) as measurement items (see Cunningham, Preacher and Banaji, 2001, for confirmatory factor analysis on implicit measures). Unfortunately, the measurement model performed badly, with a CFI of 0.26. It appears that none of the three indirect measures introduced in the model load significantly on one latent construct (estimate/S.E. from 0.526 to 0.548, $p>0.10$). The correlation between the implicit and explicit measures does not reach significance either (estimate/S.E. 0.109, $p>0.10$). Consequently, the IAT and the GNAT were introduced as separate constructs in the model. This new model is theoretically justified by the structural difference between both implicit tests, the IAT assessing the implicit attitude toward chocolate relative to a contrast category (i.e. an implicit preference) and the GNAT measuring the "implicit attitude toward chocolate" in more absolute terms. A full model assessing the influence of both implicit and explicit measures on spontaneous and deliberate choice was fitted. The fit of this model is excellent, with a non significant chi-square ($p=0.67$) and a CFI close to 1 (CFI=0.99). Nonetheless, because these traditional measures of fit have a rather low power to reject a model with binary outcome (Yu and Muthen, 2002), two additional indicators of goodness of fit were taken into account, the RMSEA and the WRMR. Both indicated a very good fit, with a RMSEA close to 0 (RMSEA=0.001) and a WRMR below 0.9 (WRMR=0.072). As expected (see figure 9), the implicit preference (IAT, est/S.E.=4.802, $p=0.000$) in addition to the explicit preference (est/S.E.=1.99, $p=0.05$)

[1] . At the time the analyses were conducted, Mplus is the only software allowing the introduction of binary categorical outcomes in a structural model.

contribute to the prediction of the spontaneous choice. The deliberative behaviour is significantly influenced by the explicit preference only (est/S.E.=2.48, p=0.01).

Figure 9: Structural model of implicit and explicit influence on choice



Standardized parameters for the structural equation model on the group of respondents (N=197). Significant structural paths are in bold.

Second, the model was fitted simultaneously on the two groups of dual and non dual. Again, the fit of the model was good (CFI=0.99, RMSEA=0.000, WRMR=0.671). For the group of non dual, the implicit measures have no significant influence, neither on spontaneous choice, nor on deliberate choice (p>0.10). Yet, the explicit preference has a significant influence on spontaneous choice (std estimate=0.508, est/S.E.=3.367, p=0.000) as well as on deliberate choice (std estimate=0.158, est/S.E.=1.952, p=0.05). For the group of dual, spontaneous choice is influenced by the explicit preference (std

estimate=0.370, est./S.E.=2.061, p=0.04), the implicit preference (IAT std estimate=0.404, est./S.E.=2.135, p=0.03) and marginally the implicit attitude toward chocolate (GNAT std estimate=0.158, est/S.E.= 1.768, p=0.09), the explicit preference still being the only predictor of deliberate choice (std estimate=0.145, est./S.E.=4.875, p=0.000).

Third, the model was tested simultaneously on the high vs. low ambivalence groups[1]. The model also fits the data very well, with a significant chi-square (p=0.63), a CFI of 1, an RMSEA of 0.000 and a WRMR of 0.598. In the group Low in ambivalence, the explicit preference determines both the spontaneous (std estimate=0.515, est./S.E.= 3.615, p=0.000) and deliberate behaviour (std estimate=0.186, est./S.E.= 1.981, p=0.05). In the group High in ambivalence, the explicit preference is not significantly influencing deliberate behaviour (std estimate=0.129, est./S.E.=1.096, p>0.10). Yet, spontaneous behaviour is influenced by both the explicit preference (std estimate=0.492, est./S.E.=3.398, p=0.000) and the implicit preference (std estimate=0.153, est./S.E.=2.382, p=0.02).

Overall, the results support H7 and H8 on the different influence of implicit and explicit attitudes in driving spontaneous and more deliberate choice. It appears that the spontaneous choice is influenced by both the implicit and the explicit attitude (H7). In addition, the implicit attitude influences spontaneous choice more when in the context of an attitude conflict (holding ambivalent or dual attitudes). Also, in line with the

[1]. At the time the analyses are conducted, Mplus does not allow the specification of more than one grouping variable.

predictions (H8), the deliberate behaviour (behavioural intention as proxy) is only influenced by the explicit attitude, with no moderating effect of holding dual attitudes. Yet, at high levels of ambivalence, the relation explicit attitude and deliberate choice is not significant.

2.2.5. Dual attitudes and individual eating behaviors

The following sections explore individual differences that might partially explain the existence of dual attitudes. Particularly, differences between dual clusters on the Dutch Eating Behavior Questionnaire are assessed (van Strien et al. 1986). No formal hypotheses are proposed. Yet, it is expected that restrained eaters be more likely to hold dual attitudes toward chocolate (positive implicit but negative explicit) than non restrained eaters.

The Dutch Eating Behavior Questionnaire

A maximum likelihood factor analysis with varimax rotation was conducted on the 33 items extracted from the DEBQ (KMO = 0.914; Bartlett's p=0.000). 5 items had to be discarded in order to get the three expected factors and increase the reliability. The three factors extracted could be interpreted as restrained (9 items, eigenvalue= 10.661), emotional (13 items, eigenvalue = 4.415) and external/situational eating (6 items, eigenvalue=2.604). Together they explain 63% of the total variance. It has to be noted that the situational eating factor is the weaker (4 out of five items discarded were on this factor) with the lowest reliability (0.87 compared to 0.92 for restrained eating and 0.95

for emotional eating). This might be due to the fact that these four questions were the four last questions in the experiment.

The means on each subscale (scales 1-5) on the total number of participants were for the restrained scale 2.346 (S.D. 0.900), for the emotional scale 2.425 (S.D. 0.907) and for the situational scale 3.529 (S.D. 0.746).

Describing the clusters with individual variables

A discriminant analysis was carried out in order to determine how the clusters differ on a set of individual difference variables, including age and gender as well as the three dimensions of the D.E.B.Q. (restrained eating, emotional eating and situational eating). A problem of multi-collinearity among the variables was identified, restrained eating being correlated with emotional eating ($r=0.433$), age ($r=0.174$) and gender ($r=0.343$), and in addition emotional eating being correlated with situational eating ($r=0.406$) and gender ($r=0.301$) and situational eating with age ($r=-0.198$) at $p < 0.05$. Thus, an orthogonal principal component analysis was conducted and the resulting components were introduced as independents in the discrimination function analysis. The univariate ANOVAs show that the 3 clusters differ significantly on two variables, restrained eating ($F(2,194)=5.992$, $p=0.003$) and situational eating ($F(2,194)=3.691$, $p=0.027$). Two discriminant functions were obtained. The first function accounts for 92.2% of the total among-groups variability. The second accounts for the remaining 7.8%. To interpret these functions, we turned to the standardized discriminant coefficients. The first function is most heavily weighted on the factor restrained (coef. = 0.693) and negatively weighted on the factor situational eating (coef. = -0.523). The second function is most weighted on the factor situational (coef. = 0.577). Table 6

presents the group means on the discriminant functions and the five component scores. Cluster 1 (dual with a positive explicit and negative implicit attitude) is mostly described by the situational eating variable and marginally the emotional eating variable. Cluster 2 (dual with a negative implicit and a positive explicit) is mostly described by their restrained eating status and marginally this group is older and more feminine. The discriminant function helped classify correctly 42.1% of original grouped cases (with just guessing a success rate of 33% would have been expected), 65.8% of cluster 2 and 37.5% of cluster 1.

Table 6: description of each cluster with individual variables

	Cluster 1 Dual +	Cluster 2 Dual -	Cluster 3 Non dual
Discriminant function 1	-0.279	0.790	-0.173
Discriminant function 2	0.292	0.002	-0.005
Restrained eating	-0.125	**0.501**	-0.111
Situational eating	**0.285**	-0.366	0.032
Emotional eating	0.218	-0.121	-0.003
Gender	0.019	0.287	-0.085
Age	0.014	0.291	-0.086

Classification results demonstrate that knowledge of people's eating behavior increases the ability to predict what clusters (especially dual positive or negative toward chocolate) individuals belong to. It is interesting to notice that being dual negative or being dual positive does not lead to the same eating behaviours. Whereas dual negative individuals are more restrained, dual positive tend to be more external/situational eaters (influenced by the environment and social settings). This result is particularly intriguing and difficult to explain. It might be that those having a tendency to be influenced by external cues have internalized that chocolate is not good for their weight but justify their

social behaviours through a positive attitude. Or these people might be health conscious, but with no serious weight problems. On the other hand, those who have a tendency to control more their eating behaviour and refrain from eating certain food try to convince themselves that chocolate is not good for them.

Main differences between the restrained and non restrained group

Although there is no conventional cut-off for the restrained subscale of the DEBQ, it was decided to include as restrained eaters those participants with an average superior to three out of five on the restrained scales (n=47), which seems conservatory taking into account a median of 2.333. With these two subgroups (restrained-non restrained) identified, a cluster X restrained status tabulation was computed (see table 7), which shows significant differences between restrained groups (chi-square (2)=11.358, p=0.003), with restrained eaters being more frequently dual (especially negative) toward chocolate than non-restrained eaters.

Table 7: frequency of duals in restrained and non restrained eaters

	Non Restrained (n = 150)	Restrained (n=47)
Cluster 1 dual + (n = 24)	12.7%	10.6%
Cluster 2 dual - (n = 38)	14.0%	**36.2%**
Cluster 3 non dual (n = 135)	73.3%	53.2%

Table 8 summarizes the main differences on explicit and implicit variables between restrained and non-restrained eaters, The restrained eaters have a significantly more negative explicit attitude toward chocolate (mean difference = - 0.98, F(1,197)=12.990, p=0.000). There is also a significant difference between both groups in

terms of explicit preference between the chocolate and the yoghurt (F(1,197)= 14.118, p=0.000)). Restrained eaters display a marked preference toward the yoghurt. In addition, restrained eaters display a more positive implicit attitude toward chocolate than non restrained eaters (d-IAT = 0.367 vs. 0.250 p=0.000; d-GNAT = 0.514 vs. 0.382, p=0.000). Yet, they are not anymore ambivalent than non-restrained eaters (F(1,197)=0.300, p=0.585).

Turning to choice, there is a significant difference in the deliberative choice between both groups (F(1,197)=3.195, p=0.075), with a higher intention to choose the yoghurt for restrained than non restrained eaters (F(1,197)=3.533, p=0.062). Nonetheless, there are no differences in the real choices made subsequently between the restrained and non restrained eaters (F(1,197)=1.726, p=0.191). Overall, 59.3% of participants choose the chocolate bars, 51.1% among the restrained eaters group and 61.8% among the non-restrained eaters group. This result highlights a discrepancy between the behavioural intention of restrained eaters and their subsequent, "more impulsive", choice.

Table 8: implicit and explicit variable means for restrained and non restrained eaters

	Restrained eaters	Non restrained eaters
Attitude chocolate	4.489 (SD 1.920)	5.467 (SD 1.524)
Preference	-1.262 (SD 2.437)	0.211 (SD 2.321)
IAT-d	0.367 (SD 0.432)	0.250 (SD 0.394)
GNAT chocolate-d	0.514 (SD 0.926)	0.382 (SD 0.730)
EAST chocolate-d	0.004 (SD 0.418)	0.047 (SD 0.522)
Deliberative choice	-0.766 (SD 2.531)	0.054 (SD 2.339)
Ambivalence chocolate	1.918 (SD 1.911)	1.754 (SD 1.757)

All together, these results indicate that restrained eaters have a tendency to be more dual toward chocolate than non restrained eaters. It appears that their explicit

attitude toward chocolate is less positive than that of non-restrained eaters, whereas their implicit attitude is generally more positive (both when measured on the IAT and on the GNAT).

2.3. Summary

Overall, these results indicate that ambivalence and duality are two distinct forms of attitude conflict (H1). Yet, it appears that, in both cases, the positive and negative bases of evaluation are equally important and relevant, and participants experience the feeling to be conflicted, giving partial credit to hypotheses H2 and H3. It appears that participants are aware of their contradictions in both cases, when ambivalent and dual.

In addition, findings in the ambivalence literature on the weakness of explicit attitudes based on ambivalence (H4.1 to H6.1) are corroborated. Explicit attitudes are less accessible, less stable and less certain at higher levels of ambivalence. It appears also that duality is a moderator for attitude accessibility and certainty at higher levels of ambivalence. Attitudes are even longer to retrieve (i.e. less accessible) when they are both dual and ambivalent (H4.2.), yet they are also more certain.

Finally, hypotheses H7 and H8 are fully supported. Both implicit and explicit attitudes drive spontaneous behaviour whereas only explicit attitude influence deliberate choice. The influence of the implicit attitude on spontaneous choice seems amplified when a conflict (either ambivalence or duality) exists in attitudes.

Based on these findings, it is likely that the form of duality encountered in the context of food is similar to that of motivated overriding (Wilson et al. 2000) where people are fully aware that they have two implicit and explicit attitudes. Yet, ultimately, these people seem to deny one aspect of their attitude. The context of restrained eating appears to be ideal to study the processes yielding to dual attitudes.

CHAPTER III: Follow up study - The case of restrained eating

Results from Study 1 indicated that restrained eaters would be more likely to hold a dual attitude toward chocolate (negative explicit attitude and positive implicit attitude) than non-restrained eaters. This second study uses restrained eating as context in order to explore the processes leading to holding dual attitudes. It is hypothesized that restrained eaters inhibit (or override) their positive implicit attitude toward certain products, which they deny eating or liking. Nonetheless, this implicit attitude might influence restrained eaters' eating choices in circumstances when they lose control on their behavior. This follow up study also gives the opportunity to study changes in implicit and explicit attitudes after direct experience with a food item, with a view to evaluate means to reduce attitude conflicts. Finally, the interplay between implicit and explicit attitudes in influencing spontaneous and controlled behavior is investigated further with different choice options compared to study 1.

1. Conceptual foundations

1.1. Is holding dual attitudes the consequence of inhibition?

Wilson et al. (2000)'s form of duality which is referred as *motivated overriding* is comparable to a phenomenon widely studied in psychology as *inhibition*. In psychology, the term inhibition describes a decrease in the activation or accessibility of a mental representation or the blocking of a particular mental process (Anderson and Spellman, 1995; Brendl, Markman and Messner, 2003; Fitzsimons and Shiv, 2001) and disinhibition would arise from "*lessened controls on response inclinations*" (Gorenstein and Newman, 1980, p. 302). Motivated overriding entails inhibition as people block access to an

implicit attitude they view as illegitimate or unwanted and replace it by an attitude which they believe to be good or instrumental with respect to their goals. For instance, Moskowitz, Gollwitzer, Wasel and Schaal (1999, Study 4) showed that chronic egalitarians have the same stereotype representations as non-chronics, but both groups differ in their goals. "*Implicitly activated egalitarian goals allow chronics not merely to prevent stereotypes from being activated but to inhibit the stereotype prior to activation*". This process requires motivation and cognitive capacity.

Self-regulating behaviors, such as restraining eating, precisely involve managing a conflict between strong inhibiting and strong instigating pressures. Polivy's (1998) seminal article provides a comprehensive review on behavioral inhibition and the conflict involved between the desire to suppress, and to perform, a behavior (e.g. eating a favorite food when on a diet). Similarly, Ward and Mann (2000, p. 753) state , "*Restrained eating, like the inhibition of the most pleasurable activities, entails self-regulation, an overriding of a normal response through the substitution of a competing response*". Accordingly, this group is more likely to experience dual attitudes toward a number of high-fat products (e.g. a positive implicit attitude toward "forbidden" food and a negative explicit attitude conforming to their diet), compared to non-restrained eaters. A robust observation by nutritionists is that when restrained eaters break their diet, not only do they eat much more than they should, taking into account their commitment to a diet, but also their choice invariably goes in favor of foods high in calories, and forbidden in the context of their diet. Typically, restrained eaters and bulimics tend to report dislikes in preference studies for food considered forbidden or "dangerous" because they are high in calories and especially in fat content, but paradoxically, these forbidden foods are those eaten in

excess when restrained eaters release from self-imposed control and break their diet (Kales, 1990; Vartanian, Polivy and Herman, 2004). Although the overeating of restrained eaters during disinhibited episodes has been widely documented, the mechanism driving their choice in favor of these forbidden food is yet largely unknown. It is assumed that through repeated dieting episodes, restrained eaters have self-conditioned themselves to express preferences in line with their diet and block access (inhibit) to their original inclination in favor of food higher in calories.

When restrained eaters are motivated and have the cognitive capacity to override their temptations, they control their eating and their food choices whereas when they release from self-imposed control they make choices dictated by their impulses (Baumeister, Heatherton and Tice, 1994). A breakdown of cognitive control is involved in disinhibitive episodes, when restrained eaters increase their food consumption contrary to their usual caloric restriction (e.g. Ward and Mann, 2000). For instance, the use of disinhibitors such as food pre-loads, dysphoric mood or alcohol consumption was successful in rendering restrained eaters to lose their cognitive control over their food consumption, leading to overeating. The "food pre-load effect" is one of the best documented failures of self-regulation processes. After consuming a high-fat milkshake, restrained eaters consume more calories in the preload condition whereas, in contrast, non-restrained eaters tend to consume fewer calories than in the control condition (Kirschenbaum and Dykman, 1991; Knight and Boland, 1989; Herman and Mack, 1975). Mitchell and Epstein (1996) also demonstrated that stress has disinhibitive effects. Following a Stroop task used as a stressor, restrained eaters increased their food consumption whereas non-restrained eaters decreased their consumption compared to the control group (Mitchell and Epstein, 1996).

An interesting parallel could be drawn with the disinhibition involved in alcohol drinking. In Dermen and Cooper (2000)'s research, alcohol decreases condom use only in individuals that have highly conflicted feelings about condoms. The researchers advocate that alcohol might interfere with access to distal, instigatory cues for condom use (e.g., fear of AIDS) whereas it does not impede access to proximal cues (e.g., sexual pleasure).

Ward and Mann (2000) demonstrated that a simple cognitive load such as a memory test is sufficient to obtain overeating in restrained eaters. They exposed restrained and non-restrained eaters to a high-calorie food while they were occupied with a recognition-memory task (high cognitive load condition) or a simple reaction-time task (low cognitive load). In the high-cognitive load condition, restrained eaters were more under instigating pressure (focusing on the attractiveness of the food) and engaged more in disinhibited eating compared to the low cognitive load condition. In contrast, non-restrained eaters ate less food in the high-cognitive load condition compared to the low cognitive load condition. In 2004, Ward and Mann extended their work by demonstrating that under limited attention capacity, the behavior of restrained eaters is influenced by the salience of the cues instigating consumption or inhibiting it. In the high cognitive load condition, restrained eaters ate more when the attractiveness of the food was salient than in a situation in which their diet was made salient (Mann and Ward, 2004). Altogether, these results tend to indicate that cognitive load plays a role in the incapacity to override responses based on instigating cues in restrained eaters. Similarly, cognitive load might impede the capacity of restrained eaters to retrieve the explicit attitude that relates to their internal goals (losing weight). For instance, Monahan and Laliker (2002) had participants evaluate a confederate under high or low cognitive load after subliminal affective

priming, positive, negative or neutral. Results show that participants were more affected by the subliminal priming task when under high cognitive load. Koole, Dijksterhuis and van Knippenberg (2001) found a correspondence between implicit self-esteem (positive bias towards the letter of one's name) and self-reported self-evaluation only under time pressure (study 3) and cognitive load (study 4). In the domain of consumer decision making, Shiv and Fedorikhin (1999; 2002) tested the effect of restricting cognitive resources on the choice between an alternative associated with more positive affect (a chocolate cake) and one associated with more positive cognitions (a fruit salad). Findings suggest that when resources are restricted, lower-order affect arising from more automatic processes might have higher impact on choice (leading to higher likelihood to choose the chocolate cake). On the contrary, when resources are not restricted, higher-order affect arising from more controlled processing might have more influence, leading to higher likelihood to choose the fruit salad.

In this follow up study, the prediction that non-conscious processes influence immediate choice when restrained eaters are under high cognitive load, but that they are more likely to make a choice influenced by more deliberative processes when more in possession of their cognitive capacities is investigated.

Hypothesis 9: Restrained eaters under high cognitive load should be more likely to choose a food item forbidden in their diet than when under low cognitive load. Non-restrained eaters should be less affected by the manipulation.

Hypothesis 10: The spontaneous choice of restrained eaters should be more influenced by the implicit attitude under high cognitive load than under low cognitive load. Non-restrained eaters should be less affected by the manipulation.

1.2. Reducing attitudinal conflicts through direct experience

Reducing duality involves a change in the implicit attitude to increase the correspondence with the explicit attitude, or change the explicit attitude to relate more with the implicit, or both. The general assumption is that explicit attitudes are less resistant to persuasion compared to implicit attitudes, which are supposed to be slow to form and change, as they are the product of long-term exposure to particular associations (Wilson et al., 2000). Yet, a number of recent articles seem to suggest that implicit attitudes might be more malleable than theoretically conceived (Blair, Ma and Lenton, 2001; Brinol et al., 2002; Dasgupta and Greenwald, 2001; Lowery, Hardin and Sinclair, 2001). Lowrey et al. (2001) induced a shift in automatic attitudes toward ethnic individuals through positive interpersonal contacts, demonstrating hereby that implicit attitudes can be quite malleable and dependent on situational factors. Dasgupta and Greenwald (2001) also obtained changes lasting for 24 hours, on implicit preferences for White over Black American and Young over Older people by exposing participants to pictures of admired or disliked instances of the categories, without any changes on explicit attitudes. Dijksterhuis (2004) enhanced implicit self-esteem in individuals through subliminal evaluative conditioning. Last, Blair et al. (2001) results suggest that

implicit stereotypes might be influenced by controlled strategies such as counterstereotypic mental imagery.

Altogether, these results provide evidence that implicit attitudes might change at least temporarily by exposing subjects to particular exemplars of the ethnic groups or activating links opposed to the implicit attitude. Yet, it is not clear whether implicit attitudes might be changed through exposure to counterpersuasive messages or direct experiences. Rudman, Ashmore and Gary (2001) report a significant decrease in both implicit and explicit negative attitudes toward black people in students attending a semester of multicultural training. Especially, implicit change seemed to follow an affect-based route (through fear reduction, friendship etc.), which tends to indicate that emotional conditioning or reconditioning might be effective for an implicit attitude shift (cf. also Kawakami, Dovidio, Moll, Hermsen, and Russin, 2000). Tomala, Briñol and Petty (2004) also report an effect of persuasive messages encouraging consumption of vegetables at the implicit level without changes in explicit attitude (study 1). Nonetheless, persuasive ads seem to affect also the explicit attitude, via the confidence of participants in their evaluation (study 2).

Yet, no research indicate that implicit food attitudes, which might be based on sensorial and emotional factors deeply rooted in family and cultural traditions, might be changed. Habituation to new flavors seems to occur through repeated tasting (Sakai, Kataoka and Imada, 2001; Sullivan and Birch, 1990). Birch and his colleagues (1990; Birch, McPhee, Steinberg and Sullivan, 1990) provide evidence for the conditioning of food preferences in children and adults through repeated experience and tasting. If

repeated exposure has a conditioning effect on explicit attitudes and preferences, it could also be effective in modifying attitudes at the implicit level. Indeed, implicit attitude formation and change was obtained for new products through a classical conditioning procedure without awareness of participants (Olson and Fazio, 2001; 2002; Ohme, 2001).

However, direct experience and repeated tasting seems to affect restrained and non-restrained eaters in different ways. In Mitchell and Epstein (1996)'s study using Yoplait yogurt as target food, restrained eaters showed an increased liking of the yogurt which they repeatedly tasted whereas non-restrained eaters showed a reverse pattern with decreased liking related to boredom. Zandstra, Graaf and van Trip (2000) also report a boredom effect in a group of normal subjects which repeated once a week for ten weeks the consumption of a meat sauce, which created a substantial decrease in acceptance and attitude ratings. In the same way, the attitude of restrained and non-restrained eaters might be differentially affected by repeated exposure and tasting of a food item.

In this research, restrained and non-restrained eaters are exposed to two direct experience tasks: a comparative test (within-subjects pre-post test) and the repeated tasting of a reduced-fat OREO cookie for ten days (between-subjects test vs. control). Restrained eaters are expected to display a negative implicit attitude toward the reduced-fat product before the repeated exposure and a more positive implicit attitude after the repeated exposure. Also, repeated tasting should foster the strength of the explicit attitude in restrained eaters, with attitudes being less ambivalent and more certain toward the reduced fat.

Hypothesis 11:

H11.1. Direct experience with the food item will be effective in modifying the implicit attitudes.

H11.2. Direct experience with the food item will strengthen explicit attitudes: attitudes will be less ambivalent and more certain after direct experience with the food item

H11.3. The restrained eating status will be a moderator of the effectiveness of direct experience. Direct experience will be more effective in reducing attitude conflict for restrained compared to non-restrained eaters.

2. Method study 2

The hypotheses presented in the preceding sections were tested in a two-session laboratory experiment. In the first session, access to cognitive resources was manipulated through a cognitive load manipulation with a group of restrained and a group of non restrained eaters. It was expected that restrained eaters in the high cognitive load condition (i.e. disinhibitive effect; see Ward and Mann, 2000) would make a choice influenced by their implicit preference whereas they should make a choice more related to their explicit preference in the low cognitive load condition. Non-restrained eaters should be less affected by the manipulation. After ten days of repeated tasting, a second session was organized to assess changes in implicit and explicit attitudes.

2.1.Focal attitude object

The focal attitude objects for this study are OREO cookies in two varieties, reduced fat and double crème (or double stuff). OREO cookies are familiar to Canadian

residents (pre-test N=20 females, mean= 2.70 on seven-point scale -3/3). The varieties double crème and reduced-fat seem equally familiar but less well known (pre-test n=20 females, mean= 0.85 for reduced-fat and 1.15 for double crème, t(19)=0.688, p=0.500). Yet, the associations linked to both products are very clear, the reduced-fat option linked with the notion of low calorie and the double crème with that of rich and tasty treats (see pre-test words for the IAT in Appendix 14). Hence, these varieties allow a real dichotomous choice based on the same product category (cookies), same brand (OREO) but with varieties of which, one is a better option with regards to pleasure and the other a better option with regards to health considerations.

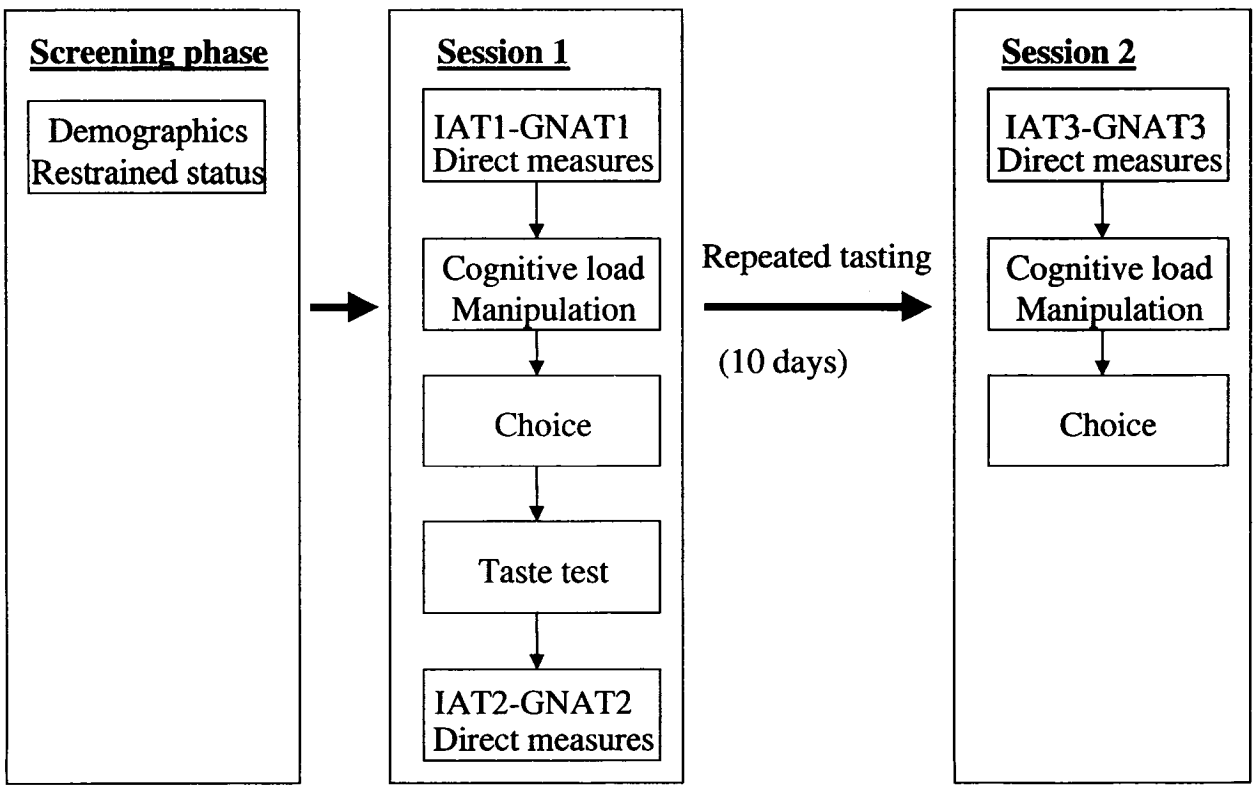
Fat in food is an issue which elicits strong attitudes. Tuorila, Cardello, and Lesher (1994) demonstrated that even though consumers had never tasted specific fat-free food in the past (i.e. cake, crackers and cheese), they had strong (negative) expectations on the taste of these products. In addition, the difference in attitude and behavioral intention toward reduced fat products (cakes and chocolate in particular) between restrained and non-restrained is well documented (see Tuorila, Kramer and Engell, 2001; Kahkonen and Tuorila, 1999), with restrained eaters more positive toward reduced fat products and more likely to choose them over regular alternatives than non restrained eaters.

2.2. Study overview.

The design of this second study is a 2(high / low restrain) X 2(high cognitive load/ low cognitive load) between-subjects design. In addition, direct experience is manipulated within-subjects in a pre-post test (session 1) and between-subjects (repeated tasting for ten days vs. control group).

The procedure presented in figure 10 was tested in a pilot study (n=20). Participants start with completing an IAT, a GNAT and a series of explicit measures. Next, disinhibition is manipulated through high cognitive load in half of the participants with a memory test task. Next, participants taste both products to assess any influence on indirect and direct measures after a comparative assessment of both products. It also helps us conform to the cover story (i.e. the influence of mental tasks on taste perceptions). At the end of the session, participants are administered the implicit and explicit measures again. Afterwards, the same group is split in two subgroups and allocated different tasks to complete everyday (control, repeated tasting) for ten days. Participants are rescheduled at the end of the ten day period for a new session similar to the first one with direct and indirect measurement, cognitive load manipulation and choice.

Figure 10: Summary of experimental procedure used in Study 2



2.3. Sample

Women were pre-screened over the phone fifteen days before the beginning of the study to be perfectly fluent in English, to have a correct vision and not suffering from diabetes or any food allergies. In addition, all of them were selected to have knowledge of the brand OREO cookies (see Appendix 15). The Revised Dietary Scale (Herman and Polivy, 1980) was embedded in the set of questions. Participants were classified as restrained or non-restrained eaters on the basis of their score on this restrained scale: women with a score above 16 out of 35 (conventional cut-off) were considered as restrained eater. 133 women attended the first part of the research in the lab (on computer); yet 128 women completed the first session in full. Of the 128 women who completed the study, 61 scored 16 or above on the Revised Restrained Scale and were considered as restrained (mean=19.98, SD 3.088) whereas the rest was grouped as non-restrained (mean=9.81, SD 3.162). Within each group, women were randomly allocated to one of two conditions, high load (30 restrained and 31 non-restrained) and low load (31 restrained and 36 non-restrained), with no differences between restrained groups (chi-square=0.109, p=0.742). Among these 128 women, 120 participated in the second session, 61 repeating the tasting of a reduced-fat OREO cookie for ten days and 59 performing the same task with a social tea cookie. Before each session, women were requested to refrain from eating and drinking for an hour, in order to monitor the same level of hunger and thirst. Measures of hunger and thirst were taken at the beginning of each session and were used as covariates in each analysis. If not mentioned, these variables are not significantly affecting the results.

2.4. Procedure

Laboratory sessions.

Participants were tested individually. Upon entering the experimental room, all participants completed the IAT and the GNAT (counterbalanced) in order to assess their implicit preferences between double crème OREO and reduced-fat OREO cookies. They also reported their explicit attitude toward both products (attitude, attitude certainty and attitude ambivalence measured on unipolar scales) and their behavioural intention toward each OREO variety on computer in the same procedure as study 1.

Next, participants took a memory test. Words (countries in the first session and animals in the second sessions) were displayed in the middle of the screen, each for 5 seconds, and participants had to memorize these words. One group of participants (low cognitive-load condition) had to memorize two words (e.g. Indonesia and Mexico), whereas the other group (high-cognitive load) had to memorize 8 words. Afterwards, participants were offered a choice between a box of double crème OREO cookies and a box of reduced-fat OREO cookies. During the experiment, participants could not see the boxes of cookies which were hidden in the drawers of the experimenter's desk. After the choice, participants filled out a post-choice questionnaire (see Appendix 16) and participated in the taste test. After having tasted both cookie types, participants wrote down the words they had to memorize. Hence, participants put effort in remembering the words for a maximum of 15 minutes. Last, participants completed a second IAT and GNAT and a second set of explicit measures.

IAT and *GNAT*

Pre-test words. The five words chosen to describe the category double crème OREO ("rich", "taste", "cream", "treat", "indulgence") and the five words chosen to describe the category reduced-fat OREO ("low calorie", "low fat", "diet", "light", "moderation") were pre-tested among 20 women to be equally familiar (on a seven-point scale anchored by -3 to 3, set reduced-fat = 2.75 and set double crème = 2.72, $t(19)= 0.429$, $p=0.673$) and be equally associated with the target category and dissociated from the contrasting category (on a seven-point scale from strongly associated with double crème to strongly associated with reduced-fat, $t(19)= 0.092$, $p=0.928$) (see Appendix 14).

Procedure. The same procedure as in Study 1 was used.

Cognitive load manipulation check:

After making their choice, participants had to describe, as completely as possible, whatever went through their minds while they were deciding between the two cookie types (see Shiv and Fedorikhin, 1999). The thought protocols were coded by two independent judges for the total number of thoughts. Along Shiv and Fedorikhin's(1999) procedure, any statement representing evaluations or descriptions of the food options, thoughts about the task, or prior experience with the options, or consequences of choosing one or the other option (e.g. on their weight), description of current state (hungry or thirsty) were coded as thoughts (all statements fell into one of these categories). Inter-rater agreement was high (96%) and discrepancies were resolved through discussion. A between-subject ANOVA with cognitive load condition as independent variable reveals that the manipulation was successful both in the first and second session. In the first

session (F(1,126)=23.457, p=0.000), participants reported an average of 3.02 thoughts (SD 2.062) in the high cognitive load condition vs. 4.49 (SD 1.245) in the low cognitive load. In the second session (F(1,118)=8.732, p=0.004), participants reported an average of 2.98 thoughts (SD 1.712) in the high cognitive load condition vs. 3.89 (SD 1.641) in the low cognitive load.

The level of concentration needed during each cognitive load condition was assessed through asking the question "How much did you have to concentrate in order to remember these words?". As expected, there is a significant difference on the level of concentration involved between the high load and low load conditions for both sessions (F(1,126)=33.274, p=0.000 and F(1,117)=27.710, p=0.000). The high load condition was involving more concentration on remembering the words and was likely to impede more the participants' cognitive capacities than the low load condition (in session 1, mean=4.69, SD 1.698 vs. mean=2.97, SD 1.669 and in session 2, mean=4.29, SD 1.717 vs. mean=2.75, SD 1.468).

Direct experience tasks

Taste test: In session 1, after making their choice, participants were presented with two bowls, each containing 10 cookies of each OREO type. Participants were instructed to sample as many cookies as they needed in each bowl. In order to conform to the cover story (i.e. influence of mental tasks on taste perception), they had to rate the taste of the cookies (in counterbalanced order, see questionnaire Appendix 16). In addition, this comparative task was used to assess changes in the implicit and explicit attitude after direct experience (and comparison) with both OREO cookie types.

On-going repeated exposure. At the end of the first session, half of the participants were offered a box with 10 reduced-fat OREO cookies to be eaten every day at the same hour. The second and control group was offered a box of 10 social tea cookies. All participants had to fill out the same taste rating questionnaire everyday (see Appendix 17). They also provided an estimate on their level of mental occupation during the day (in order to enhance the cover story). All participants were rescheduled for a second session ten days later.

3. Results study 2

3.1. Evolution of implicit and explicit attitude measures over time

In order to test Hypothesis 11 on the influence of direct experience on implicit and explicit attitudes, the GNAT, IAT and the explicit measures (attitude, attitude certainty and attitude ambivalence) were analyzed at three points in time, at the beginning of the first session, after the taste test (end of session 1) and after the repeated tasting (session 2). For session 1 (time 1), it was expected that participants would display a positive implicit attitude toward the double crème but a negative implicit attitude toward the reduced fat. In addition, it was expected that the explicit attitudes of participants be affected by the restrained status, restrained eaters being more positive toward the reduced fat option but more negative toward the high fat option than non restrained eaters. With direct experience, it was expected a favourable evolution of the implicit attitude toward the reduced fat option as well as a strengthening of the explicit attitude (more certain, less ambivalent) especially for restrained eaters.

Go-No Go task

Participants undertook three GNAT tests, one at the beginning of the first session (time 1, 133 participants), one at the end of the second session (time 2, 128 participants) and one at the beginning of the second session (time 3, 120 participants). Analyses proceeded as explained in study 1. Results are detailed for time 1 but they are presented in a synthetic format for time 2 and 3.

GNAT time 1: d' (d prime) values were first assessed for the four blocks, reduced fat + good or bad and double crème OREO + good or bad. As expected, sensitivity was greater when subjects were jointly discriminating double crème and good from distracters (d'= 1.67) than jointly discriminating double crème and bad (d'=1.59, t(132)=2.040, p=0.04). This result suggests that the double crème OREO and good are more strongly associated than double crème and bad. When the target concept was reduced fat, sensitivity was greater when subjects were jointly discriminating reduced fat and bad from distracters (d'=1.65) than when jointly discriminating reduced fat and good (d'=1.60) yet the difference is not significant (t(132)=-1.448, p=0.150). On this dependent measure, results indicate that overall subjects tend to display a rather negative implicit attitude toward reduced fat OREO cookies (although not clearly significant) and a positive implicit attitude toward the double crème version. In addition, a MANOVA demonstrates that sensitivity did not vary by the target concept (reduced fat or double crème, F(1,132)=0.077, p=0.782) nor by the evaluative category (good or bad, F(1,132)= 0.047, p=0.828). The sensitivity score is a unique reflection of the association between category and valence (F(1,132)=4.384, p=0.038).

Second, the latencies to categorize the target words when associated with bad compared to when associated with good were analysed as second dependent variables. Reaction times were log-transformed and subsequent analyses are based on log-transformed data, although presented in ms for greater ease of interpretation. If reactions times when double crème OREO is associated with bad (Ms=682) and when double crème OREO is associated with good (Ms=622) are compared the difference is significant ($t(132)=5.284$, $p=0.000$), indicating a positive attitude toward the product (Cohen's $d=0.444$). For reduced fat, the difference in reactions time when reduced fat OREO is associated with bad (Ms=596) vs. good (Ms=625) is also significant in the opposite direction ($t(132)=-2.877$, $p=0.005$), indicating a negative implicit attitude toward reduced fat OREO (Cohen's $d=-0.222$).

In terms of differences between conditions, a MANOVA with restrained status as between-subject factor indicates no difference between groups on the implicit (negative) attitude toward the reduced fat OREO ($F(1,124)=1.408$, $p=0.238$) but a more positive implicit attitude for the restrained participants in favour of the high fat OREO ($F(1,124)=5.803$, $p=0.017$; $d=0.653$ for restrained vs. $d=0.241$ for non-restrained)

Overall both dependent variables (sensitivity and latencies) are internally consistent and indicate, as was expected, a positive implicit attitude toward double crème OREO and a negative implicit attitude toward reduced fat OREO. In addition, the implicit attitude toward the high fat OREO is significantly more positive for restrained eaters.

Comparison between tests: The three GNAT tests go in the same direction, on both dependent variables, indicating a positive implicit attitude toward the high fat OREO and a negative implicit attitude toward the reduced fat OREO.

For the high fat OREO, there is a main within-subject effect of time between time 1 and time 2 ($F(1,122)=5.308$, $p=0.023$) as well as an interaction effect with the restrained status ($F(1, 122)= 4.040$, $p=0.047$). This indicates that the implicit attitude is more positive toward the high fat OREO at time 2 vs. time 1 (i.e. after the tasting session), especially for the non-restrained eaters. Between time 2 and 3, there are no significant within-subject effect of time ($F(1, 1,109)= 0.945$, $p=0.333$) nor any significant interaction effects.

For the reduced fat OREO, there is no within subject effect of time ($F(1, 122)= 0.195$, $p=0.660$) nor any significant interactions between time 1 and 2. The within-subject time effect is also not significant between time 2 and 3 ($F(1,109)= 1.538$, $p=0.218$), as are none of the interactions between factors and conditions.

Table 9: GNAT measures over time

	Time 1	Time 2	Time 3
D' (HF + Good)	1.673	1.793	1.896
D' (HF + Bad)	1.595	1.687	1.694
D latencies HF	0.444	0.705	0.503
D' (RF + good)	1.603	1.677	1.711
D' (RF + bad)	1.650	1.793	1.839
D latencies RF	-0.222	-0.105	-0.113

Overall, the GNAT appears to be a very stable measure over time. Contrary to expectations, direct experience has no effect on this measure for the reduced fat option. For the high fat option, it appears that there is a favourable evolution after tasting and comparing the product for the group of non restrained eaters only.

Implicit Association Test

The IAT was administered at three points during the experiment, at the beginning and at the end of the first session as well as at the beginning of the second session, with exactly the same block order within-subjects. Analyses for these three measures proceeded as described in Study 1. The overall % of errors was below 10% in the three tests. Conforming to expectations, the d measures for the three tests (d_1=0.5426, d_2=0.3984 and d_3=0.3971) indicate a more positive implicit attitude toward the high fat OREO than vs. the reduced fat OREO, with no differences between the restrained groups ($p > 0.182$ in the three tests).

Between time 1 and time 2, a repeated measure MANOVA demonstrates there is no significant main effect of time within-subjects ($F(1,121)= 1.635$, $p=0.204$) nor any effects of restrained status ($F(1,121)=0.045$, $p=0.833$) or cognitive load (condition 1, $F(1,121)=0.015$, $p=0.903$). In addition, interactions between factors are not significant. The same phenomenon replicate between time 2 and time 3. There is no main within-subject effect of time ($F(1,107)=1.180$, $p=0.280$), nor any effect of the restrained status ($F(1,107)=1.704$, $p=0.195$) or the experimental conditions (high vs low load, $F(1,107)=$

1.472, p=0.228; repeated tasting, F(1,107)=0.532, p=0.467). It seems that the IAT measure is very stable within-subjects, as none of the experimental conditions (contrary to predictions) is influencing the measure.

Between the IAT and the GNAT measures, there are no significant correlations during the first session but the measures tend to increasingly correlate with time. In the first session, the correlations are between the IAT and the GNAT high fat r=0.131 (p=0.143) and between the IAT and GNAT the reduced fat r=-0.142 (p=0.110). In the first session time 2, the correlations are for the IAT and GNAT high fat r=0.108 (p=0.227) and IAT and GNAT reduced fat r=-0.283 (p=0.001). In the second session, IAT and GNAT high fat r=0.395 (p=0.000) and IAT and GNAT reduced fat r=-0.232 (p=0.011).

Evolution of explicit measures over time

Four measures concerning the explicit attitude were taken at the three points in time: the attitude toward the double crème and reduced fat OREO cookies, the attitude certainty (for both products), the ambivalence (measured on both positive and negative evaluation combined into Griffin index for both products) and the behavioural intention.
A MANOVA conducted on the data at time 1, i.e. before the administration of the experimental conditions, demonstrate that there are no differences between restrained and non restrained eaters on any of the variables for the high fat OREO. However, in line with the expectations, all four variables are significantly different between restrain groups for

the reduced fat OREO. Restrained eaters have a more positive attitude toward reduced fat OREO ($F(1,126)=8.156$, $p=0.005$), are more certain in their evaluation ($F(1,126)=5.004$, $p=0.027$) and they also are significantly less ambivalent toward these products ($F(1,126)=4.562$, $p=0.035$). In addition, restrained eaters have a higher intention to buy reduced fat OREO cookies ($F(1,126)=5.130$, $p=0.025$).

Between time 1 and time 2, there is no within-subject effect of restrained group or cognitive load condition on any variables for the high fat OREO. For the reduced fat OREO, there is a marginally significant within-subject effect of the restrained status on ambivalence ($F(1,122)=3.242$, $p=0.074$), with a reduction of the ambivalence level among the non-restrained eaters after having eaten the reduced fat OREO cookie (amb1=1.9179, SD 1.481; amb2=1.399, SD 1.502), but without any influence on their overall evaluation of the product ($p >0.10$).

Between time 2 and time 3, there is no within subject effect of restrained group or any experimental condition for the high fat OREO. For the attitude toward reduced fat OREO, there is a significant within-subject interaction between the restrained factor and the repeated-measure factor ($F(1,113)=6.394$, $p=0.013$). The non-restrained eaters in the repeated exposure experimental condition have a more positive attitude toward reduced fat OREO at time 3 compared to time 2 (mean $attitude_2$= 4.533 SD 1.364 vs. mean $attitude_3$= 3.783 SD 1.617). In addition, there is a within-subject effect of the repeated-measure condition on both the attitude certainty ($F(1,109)= 3.328$, $p=0.041$) and the attitude ambivalence ($F(1,109)=7.831$, $p=0.006$). In the condition in which participants had to eat reduced fat OREO for ten days, the attitude certainty is higher and the attitude ambivalence is significantly reduced.

In summary, hypothesis 11 is not fully supported. First, the direct experience manipulation was not successful in significantly changing participants' implicit attitude (H11.1.). The implicit attitude toward reduced fat is not affected, neither for restrained nor for non restrained eaters. The implicit attitude toward the high fat is affected for non restrained eaters only, which might indicate that the implicit attitude is less resistant to change when it is not implicitly denied and when it is endorsed at the explicit level. Nonetheless, supporting hypothesis H11.2., direct experience has an influence on explicit attitudes in that the explicit attitudes are significantly more certain and less ambivalent toward the reduced fat option after the repeated tasting.

2.2.2. Influence of implicit vs. explicit attitude measures on real choice

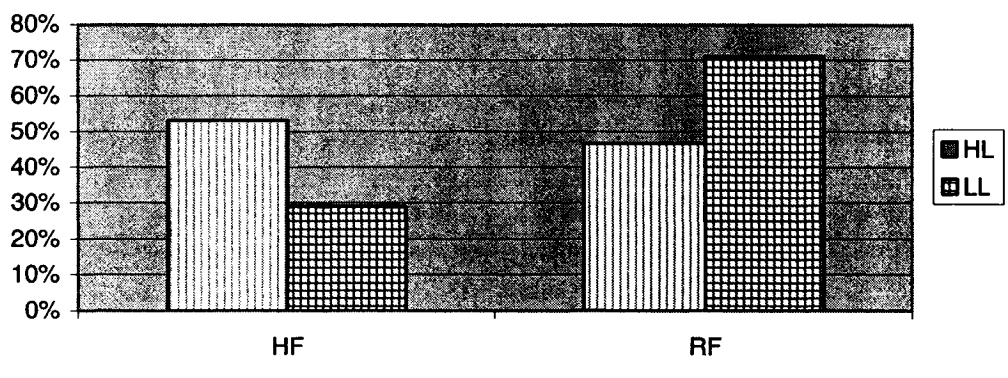
During the first and second session, half of the restrained and non-restrained groups were assigned to either a high cognitive load condition or a low cognitive load condition. The hypothesis H10 was that in the high cognitive load condition, restrained eaters would be more likely to choose a high fat OREO, in line with their implicit attitude whereas in the low load condition, they would control their choice better (more in favour of the reduced fat) and would be more influenced by their explicit attitude. Results for each session are presented below.

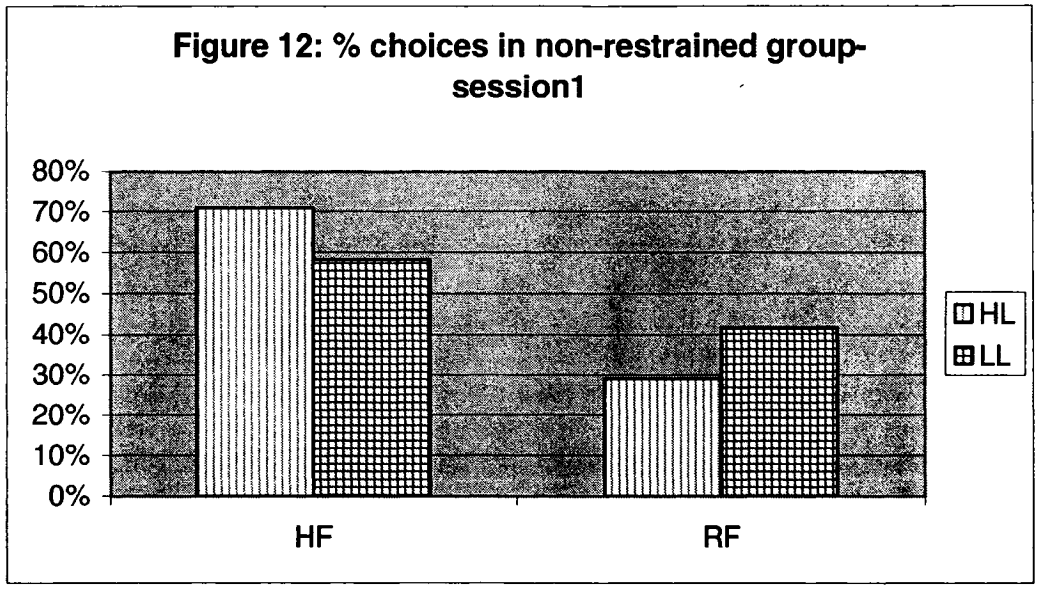
Session 1

During the first session, 53% of participants chose the high fat OREO vs. 47% chose the reduced fat. A logistic regression with restrained status and cognitive load

condition levels as predictors and choice between the double crème and the reduced fat as dependent indicates differences both between restrained group and conditions (chi-square(3)=11.885, p=0.008). In line with expectations, there is a main effect of cognitive load, with an increased likelihood to choose the high fat option over the reduced fat in the high load condition (odds=2.209, Wald=4.474, p=0.034). There is also a main effect of the restrained status on choice, with restrained eaters being more likely to choose the reduced fat over the high fat cookie (odds=0.370, Wald=7.059, p=0.008). Nonetheless, the interaction between restrained status and cognitive load condition is not significant (odds= 1.600, p=0.530), although it was expected that restrained eaters would be more likely to choose the high fat cookie under high cognitive load (H9).

Figure 11: % choices for restrained eaters- session 1



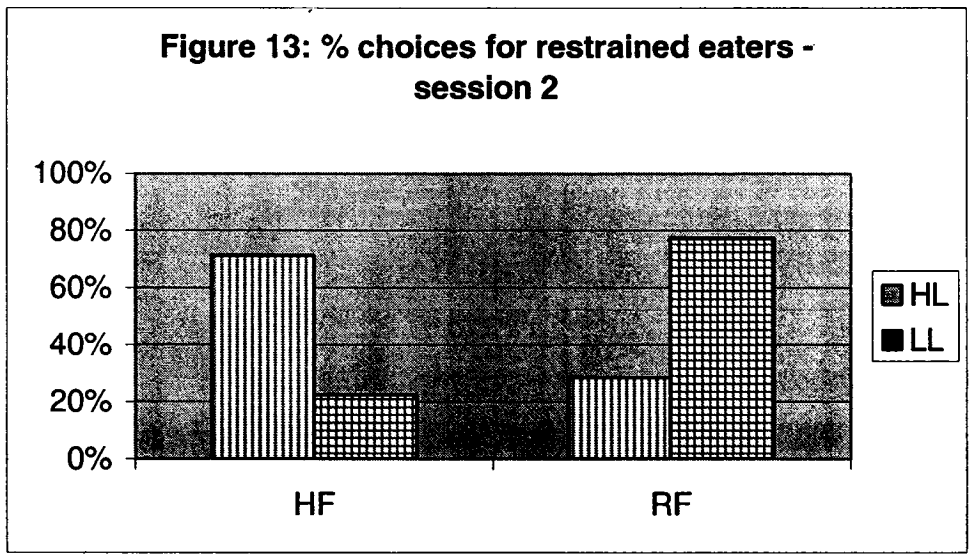


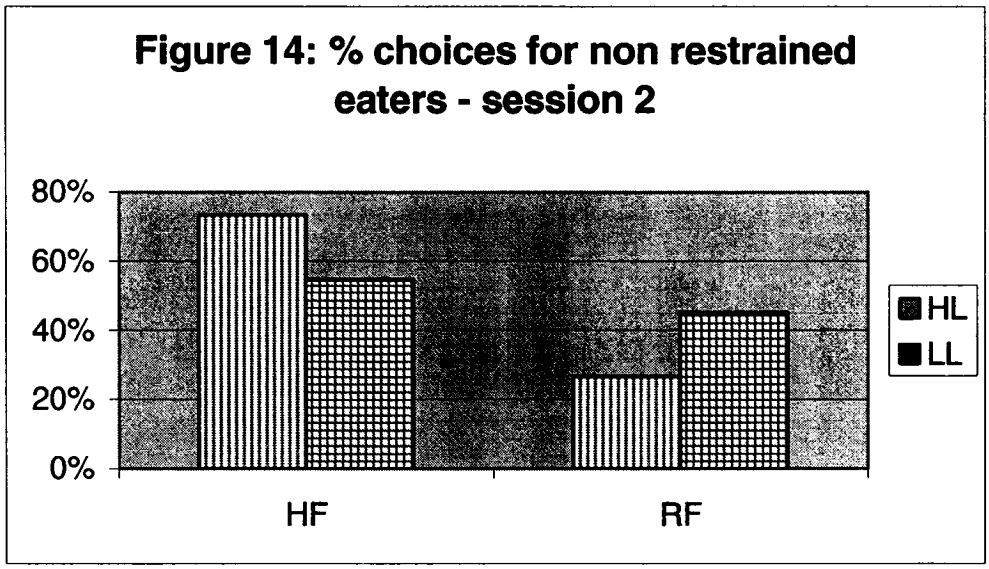
In order to test the influence of the implicit and explicit attitude on spontaneous choice (H10), a second logistic regression was conducted. The explicit preference, the implicit preference (IAT), the implicit attitude (GNAT) toward high fat and reduced fat OREO were introduced as predictors of choice. The restrained status and the cognitive load condition were also introduced as categorical predictors. The model fits the data very well (chi-square(7)=53.483, p=0.000) and helps predict 80.2% of the choices. Corroborating the results of study 1, both the explicit preference (odds=2.198, Wald=19.017, p=0.000) and the implicit preference (IAT, odds=2.458, Wald=3.073, p=0.080)) have an influence on spontaneous choice. The implicit attitude toward the reduced fat option (GNAT) is never significant, neither as main effect nor as interaction. The implicit attitude toward the high fat is not significant as main effect. However, in line with hypothesis H10, there is a restrained X condition X GNAT high fat interaction (odds=6.109, Wald=8.020, p=0.005), with the implicit attitude toward the high fat option being more influential for restrained eaters in the high load condition.

In parallel, to replicate the results of study 1 on the influence of the explicit preference on deliberate choice (difference in behavioural intention as proxy), a linear regression was fitted. The explicit preference, the implicit preference (IAT), the ambivalence levels and the two implicit attitude measures (GNAT) were entered into the model simultaneously. The model performs fairly well (R=0.505, adjusted R^2=0.218, F(6,119)=6.802, p=0.000). Findings are in line with the results obtained in study 1. The only significant predictor of "volitional" choice is the explicit preference between the high fat and reduced fat OREO (b=0.395, t=4.650, p=0.000).

Session 2

The same analyses as in session 1 were conducted on the results of the second session. At the end of this second session, 55% of the participants chose the high fat OREO and 45% chose the reduced fat. A logistic regression was conducted in order to analyze meaningful differences between groups and conditions. The model with main effects and interactions is significant (chi-square(7)=24.697, p=0.000). There is a main effect of restrained status (odds=0.484, Wald=3.059, p=0.080), a main effect of cognitive load condition (odds=4.675, Wald=13.524, p=0.000) and an interaction effect between cognitive load condition and restrained status (odds=4.214, Wald=3.507, p=0.061). These results give credit to hypothesis H9; the likelihood to choose the high fat option is higher for restrained participants in the high load condition compared to the low load condition. In addition, the effect of the second condition (direct experience) is not significant (odds=0.674, p=0.343) although the means go in the direction of eating reduced fat increases the likelihood to choose the reduced fat option. None of the other interactions are significant (p>0.15).





A second logistic regression was assessed with the introduction of the explicit preference, the IAT, and both GNAT as predictors, plus the restrained and cognitive load status. The model performs slightly less well than in the first session, but is nonetheless significant (chi-square(7)=37.299, p=0.000 with 71.2% choices predicted). The explicit

preference is still a good predictor of choice (odds=1.508, Wald=11.512, p=0.001), the implicit preference (IAT) has still a marginally significant influence (odds=1.868, Wald=2.850, p=0.091) and both GNAT measures do not reach significance as main effects. Yet, the increased influence of the implicit attitude (GNAT) toward the high fat option in the restrained X high cognitive load group compared to the other groups is still significant (odds=8.135, Wald=4.954, p=0.026). This result corroborates that obtained during the first session, and gives strong support to hypothesis 10. The implicit attitude toward the high fat option is more influential for restrained eaters in high cognitive load condition.

In line with the results obtained in study 1 as well as during the first session, the model to predict "volitional" choice also fits the data very well (R=0.643, adjusted R^2= 0.414, F (6,111) =13.044, p=0.000), with still the strong influence of the explicit preference on deliberate choice (b=0.515, t=6.888, p=0.000). In addition, the two ambivalence variables have a significant influence on the intended choice, in opposite direction (for ambivalence toward high fat, b=-0.290, t=-3.641, p=0.000; for ambivalence toward reduced fat, b=0.252, t=3.123, p=0.002).

Overall, these results give credit to H9 and H10. Restrained eaters are more likely to choose the high fat alternative, in line with their implicit attitude, when under high cognitive load than when under low cognitive load. Non restrained eaters are less affected by the manipulation. These findings also replicate those obtained in the first study, with both implicit and explicit preference influencing spontaneous choice, whereas only the explicit preference is significantly impacting deliberate choice

Chapter IV: General discussion

1. Main findings

1.1. Ambivalent and dual attitudes

This research tests empirically the hypothesis suggested by Wilson and colleagues that ambivalent and dual attitudes are different constructs, leading to different attitudinal conflicts. Study 1 was entirely designed to investigate the main differences between dual and ambivalent attitudes. First, it was clearly demonstrated that holding inconsistent implicit and explicit attitudes (i.e. having dual attitudes) does not lead to being any more ambivalent (measured objectively). Following Wilson et al. (2000), it appears that individuals might hold two separate evaluations of an attitude object, with different valences, without recognizing that they are both positive and negative toward this object. (i.e. objective ambivalence). However, participants seem to be subjectively aware of the existence of an internal conflict, which they express in the form of subjective ambivalence. Participants report being conflicted (holding mixed beliefs and /or mixed feelings) both when they hold ambivalent attitudes and when they hold dual attitudes (compared to when they have no conflict). This finding gives credit to one proposition presented by Priester and Petty (1996) that the feeling of being conflicted (or tensed) as measured by subjective ambivalence might be influenced by manifest conflicting reactions (i.e. conflicting evaluations of which the individual is aware) above a threshold but below this threshold (i.e. when the conflict is unknown or denied), anticipated reactions might become important. Similarly, individuals holding dual attitudes might not be aware of their internal conflict but they might be able to anticipate the conflicting reactions they would have at the moment of consumption.

It was also predicted that the source of ambivalent attitudes lies in a similar endorsement, relevance and importance of both bases of evaluation (positive and negative) whereas, on the contrary, dual attitudes would be based on one stronger basis of evaluation (the explicit attitude), which would be perceived as more important and relevant for the individual. Contrary to the predictions, the results show that both ambivalent and dual attitudes tend to involve positive and negative bases of evaluation that are equally endorsed and considered as important and relevant. However, the conflict seems to be created by a differential weighting of negative aspects between ambivalent and non-ambivalent, dual and non-dual. The negative basis of evaluation is more important and relevant for those individuals high in ambivalence (compared to low) but also for those holding dual attitudes over non dual ones. This finding corroborates the hypothesis presented by Caccioppo, Gardner and Berntson (1997) that attitude conflicts are more closely associated with the activation of negativity than positivity (i.e. the negativity bias).

A second set of hypotheses was proposing that whereas the explicit attitude is weaker when participants are high in ambivalence, it should not be weaker when participants hold dual attitudes. Indeed, the assumption was that, in order to override automatic and implicit drives, the explicit attitude should be strongly held and wanted, i.e. highly accessible, stable and held with much confidence. Study 1 corroborates the body of research on ambivalence demonstrating that when participants are high in ambivalence, their attitude is less accessible, more unstable and held with much less confidence than when they are low in ambivalence. Nonetheless, duality has an impact on two dimensions, accessibility and certainty. At high levels of ambivalence, the explicit attitude is even slower to retrieve when participants hold dual attitudes. Overall, this

implicit-explicit discrepancy seems to create additional confusion and difficulty to quickly express an overall evaluation. This finding seems in line with Wilson et al.'s (2000) theorizing on the repression of the implicit attitude, which might involve an extended reaction time to express the final evaluation. In parallel, at high levels of ambivalence, the attitude is held with more certainty for dual compared to non dual individuals, which supports the hypothesis of an explicit attitude held with strong conviction, and strongly wanted over the implicit attitude.

1.2. The interplay between implicit and explicit attitudes in predicting behavior

The findings of both study 1 and 2 clearly demonstrate that deliberative behavior is only influenced by the explicit attitude whereas spontaneous behavior is driven by both the implicit and the explicit attitude (Strack and Deutsch, 2004; Perugini, 2005). In study 1, what is even more intriguing is the moderating effect of holding dual and ambivalent attitudes on the influence of the implicit on spontaneous choice. The influence of the implicit attitude is particularly evident when participants hold dual attitudes and also when they are high in ambivalence. In the second study, resource capacity (through a cognitive load manipulation) was manipulated in order to detect differences in the influence of the implicit attitude on behavior. The rationale was that under high cognitive load, participants might be less likely to control their choice, and as a consequence, the implicit attitude might exert a stronger influence on their spontaneous choice. Results corroborate an effect of cognitive load condition on choice, with more likelihood to choose the high fat option when under high cognitive load. In addition, for the group that might experience most conflict in their choice between a high fat and a reduced fat option (i.e. the restrained eaters, who mostly hold positive implicit attitudes towards the high-fat

cookie), the implicit attitude (GNAT) toward the high fat option has a significant influence on choice when the group is under impairment of cognitive resources.

All together, these results corroborate empirically Perugini (2005)'s hypotheses on the dissociation between implicit attitudes as predictors of spontaneous choice and explicit attitudes as predictors of deliberate choice in the context of food. Unfortunately, Perugini (2005) could not fully test his hypothesis due to a small sample size and limitations in his statistical approach (p. 38)[1]. These results are robust in that they replicate with two different choice options, one choice between two product categories (chocolate vs. yoghurt) and one choice between two varieties of the same product (OREO in its reduced fat or double crème version). Findings also clearly demonstrate that the role of the implicit attitude at the moment of a spontaneous choice is particularly strong in the case of an attitudinal conflict (i.e. dual or ambivalent attitudes) or when restrained eaters are less likely to control their eating behaviors. It seems that, when conflicted and in position of restricted cognitive capacity, individuals might rely more on their internal "feelings" in a "I do as I feel" type of mode.

1.3. Implicit attitudes toward food

A lot of research in the domain of food has found an implicit preference toward low fat foods over high fat foods, both in overweight or normal weight participants (Roefs and Janssen, 2002) or restrained and non-restrained eaters (Vartanian et al. 2004), contrary to researchers' predictions. For instance, Roefs and Janssen (2002) found counter-intuitively that people have a positive preference toward low fat food (described

[1] Perugini fits a LISREL model with a dichotomous dependent variable inappropriately, as it distorts the parameters and standard error terms.

with fruits and vegetables) over high fat food (described as junk foods). Similarly, Perugini (2005) in a choice between snacks (defined as cake, pastries, biscuits etc.) and fruits (defined apples, bananas etc.) or Karpinski and Hilton (2004) in a choice between apples and candy bars found a positive implicit preference in favor of the healthier option.

In this research, implicit attitudes are assessed on particular exemplars of food items (chocolate vs. yoghurt; OREO reduced fat vs. double crème) rather than on abstract product categories, as it focuses more on the immediate, concrete and sensorial representation of the food at the point of consumption. In line with the robust findings on chocolate liking and cravings (Hetherington and Macdiarmid, 1993), participants hold an implicit preference in favor of chocolate over yoghurt (measured through the IAT). In addition, the separate assessment of the implicit attitude for chocolate vs. yoghurt (through the GNAT and the EAST) reveals that this preference is made up of a positive implicit attitude toward chocolate and a neutral attitude toward yoghurts[1]. For the choice involving both OREO varieties, participants displayed a marked preference for the double crème over the reduced fat cookie (IAT), which is compounded of a positive implicit attitude toward the double crème and a negative implicit attitude toward the reduced fat (GNAT measures). It has to be noted that the choice made here was not between a high fat vs. a low fat product but between an enriched product (supposed more creamy, sweeter) over a reduced fat option. Hence, whereas high fat vs. low fat might directly (and only) refer to differently healthy options, enriched vs. reduced fat refers to, on one side, extra taste-extra fat and on the other side, lower taste-lower fat.

[1] . In studies involving only the IAT, a positive preference toward low fat product does not necessarily mean the attitude toward the low fat category is positive. Results might also imply that the attitude is negative toward both options (or positive toward both options) and that one option is preferred over the other.

1.4. Measurement of implicit attitudes

This research also helps understand better the reliability and validity of indirect measures of implicit attitude. Although the IAT is the most widely used procedure, many studies have found low internal consistency and low test-retest reliabilities (see Cameron, Alvarez and Bargh, 2000). For instance, low correlations were found between the IAT and evaluative priming measures in several studies (Sherman, Presson, Chassin and Rose, 1999; Fazio, 1999). Yet, the findings obtained in study 1 and 2 corroborate Cunningham et al.'s (2001)[1] findings that indirect instruments such as the IAT are valid and display a good test-retest reliability. In study 2, the implicit attitude was measured at three points in time through the IAT and the GNAT. Results show that there is no within-subject effect of time on the IAT, despite experimental conditions likely to modify the implicit attitude. This supports the claim that the IAT is able to assess implicit attitudes with reliability over time. Similarly, the GNAT measures were overall stable over time and both dependent variables (sensitivity and latencies) are internally consistent.

The interest of this research also lies in the inclusion of different measures of implicit attitude. Both in study 1 and 2, the findings for the different implicit measures go in the same direction, indicating a positive preference in favour of chocolate (study 1) and in favour of the double crème (study 2)[2]. In addition, in study 1, the IAT correlates significantly with both the GNAT (r=0.323) and the EAST (r=0.192). Second, in study 2 (session 2), the IAT correlates with both GNAT measures, that measuring the implicit

[1] . Cunningham et al. (2001) tested the psychometric properties of the IAT against a response-window IAT and a response-window evaluative priming procedure.

[2] . The results for the evaluative priming task are not conclusive. It is likely that the priming was not strong (words rather than images) or long enough in order to be noticed.

attitude toward the double crème and that of reduced fat. These results indicate that the IAT and the GNAT overlap in what they are measuring but they do not measure the same construct. It appears that, whereas the IAT measures an implicit preference between the target and the contrast category, the GNAT is more related to an absolute evaluation (Nosek and Banaji, 2001).

1.5. Inhibitive processes at play

This research also suggests, in line with Wilson et al.'s (2000) theorizing, that dual attitudes result from an overriding of one response and its replacement by another response, endorsed and viewed as more legitimate by the individual. The empirical study is conducted in the context of food, and especially in the context of restrained eating, as it is assumed that restrained eaters who have to control heavily their diet would experience such inhibitive processes, in an attempt to deny themselves their impulsive (spontaneous) drives (Polivy, 1998). Indeed in study 1, findings show that restrained eaters are more likely to hold dual attitudes (negative toward chocolate at the explicit level but positive at the implicit level) whereas they are not anymore ambivalent than non restrained eaters. In study 2, the hypothesis that restrained eaters reinforce their explicit attitude in line with their goal (i.e. losing weight) and override the attitude that does not serve their goal is tested via a cognitive load paradigm. Results give partial credit to this hypothesis. There is, indeed, an increase in the influence of the implicit attitude toward the high fat cookie (GNAT) on choice for restrained eaters in the high load condition. This result suggests that when restrained eaters are not able to control their choice, the influence of the implicit attitude is higher. Yet, there is no difference between the high and low cognitive

load conditions on the influence of the implicit attitude toward the reduced fat cookie. It seems that inhibitive processes might only be the source of dual attitudes toward certain products, may be those high in emotional correlates (i.e. chocolate; favorite food).

1.6. Changing attitudes through direct experience

Taking into account the role played by implicit attitudes in dictating choices made under low control, the challenge is to change these implicit attitudes in order to reduce the attitude conflict, strengthen the attitude-behavior relation and be able to predict better behavior and consumption. In Study 2, a manipulation intended to change the attitude, through having a test group (half restrained and half non-restrained eaters) tasting the reduced fat OREO for ten days. The hypothesis was that implicit attitudes would be more positive with direct experience. Unfortunately, the manipulation did not result in any significant changes in the implicit attitude over time. Nonetheless, the manipulation appeared to foster the explicit attitude toward the reduced fat cookie, through reducing the ambivalence toward the reduced fat and increasing the confidence with which the attitude was held. Yet, the attitude remained overall quite negative. It can be concluded that the implicit attitude (at least toward food) seems difficult to change, and that the reduction of attitude conflicts might be easier to achieve through the strengthening of one's explicit attitude. In line with this conclusion, Madon et al. (2005) found that social norms regarding protection from prejudice affected threat reactions on the explicit but not on the implicit measure.

2. THEORETICAL AND PRACTICAL CONTRIBUTION

Attitudes are one of the oldest and most studied constructs in social and consumer psychology. Yet, ambivalence and duality are constructs new to the (consumer) psychology field and little is known on the origin of these attitudinal conflicts, how they manifest subjectively to the individual, what the consequences are for the overall summary evaluation (or self-reported explicit attitude) and what the consequences are for subsequent behaviors. This research increases knowledge on both conflicts, and highlights the processes that might lead to them. It also contributes to previous work on the difficulty of making trade-offs and its emotional implication within the context of choices (Luce, Bettman and Payne, 2001) in examining the interplay between controlled and automatic processes in consumer decisions. This dissertation is also strongly rooted on Shiv and Fedorikhin (2002; 1999) research on spontaneous and controlled influences in the choice between an affect vs. a cognitive-based option and extend their findings. When a decision is taken quickly or under impairment of cognitive resources, the implicit attitude influences significantly the choice which is made in its direction. Our findings also extend work on impulsive buying. It provides evidence for the role of implicit attitudes on spontaneous behaviors and the role of cognitive capacity in determining the influence of deliberative and automatic processes. Particularly, it explains the lack of an attitude-behavior link frequently reported for ambivalent attitudes and by extension any conflicted attitude structure. Finally, this research has implications for research on attitude change and persuasion as well. Direct experience is assessed as a means to change implicit and explicit attitude. Findings suggest that the implicit attitude (at least in

the domain of food) is resistant to change through direct experience. Nonetheless, conflict might be reduced through strengthening the explicit attitude.

This research also contributes to the development of attitude measurement. The reliability and validity of implicit measures are explored via different instruments (IAT, EAST, GNAT) in a consumer environment, using brands as stimuli (Study 1) and two varieties of a branded product (OREO, Study 2). It is demonstrated that consumer products might be the vector of dual attitudes, and that it is possible to measure an implicit attitude toward consumer products in a reliable way. This result constitutes a methodological contribution to the development of new market research tools to understand consumers' attitudes and behaviors.

Results are of particular interest to researchers and practitioners alike involved in changing inappropriate behaviors in domains where ambivalence or duality might be at play, such as health-related behaviors (i.e. unhealthy diets, condom use etc.). They suggest that certain populations (e.g. restrained eaters) might be more susceptible to attitude conflicts and might experience a related psychological discomfort. During periods of stress or cognitive load, these people might have more difficulties controlling their behaviors, and make choices which they might regret later on.

Marketers will also find interesting conclusions for the marketing of products in a consumption environment. First, it is demonstrated that consumers might hold attitudes toward certain products which they are not aware of or which they deny. Self-report measures do not necessarily reflect the real or the full picture. Yet, these implicit

attitudes might be assessed with reliability through quantitative methods, whereas until now qualitative methods only (eg. through projective techniques) could have access to this hidden side of the consumer. This finding offers the opportunity for marketers to dig deeper into consumers' evaluation of their products.

Second, results suggest that spontaneous and impulsive choices might often be driven by the implicit attitude whereas more deliberate choices are strongly influenced by the explicit attitude. Hence, for products which might lead to conflicted attitudes (chocolate, biscuits, candies etc.), any action in the store that constraint processing resources or encourage immediate choices (i.e. pressure of a salesperson; end- of-aisles) increases the likelihood that the implicit attitude will drive the behavior. On the contrary, any action in the store that would favor elaboration and deliberation (such as tasting sessions, presentation of information on leaflets etc.) increases the likelihood that the explicit attitude will drive behavior (see Shiv and Fedhorikin, 1999 for same comment).

3. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

The conclusions of this research are made under the limitations of experiments conducted in controlled, hence artificial environment. To enhance ecological validity, it is necessary to replicate the results in the natural context of everyday decision situations. Nonetheless, the choice situation presented in this research represent dilemmas frequently encountered in everyday life. Food in particular is a domain in which very often our immediate and spontaneous choices are in contradiction with our intentions. Yet, it would be desirable to extend these findings to other domains, such as other health-related

behaviors (i.e. condom use), products/services conducting to impulsive choices (e.g. restaurants; gas-station) and real shopping environments.

Additionally, although the test-retest reliability of the indirect measurements was demonstrated, certain limitations in the instruments have to be acknowledged, for instance, the lack of internal consistency in the EAST or the low overall inter-reliability between measures. Nonetheless, this research (study 1) is one of the first to use four indirect measures of implicit attitudes. The measurement and classification of dual attitudes should also be improved. For the sake of this dissertation, a conservative path (using cluster analysis) was undertaken. Yet, since the 70's, researchers made extraordinary improvements in the measurement of ambivalent attitudes (Appendix 1 for a review). Developments in the measurement and identification of dual attitudes are foreseen.

Last, the manipulation to change implicit attitudes through direct experience was not successful. Either the number of days (10 days) allocated to the manipulation was not sufficient or direct experience with the product is not an adequate means to tap into the implicit attitude structure and change it. It would be beneficial to conduct this experiment again with a manipulation involving the creation of mental imagery (see Blair et al., 2001) or under an evaluative conditioning paradigm (see Dijksterhuis, 2004; Olson and Fazio, 2001; 2002). To enhance the contribution to marketers, the role of advertising in changing implicit attitudes should also be investigated further. Briñol and his colleagues (2003) already contributed strongly to this line of research by demonstrating that when explicit attitudes appear to have resisted persuasion, there might be hidden effects on the

implicit attitude. This finding encourages research on means to persuade attitudes both at the implicit and explicit level.

Overall, the results open interesting avenues for new research following the implicit attitude paradigm. It would be particularly interesting to continue testing inhibitive processes as an explanation for implicit and explicit dissociation. In this dissertation, it is proposed that dual attitudes lead to a response conflict when a behavior is instigated by one attitude and simultaneously inhibited by another attitude. Any context impairing cognitive processing or narrowing attentional range (e.g. stress) is likely to increase the likelihood that the behavior will be driven by the implicit attitude, which is likely to lead to psychological discomfort and negative affect. Researches would also benefit from the use of additional paradigms to the cognitive load one used in the context of this study, for instance ego-depletion manipulations involving successive acts of self-control (Baumeister, 2002). An additional research avenue would be to assess individual behavioral traits that might increase the likelihood to hold dual attitudes toward a variety of consumer products and / or to be more driven by the implicit attitude when making consumer choices (e.g. impulse buying tendencies, Rook and Fisher, 1995; Consumer Locus of Control, Busseri, Lefcourt and Kerton, 1998).

Researches on attitude conflict, especially under the implicit attitude paradigm, are in their infancy. Consumer research will benefit from researches in this domain, from a theoretical, methodological and practical perspective. I hope that this dissertation will motivate others to engage in research on ambivalent and dual attitudes as well as on unconscious processes of consumer choice.

REFERENCES

Ajzen, I .(2001). Nature and operations of attitudes. *Annual Review of Psychology*, 52, 27-58

Amodio, D.M., Harmon-Jones, E., and Devine, P.G. (2003). Individual differences in the activation and control of affective race bias as assessed by startle eyeblink response and self-report. *Journal of Personality and Social Psychology*, 84(4), 738-753.

Anderson, M. C., and Spellman, B. A. (1995). On the status of inhibitory mechanisms in cognition: Memory retrieval as a model case. *Psychological Review*, 102, 68-100.

Armitage, C. J., and Conner, M. (2000). Attitudinal ambivalence: A test of three key hypotheses. *Personality and Social Psychology Bulletin*, 26, 1421-1432.

Bassili, J. N. (1996). Meta-judgmental versus operative indexes of psychological attributes: The case of measures of attitude strength. *Journal of Personality and Social Psychology*, 71, 637-653.

Bargh, J. A., Chaiken, S., Govender, R., and Pratto, F. (1992). The generality of the automatic attitude activation effect. *Journal of Personality and Social Psychology*, 62, 893-912 .

Baumeister, R. F. (2002). Yielding to temptation: Self-control failure, impulsive purchasing, and consumer behavior. *Journal of Consumer Research*, Vol 28(4), 670-676.

Baumeister, R.F., Heatherton, T. F and Tice, D.M. (1994). *Losing control: How and why people fail at self-regulation.* Case Western Reserve U, Dept of Psychology, Cleveland, OH, US, 1.

Bell, D. W., and Esses, V. M. (1997). Ambivalence and response amplification toward native peoples. *Journal of Applied Social Psychology*, 27, 1063-1084.

Birch, L.L. (1990). Development of food acceptance patterns. *Developmental Psychology*, Vol 26(4), 515-519.

Birch, L. L., McPhee, L., Steinberg, L., and Sullivan, S. (1990). Conditioned flavor preferences in young children. *Physiology and Behavior*, Vol 47(3), 501-505.

Blair, I. V., Ma, J. E., and Lenton, A. P. (2001). Imagining stereotypes away: The moderation of implicit stereotypes through mental imagery. *Journal of Personality and Social Psychology*, 81, 828-841 .

Breckler, S. J. (1994). A comparison of numerical indexes for measuring attitude ambivalence. *Educational and Psychological Measurement*, 54, 350-365.

Brendl, C. M., Markman, A.B., and Messner, C. (2003). The devaluation effect: Activating a need devalues unrelated objects. *Journal of Consumer Research*, Vol 29(4), 463-473.

Briñol, P., Horcajo, J., Becerra, A., Falces, C. and Sierra, B. (2002) Implicit attitude change. Psicothema. Vol 14(4), 771-775.

Busseri, M.A., Lefcourt, H.M. and Kerton, R.R. (1998). Locus of control for consumer outcomes: Predicting consumer behavior. *Journal of Applied Social Psychology*, 28(12), 1067-1087

Cacioppo, J. T., and Berntson, G. G. (1994). Relationship between attitudes and evaluative space: A critical review, with emphasis on the separability of positive and negative substrates. *Psychological Bulletin*, 115, 401-423 .

Cacioppo, J. T., Gardner, W. L., and Berntson, G. G. (1997). Beyond bipolar conceptualizations and measures: The case of attitudes and evaluative space. *Personality and Social Psychology Review*, 1, 3-25.

Cameron, J.A., Alvarez, J.M. and Bargh, J.A. (2000). Examining the validity of implicit measures of prejudice. Poster presented at the first annual meeting for the Society and Social Psychology, Nashville, TN.

Conner, M., Sparks, P., Povey, R., James, R., Shepherd, R., and Armitage, C. J. (2002). Moderator effects of attitudinal ambivalence on attitude-behaviour relationships. *European Journal of Social Psychology*, 32, 705-718 .

Cunningham, W. A, Preacher, K.J. and Banaji, M.R. (2001). Implicit attitude measures: Consistency, stability, and convergent validity. *Psychological Science*, 121(2), 163-170.

Dasgupta, N., and Greenwald, A. G. (2001). On the malleability of automatic attitudes: Combating automatic prejudice with images of admired and disliked individuals. *Journal of Personality and Social Psychology*, 81, 800-814 .

De Houwer, J. (2001). A structural and process analysis of the Implicit Association Test. *Journal of Experimental Social Psychology*, 37, 443-451

De Houwer, J. (2003). The extrinsic affective Simon task. *Experimental Psychology*, 50, 77-85 .

Dermen, K. H., and Cooper, M. L. (2000). Inhibition conflict and alcohol expectancy as moderators of alcohol's relationship to condom use. *Experimental and Clinical Psychopharmacology*, 8, 198-206 .

Devine, P. G. (1989). Stereotypes and prejudice: Their automatic and controlled components. *Journal of Personality and Social Psychology*, 56, 5-18 .

Devine, P. G., Monteith, M. J., Zuwerink, J. R., and Elliot, A. J. (1991). Prejudice with and without compunction. Journal of Personality and Social Psychology, 60, 817-830 .

Dhar, R., and Wertenbroch, K. (2000). Consumer choice between hedonic and utilitarian goods. *Journal of Marketing Research.* Vol 37(1), 60-71.

Dijksterhuis, A. (2004). I like myself but I don't know why: enhancing implicit self-esteem by subliminal evaluative conditioning. *Journal of Personality and Social Psychology*, 86(2), 345-355.

Dovidio, J. F., Kawakami, K., and Gaertner, S. L. (2002). Implicit and explicit prejudice and interracial interaction. *Journal of Personality and Social Psychology*, 82, 62-68 .

Dovidio, J. F., Kawakami, K., Johnson, C., Johnson, B., and Howard, A. (1997). On the nature of prejudice: Automatic and controlled processes. *Journal of Experimental Social Psychology*, 33, 510-540.

Draine, S. C., and Greenwald, A. G. (1998). Replicable unconscious semantic priming. *Journal of Experimental Psychology: General*, 127, 286-303 .

Eagly, A. H. and Chaiken, S. (1993). *The psychology of attitudes*. Harcourt Brace Jovanovitch College Publishers, Orlando, US

Fazio, R. H. (1990). A practical guide to the use of response latency in social psychological research. In Hendrick, C. (Ed), Clark, M. S. (Ed). Research methods in personality and social psychology. *Review of personality and social psychology*, Vol. 11, 74-97.

Fazio, R.H., Jackson, J.R., Dunton, B.C. and Williams, C.J. (1995). Variability in automatic attitude activation as an unobtrusive measure of racial attitudes: A bona fide pipeline? *Journal of Personality and Social Psychology*, 69, 1013-1027.

Fazio, R.H. and Olson, M.A. (2003). Implicit measures in social cognition research: their meaning and use. *Annual Review in Psychology*, 54, 297-327.

Festinger, L. (1957). A theory of cognitive dissonance. Stanford, CA: Stanford University Press

Fitzsimons, G.J., and Shiv, B. (2001). Nonconscious and contaminative effects of hypothetical questions on subsequent decision making, *Journal of Consumer Research*, 28(2), 224-238.

Giner-Sorolla, R. (2001). Guilty pleasures and grim necessities: Affective attitudes in dilemmas of self-control. *Journal of Personality and Social Psychology*, 80, 206-221 .

Glick, P., Diebold, J., Bailey-Werner, B., and Zhu, L. (1997). The two faces of Adam: Ambivalent sexism and polarized attitudes toward women. *Personality and Social Psychology Bulletin*, 23, 1323-1334.

Gorenstein, E. E. and Newman, J.P. (1980) Disinhibitory psychopathology: A new perspective and a model for research. *Psychological Review*, 87(3), 301-315.

Greenwald, A. G., and Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Psychological Review*, 102, 4-27 .

Greenwald, A.G., Klinger, M.R. and Schuch, E.S. (1995). Activation by marginally perceptible ("subliminal") stimuli: dissociation of unconscious from conscious cognition. *Journal of Experimental Psychology: General*, 124(1), 23-42.

Greenwald, A. G., Nosek, B. A., and Banaji, M. R. (2003). Understanding and using the Implicit Association Test: I. An improved scoring algorithm. *Journal of Personality and Social Psychology,* 85, 197-216 .

Greenwald, A. G., McGhee, D. E., and Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: The Implicit Association Test. *Journal of Personality and Social Psychology*, 74, 1464-1480 .

Hass, R. G., Katz, I., Rizzo, N., Bailey, J., and Moore (1992). When racial ambivalence evokes negative affect, using a disguised measure of mood. *Personality and Social Psychology Bulletin*, 18, 786-797.

Hass, R. G., Katz, I., Rizzo, N., Bailey, J., and Eisenstadt (1991). Cross-racial appraisal as related to attitude ambivalence and cognitive complexity. *Personality and Social Psychology Bulletin*, 17, 83-92.

Herman, C. P. and Mack, D. (1975). Restrained and unrestrained eating. *Journal of Personality*, 43, 647-660.

Herman, C. P. and Polivy J. (1980). Restrained eating. In Stunkard A. J. (Ed.), *Obesity.* Philadelphia, P.A.: W. B. Saunders, 208-225.

Hetherington, M.M. and Macdiarmid, J.I. (1993). "Chocolate Addiction": a preliminary study of its description and its relationship to problem eating. *Appetite*, 21, 233-246.

Jonas, K., Broemer, P., and Diehl, M. (2000). Experienced ambivalence as a moderator of the consistency between attitudes and behaviors. *Zeitschrift fuer Sozialpsychologie*, 31, 153-165.

Jonas, K., Diehl, M., and Broemer, P. (1997). Effects of attitudinal ambivalence on information processing and attitude-intention consistency. *Journal of Experimental Social Psychology*, 33, 190-210.

de Jong, P.J., van den Hout, M.A., Rietbroek, H. and Huijding, J. (2003). Dissociations between implicit and explicit attitudes toward phobic stimuli. *Cognition and Emotion*, 17(4), 521-545.

Kahkonen, P. and Tuorila, H. (1999). Consumer responses to reduced and regular fat content in different products: effects of gender, involvement and health concern. *Food Quality and Preference*, 10, 83-91

Kales, E. F. (1990) Macronutrient analysis of binge eating in bulimia. *Physiology and Behavior*, 48(6), 837-840.

Kaplan, K. J. (1972). On the ambivalence-indifference problem in attitude theory and measurement: A suggested modification of the semantic differential technique. *Psychological Bulletin*, Vol. 77, 361-372 .

Karpinski, A., and Hilton, J. L. (2001). Attitudes and the Implicit Association Test. *Journal of Personality and Social Psychology*, 81, 774-788.

Katz, I., and Hass, R. G. (1988). Racial ambivalence and American value conflict: Correlational and priming studies of dual cognitive structures. *Journal of Personality and Social Psychology*, 55, 893-905.

Kawakami, K., Dovidio, J. F., Moll, J., Hermsen, S., and Russin, A. (2000). Just say no (to stereotyping): Effects of training in the negation of stereotypic associations on stereotype activation. *Journal of Personality and Social Psychology*, 78, 871-888.

Kim, D-Y. (2003). Voluntary controllability of the Implicit Association Test (IAT). *Social Psychology Quarterly*, 66(1), 83-96.

Kirschenbaum, D. S., and Dykman, B. M. (1991). Disinhibited eating by resourceful restrained eaters. *Journal of Abnormal Psychology*, 100, 227-230.

Knäuper, B., Rabiau, M., Cohen, O., and Patriciu, N. (2004). Compensatory health beliefs: Theory and measurement. *Psychology and Health*, 19(5), 607-624.

Knight, L. J., and Boland, F. J. (1989). Restrained eating: An experimental disentanglement of the disinhibiting variables of perceived calories and food type. *Journal of Abnormal Psychology*, 98, 412-420.

Koole, S. L., Dijksterhuis, A., and van Knippenberg, A. (2001). What's in a name: Implicit self-esteem and the automatic self. *Journal of Personality and Social Psychology*, 80, 669-685.

Krosnick, J. A., Boninger, D. S., Chuang, Y. C., Berent, M. K. and Carnot (1993). Attitude strength: One construct or many related constructs? *Journal of Personality and Social Psychology*, 65, 1132-1151.

Lavine, H., Thomsen, C. J., Zanna, M. P., and Borgida, E. (1998). On the primacy of affect in the determination of attitudes and behavior: The moderating role of affective-cognitive ambivalence. *Journal of Experimental Social Psychology*, 34, 398-421.

Lowery, B.S., Hardin, C. D. and Sinclair, S. (2001). Social influence effects on automatic racial prejudice. *Journal of Personality and Social Psychology*, 81(5), 842-855.

Luce, M. F. (1998). Choosing to avoid: Coping with negatively emotion-laden consumer decisions, *Journal of Consumer Research*, 24(4), 409-433.

Luce, M. F., Bettman, J. R. and Payne, J. W (2001). *Emotional decisions: tradeoff difficulty and coping in consumer choice.* Monographs of the Journal of Consumer Research. D. Roedder John, Ed.

Luce, M. F., Bettman, J. R., and Payne, J. W (1997). Choice processing in emotionally difficult decisions. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 23, 384-405

Luce, M. F., Jia, J. and Fischer, G. W. (2003). How much do you like it? Within-alternative conflict and subjective confidence in consumer judgments, *Journal of Consumer Research*, 30(3), 464-472.

Luce, M. F., Payne, J. W. and Bettman, J. R. (1999). Emotional trade-off difficulty and choice, *Journal of Marketing Research*, 36(2), 143-159.

MacDonald, T. K., and Zanna, M. P. (1998). Cross-dimension ambivalence toward social groups: Can ambivalence affect intentions to hire feminists? *Personality and Social Psychology Bulletin,* 24, 427-441.

Madon, S., Smith, A.E., and Guyll, M. (2005). Social norms regarding protected status and threat reactions to the stigmatized. *Journal of Applied Social Psychology*, 35(3), 572-602.

Maio, G. R., Esses, V. M., and Bell, D. W. (2000). Examining conflict between components of attitudes: Ambivalence and inconsistency are distinct constructs. *Canadian Journal of Behavioural Science*, 32, 58-70.

Mann, T., and Ward, A. (2004). To Eat or Not to Eat: Implications of the Attentional Myopia Model for Restrained Eaters. *Journal of Abnormal Psychology*, 113, 90-98 .

Mitchell, S. L. and Epstein, L. H. (1996). Changes in taste and satiety in dietary-restrained women following stress. *Physiology and Behavior*, 60(2), 495-499.

Monahan, J. L., and Laliker, M. (2002). Intensifying the dominant response II: Nonconscious negative affect, cognitive demand and conversations. *Communication Monographs*, 69(4), 357-384.

Monteith, M. J., Devine, P. G., and Zuwerink, J. R. (1993). Self-directed versus other-directed affect as a consequence of prejudice-related discrepancies. *Journal of Personality and Social Psychology*, 64, 198-210.

Monteith, M. J., and Voils, C. I. (1998). Proneness to prejudiced responses: Toward understanding the authenticity of self-reported discrepancies. *Journal of Personality and Social Psychology*, 75, 901-916 .

Moskowitz, G. B., Gollwitzer, P. M., Wasel, W., and Schaal, B. (1999). Preconscious control of stereotype activation through chronic egalitarian goals. *Journal of Personality and Social Psychology*, 77, 167-184 .

Muthén, B. (1983). Latent variable structure modeling with categorical data. *Journal of Econometrics*, 22, 43-65

Newby-Clark, I. R., McGregor, I., and Zanna, M. P. (2002). Thinking and caring about cognitive inconsistency: When and for whom does attitudinal ambivalence feel uncomfortable? *Journal of Personality and Social Psychology*, 82, 157-166

Nosek, B. A. (2003). Moderators of the relationship between implicit and explicit attitudes. *Unpublished dissertation*

Nosek, B. A and Banaji, M. R. (2001). The Go/No-go Association Task. *Social Cognition*, 19(6), 625-666.

Nowlis, S. M., Kahn, B. E., and Dhar, R. (2002). Coping with ambivalence: The effect of removing a neutral option on consumer attitude and preference judgments. *Journal of Consumer Research*, 29, 319-334.

Ohme, R. K. (2001). The implicit conditioning of consumer attitudes: Logo substitution effect. *Polish Psychological Bulletin*, 32(1) 2001, 71-78.

Olson, M.A, and Fazio, R.H. (2002). Implicit acquisition and manifestation of classically conditioned attitudes. *Social Cognition*, 20(2), 89-104.

Olson, M. A. and Fazio, R.H. (2001). Implicit attitude formation through classical conditioning. Psychological Science. Vol 12(5), 413-417.

Ottaway, S. A, Hayden, D. C, and Oakes, M. A. (2001). Implicit attitudes and racism: Effects of word familiarity and frequency on the implicit association test. *Social Cognition*, 19(2), 97-144.

Perugini, M. (2005). Predictive models of implicit and explicit attitudes. *British Journal of Social Psychology*, 44, 29-45

Petty, R. E. and Jarvis, B. G. (1998). What happens to the "old" attitude when attitudes change? Paper presented at the meetings of the Society for Experimental Social Psychology, Lexington, KY

Plant, E. A., and Devine, P. G. (1998). Internal and external motivation to respond without prejudice. *Journal of Personality and Social Psychology*, 75, 811-832 .

Polivy, J. (1998). The effects of behavioral inhibition: integrating internal cues, cognition, behavior and affect. *Psychological Inquiry*, 9(3), 181-204.

Povey, R., Wellens, B., and Conner, M. (2001). Attitudes towards following meat, vegetarian and vegan diets: An examination of the role of ambivalence. *Appetite*, 37, 15-26.

Priester, J. R., and Petty, R. E. (1996). The gradual threshold model of ambivalence: Relating the positive and negative bases of attitudes to subjective ambivalence. *Journal of Personality and Social Psychology*, 71, 431-449.

Priester, J. R., and Petty, R. E. (2001). Extending the bases of subjective attitudinal ambivalence: Interpersonal and intrapersonal antecedents of evaluative tension. *Journal of Personality and Social Psychology*, 80, 19-34 .

Rabiau, M., Knäuper, B., and Miquelon, P. (in press[2005]). The eternal quest for optimal balance between maximizing pleasure and minimizing harm: The Compensatory Health Beliefs Model. *British Journal of Health Psychology*.

Riketta, M. (2000). Discriminative validation of numerical indices of attitude ambivalence. *Current Research in Social Psychology*, 5(5)

Roefs, A., and Jansen, A. (2002). Implicit and explicit attitudes toward high-fat foods in obesity. *Journal of Abnormal Psychology*, 111, 517-521.

Rook, D.W. and Fisher, R.J. (1995). Trait and normative aspects of impulsive buying behavior. *Journal of Consumer Research*, 22(3), 305-313.

Rudman, L. A., Ashmore, R. D., and Gary, M. L. (2001). "Unlearning" automatic biases: The malleability of implicit prejudice and stereotypes. *Journal of Personality and Social Psychology*, 81, 856-868.

Sakai, N., Kataoka, F. and Imada, S. (2001) Contrast effect in evaluating palatability of beverages. *Perceptual and Motor Skills*, 93(3), 829-842.

Shiv, B., and Fedorikhin, A. (1999). Heart and mind in conflict: The interplay of affect and cognition in consumer decision making. *Journal of Consumer Research*, 26(3), 278-292.

Shiv, B., and Fedorikhin, A. (2002). Spontaneous versus controlled influences of stimulus-based affect on choice behavior. *Organizational Behavior and Human Decision Processes*, 87(2), 342-370.

Sparks, P., Hedderley, D., and Shepherd, R. (1992). An investigation into the relationship between perceived control, attitude variability and the consumption of two common foods. *European Journal of Social Psychology*, 22(1), 55-71.

Strack, F. and Deutsch, R. (2004). Reflective and impulsive determinants of social behavior. *Personality and Social Psychology Review*, 8, 220-247

Sullivan, S. A., and Birch, L. L. (1990). Pass the sugar, pass the salt: Experience dictates preference. *Developmental Psychology*, 26, 546-551 .

Swanson, J. E., Rudman, L. A., and Greenwald, A. G. (2001). Using the Implicit Association Test to investigate attitude-behaviour consistency for stigmatised behaviour. *Cognition and Emotion*, 15, 207-230 .

Thompson, M.M., Zanna, M.P. and Griffin, D.W. (1995). Let's not be indifferent about (attitudinal) ambivalence. In R. E. Petty and J. A. Krosnick, *Attitude strength, antecedents and consequences*. Lawrence Erlbaum Associates, New Jersey, 361-386

Tormala, Z.L., Briñol, P., and Petty, R.E. (2003). Hidden effects of persuasion. Paper presented at the North American Conference of the Association for Consumer Research in Toronto

Tuorila, H. Cardello, A.V. and Lesher, L.L. (1994). Antecedents and consequences of expectations related to fat-free and regular-fat foods. *Appetite*, 23, 247-263.

Tuorila, H., Kramer, F.M. and Engell, D. (2001). The choice of fat-free vs. regular-fat fudge: the effects of liking for the alternative and the restraint status. *Appetite*, 37, 27-32

Van Strien, T., Frijters, J.E., Bergers, G.P. and Defares, P.B. (1986). The Dutch Eating Behavior Questionnaire (DEBQ) for assessment of restrained, emotional, and external eating behavior. *International Journal of Eating Disorders*, 5(2), 295-315.

Vartanian, L.R., Polivy, J., and Herman, C.P. (2004). Implicit cognitions and eating disorders: their application in research and treatment. Cognitive and Behavioral Practice, 11, 160-167.

Ward, A., and Mann, T. (2000). Don't mind if I do: Disinhibited eating under cognitive load. *Journal of Personality and Social Psychology*, 78, 753-763.

Wertenbroch K. (1998). Consumption self-control by rationing purchase quantities of virtue and vice. *Marketing Science*, 17(4), 317-337.

Wilson, T. D., Lindsey, S., and Schooler, T. Y. (2000). A model of dual attitudes. Psychological Review, 107, 101-126.

Yu, C.-Y. and Muthén, B. (2002). Evaluation of model fit indices for latent variable models with categorical and continuous outcomes. Technical report. Los Angeles: University of California at Los Angeles.

Zandstra, E. H., de Graaf, C., and van Trijp, H. C. M. (2000). Effects of variety and repeated in-home consumption on product acceptance. *Appetite*, 35(2), 113-119.

Zuwerink, J. R., Devine, P.G., Monteith, M.J., Cook, D.A. (1996). Prejudice toward blacks: With and without compunction? *Basic and Applied Social Psychology*, 18(2), 131-150.

APPENDIX 1

Review of indirect and ambivalence measurement techniques

1. IMPLICIT MEASUREMENT TECHNIQUES

Over the past few years, a variety of techniques have emerged to measure attitudes in an unobtrusive fashion. All these techniques have in common to assess attitudes without directly and verbally asking the participants. Various physiological techniques (facial electromyography, amygdala activation, eye blinking, cardiovascular reactivity etc.) have been used in order to track responses in an unbiased fashion, which will not be developed further in this overview (see Fazio and Olson, 2003 for a review). The most famous techniques based on response-latency measurement (i.e. Evaluative priming and its variants; Implicit Association Test and its variants) are reviewed hereafter.

Evaluative priming. The evaluative priming technique has been the most popular previous to the introduction of the Implicit Association Test in 1998 (see Fazio et al., 1986; 1995; Greenwald, Klinger and Liu, 1989; Draine and Greenwald, 1998). This technique involves the priming of words or pictures preceding the evaluation of positive and negative target adjectives. The assumption is that word categorization is facilitated in consistent trials compared to inconsistent ones i.e. responses are faster and more accurate when primes and adjectives have same valence compared to different valences. For instance, Fazio et al. (1995) used the priming of black and white faces preceding the evaluation of positive and negative adjectives. Black faces, relative to white faces,

facilitated the responses to negative adjectives and interfered with responses on positive adjectives, suggesting an automatic negative bias toward black people.

Implicit Association Test. The IAT is probably the most popular implicit measurement technique, and has been used for assessing the implicit attitude for a variety of different attitude objects. The procedure requires the combination of two categorization tasks, one for target words (e.g. black vs. white) and one for evaluative words (i.e. pleasant vs. unpleasant words). The difference in latency to categorize target words when paired with pleasant and unpleasant is an indicator of the strength of the association between the target words and an evaluative dimension (positive or negative). For instance, in its pioneering article, Greenwald et al. (1998) asks participants to categorize names (i.e. Latoya and Betsy) as typical of black or whites and evaluative words (e.g. joy and death) as pleasant or unpleasant words. The interest is on evaluating how participants respond when those tasks are combined via key assignments. In the critical phase of the experiment, one task requires participants to classify words meaning black or pleasant vs. white or unpleasant and another task (in counterbalanced order) requires participants to classify words into black or unpleasant vs. white or pleasant. Participants in this study found easier to associate black with unpleasant (and white with pleasant) than black with pleasant (and white with unpleasant), indicating an implicit attitude more negative toward black and more positive toward white people.

The Go-No Go Association Task. Introduced by Nosek and Banaji (2001), the GNAT is an interesting variant of the IAT. The procedure is based on signal theory. Participants are required to respond to all stimuli related to the target category or an

evaluative category (i.e. signal) and do nothing in response to all other stimuli (i.e. noise). Response latencies and errors are compared between blocks where participants have to attend to the signals "target or good" and "target or bad". On the contrary to the IAT, the GNAT does not require the presence of a contrasting category i.e. the attitude to black might be assessed without reference to white.

The Extrinsic Affective Simon Task. Introduced by De Houwer (2003), the EAST is an additional variant to the IAT. Participants have to categorize white words on the basis of their valence whereas they categorize colored words (i.e. the target objects) on the basis of the color. The target objects are presented in two colors (e.g. blue-ish and green-ish) which are almost similar. Responses are facilitated when participants need to select the extrinsically positive response (associated with positive white words) and colored positive words and responses when participants need to select the extrinsically negative response (associated with negative words) and colored negative words. Similar to the GNAT, the EAST does not need the introduction of a contrasting category. But an additional interest is that performance is not based on a comparison of performance between two different tasks, which eliminates confounds due to a different recoding of the tasks.

2. AMBIVALENCE MEASUREMENT TECHNIQUES

Ambivalence has been measured through unobtrusive (not based on subjects' impressions) as well as self-report measures (Bassili 1996). Measures of "potential ambivalence" (Newby-Clark, McGregor, and Zanna 2002) or "objective ambivalence"

(Priester and Petty 1996; 2001) involve asking participants separately about their positive and negative evaluations of an attitude object. In contrast, the subjective feeling of tension or conflict (felt ambivalence, Newby-Clark et al. 2002; subjective ambivalence, Priester and Petty 1996; 2001) is measured through asking directly the participants how torn, mixed or conflicted they feel about the attitude object or the issue.

Objective measures. These measures require the evaluation of the positive and negative components of the attitude separately. First, participants are asked to consider only the positive aspects of the product or issue and ignore the negative aspects. They then rate how favorable is their evaluation toward the product or issue (e.g. 1 = not at all favorable 4= extremely favorable). Conversely for the negative component, participants are required to consider only the negative aspects of the issue and ignore the positive aspects, then rate how unfavorable is their attitude toward the product (e.g. 1 = not at all unfavorable; 4= extremely unfavorable). This method has been successfully employed by a large number of researchers (Armitage and Conner, 2000; Thompson et al., 1995).

Further, these ratings are combined into an ambivalence index. Three indexes have been proposed in the literature so far. Katz (Katz and Hass, 1988; Hass et al., 1991) proposes to multiply the scores for the positive and negative components (Katz formula: P X N). However, if this formula reflects correctly higher levels of ambivalence when components are rated similarly, it is nonetheless unsatisfactory when ratings are polarized (i.e. holding constant the weaker component, ambivalence is higher at higher levels of polarization for the stronger component). Jamieson formula involves calculating the square of the weaker component divided by the stronger component (Jamieson formula: W2/ S). This formula does not lead to counterintuitive findings, yet it has been challenged

for its lack of conceptual underpinnings. The most popular measure of ambivalence remains the Griffin's (1995) which subtract the absolute difference between the two components to the average of the two components (Griffin: $(P + N) / 2 - | P - N |$). Conceptually, this formula stresses that ambivalence is equal to the intensity of the components corrected by the dissimilarity in their magnitude (Thompson et al., 1995). This formula is currently used by most researchers on ambivalence (Armitage and Conner, 2000).

Open-ended questions assessing separately the positive and negative components of the attitude have also been used (Esses, Haddock and Zanna, 1993).

Subjective measures. These measures involve asking directly the participants how conflicted or torn he feels toward the issue with such questions as "I have strong thoughts about it and I cannot make up my mind one way or the other", "I find myself feeling torn between two sides of the issue" etc. Yet, these measures have been consistently shown to lack correlation with the meta-operatives indexes of ambivalence. When comparing the different ambivalence levels obtained through the above formula with the levels of ambivalence supposedly experienced by the subjects (Thompson et al., 1995), researchers have constantly find low correlations between these measures (0.2 to 0.4). Yet, the subjective measure of ambivalence generally mixes questions on the awareness of conflicting evaluations (i.e. mixed evaluations, advantages and disadvantages) with the feeling of tension generally associated with ambivalence (i.e. feeling torn, conflicted feelings, discomfort).

APPENDIX 3

Pre-test words IAT soda vs. water

Soda	Ass-Diss	Word length	Familiarity	Ass soda	Ass water
sunkist	-1,00	7	2,55	3,05	0,66
sprite	-1,35	6	2,89	5,79	1,05
orangina	-1,35	8	2,32	4,47	0,84
schweppes	-1,60	9	2,37	5,39	1,26
fresca	-1,10	6	1,05	3,92	1,45
pepsi	-2,95	5	2,95	5,95	0,66
mountain dew	-2,90	11	2,63	5,49	0,76
dr pepper	-2,95	8	2,53	5,68	0,68
crush	-2,70	5	2,32	5,42	0,45
coke	-3,00	4	2,92	5,97	0,61
canada dry	-2,30	9	2,66	5,68	0,76
barqs	-2,10	5	0,13	3,47	0,45
Average set 5	-2,90	6,60	2,67	5,70	0,63

Waters	Ass-Diss	Word length	Familiarity	Ass soda	Ass water
source	2,15	6	1,24	0,95	3,63
perrier	2,00	7	2,53	2,74	5,03
montellier	1,70	10	0,29	0,68	3,95
labrador	1,05	8	2,47	0,63	4,05
cristalline	0,75	11	1,92	1,03	3,24
naya	2,75	4	2,74	0,58	4,92
montclair	2,80	9	2,42	0,89	4,71
evian	2,85	5	2,84	0,50	5,50
dasani	2,80	6	2,45	0,66	4,05
aquafina	2,75	8	2,18	0,37	4,27
Average set 5	2,79	6,40	2,53	0,60	4,69

Soda vs. Waters			
Mean Ass-Dissoc	t(19)=1,141	p=0,268	(2,90 compared to 2,79)
Mean familiarity	t(37)=1,672	p=0,103	

APPENDIX 4

Pre-test words IAT chocolate bars vs. yoghurt

Chocolate	Ass-Diss	Word length	Familiarity	Ass choco	Ass yogourt
Wunderbar	2,70	9	1,53	4,95	0,01
Twix	2,95	4	2,55	5,68	0,13
Hershey	2,95	7	2,74	5,74	0,18
Crunchie	2,80	8	2,03	5,46	0,16
Caramilk	2,65	8	2,50	5,74	0,34
Cadbury	2,95	7	2,53	5,47	0,21
Oh Henry	2,80	7	2,68	5,76	0,00
Snickers	2,95	8	2,74	5,82	0,16
Kit Kat	2,95	7	2,92	5,95	0,29
Aero	2,95	4	1,63	5,32	0,50
Average set 5	2,89	7,4	2,54	5,65	0,14

Yogourts	Ass-Diss	Word length	Familiarity	Ass choco	Ass yogourt
Yoplait	-3,00	7	2,53	0,24	6,00
Silhouette	-2,50	10	2,26	0,32	4,95
Minigo	-2,70	6	2,21	0,29	4,21
Liberty	-2,40	7	2,47	0,87	4,11
Danone	-2,95	6	2,53	0,32	5,21
Astro	-2,40	5	-0,34	0,30	3,08
Spring valley	-0,50	13	0,82	0,42	1,00
Average set 5	-2,71	7,2	2,41	0,41	4,90

Chocolate vs. Yogourts			
Mean Ass-Dissoc	t(19)=1,630	p=0,119	(2,89 compared to 2,71)
Mean familiarity	t(37)=0,724	p=0,474	

APPENDIX 5

Experimental design study 1

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Group 1 = 1 of 4	IAT	GNAT	EAST	Priming	Explicit questions randomized within blocks
Group 2 = 2 of 4	GNAT	IAT	Priming	EAST	Yoghurts and Chocolate counterbalanced
Group 3 = 3 of 4	EAST	Priming	IAT	GNAT	Positive and Negative ambivalence counterbalanced
Group 4 = 4 of 4	Priming	EAST	GNAT	IAT	Objective and Subjective ambivalence counterbalanced

APPENDIX 6

Sets of words and brands used in study 1

Pleasant adjective set: "BEAUTIFUL", "EXCELLENT", "FRIENDLY", "FABULOUS", "WONDERFUL"

Unpleasant adjective set: "HORRIBLE", "SICKENING", "REVOLTING", "TERRIBLE", "DISGUSTING"

Chocolate brands: "HERSHEY", "CADBURY", "OH HENRY", "CRUNCHIE", "SNICKERS"

Yoghurt brands: "YOPLAIT", "DANONE", "LIBERTY", "SILHOUETTE", "MINIGO"

APPENDIX 7

IAT sequences (pilot study and study 1)

Sequence	1	2	3	4	5	6	7
Task description	Initial attribute	Initial concept	Initial combined	Initial combined	Reversed concept	Reversed combined	Reversed combined
		(The sequences 2,3,4 and 5,6,7 are counterbalanced for half subjects)					
Purpose	Practice	Practice	Practice	Test	Practice	Practice	Test
Task Instructions	E - pleasant unpleasant - I	E – CHOCO YOG - I	E – pleasant E – CHOCO Unpleasant – I YOG – I	E – pleasant E – CHOCO unpleasant - I YOG - I	E - YOG CHOCO - I	E - pleasant E - YOG unpleasant - I CHOCO - I	E - pleasant E - YOG unpleasant - I CHOCO - I
Trials	10 (all attributes)	10 (all 10 targets)	20 (10 targets and 10 attributes)	40 (10 targetsX2 10 attributesX2)	10 (all 10 targets)	20 (10 targets and 10 attributes)	40 (10 targets X2 and 10 attributes X2)

Each subject has 150 trials.
Each target word is repeated 8 times in the IAT.

APPENDIX 8

EAST sequences

Sequence	1	2	3	4-5
Task description	White attributes	Coloured targets	Mixed	Mixed
		(Half the subjects have A blue and L green)		
Purpose	Practice	Practice	Practice	Test
Task Instructions	A – PLEASANT UNPLEASANT - L	A – GREEN BLUE - L	A - PLEASANT A - GREEN UNPLEASANT - L BLUE - L	A - PLEASANT A - GREEN UNPLEASANT - L BLUE - L
Trials	10 (all attributes)	20 (10 targets in 2 colours)	30 (10 targets X2 and 10 attributes)	120 (10 targetsX8 10 attributesX4)

Each subject has 180 trials.
Each target word is repeated 12 times in the EAST (6 times in each color).

APPENDIX 9

GNAT sequence

Sequence	1-2	3-4	5-6	7-8
Task description	Attributes	Targets	Combined GNAT Choco target	Combined GNAT Yog target
	1-4 randomized		5-8 randomized	
Purpose	Practice	Practice	Test	Test
Signal / Noise	Signal: Good Noise: Bad Signal: Bad Noise: Good	Signal: Choco Noise: Yog Signal: Yog Noise: Choco	Signal: Choco-good Noise: Yog-bad Signal: Choco-bad Noise: Yog-good	Signal: Yog-good Noise: Choco-bad Signal: Yog-bad Noise: Choco-good
Deadlines	Signal: 1000ms Noise: 500ms	Signal: 1000ms Noise: 500ms	Signal: 1000ms Noise: 500ms	Signal: 1000ms Noise: 500ms
Ratio signal/noise	1:1	1:1	4:3	4:3
Trials	20 (all attributes signal)	20 (all target signal)	140 (5 targets X8)	140 (5 targets X8)

Each subject has 352 trials.
Each target word is repeated 14 times in the GNATs (9 times as signal and 5 times as noise).
Each combined GNAT set of 70 trials is preceeded by a block of 8 practice trials randomized.

APPENDIX 10

Screening questionnaire

Study 1

SUBJECT #: _____

Sequences: 1-IATWHI2 2-GNATWHI2 3-EASTWHI2 4-PRIMEWHI2 5-QUESTWHI2

Date: _____ Time: _____

What is your gender? ❑ Male ❑ Female

What is your age? _____

What is your occupation? _____

What is your highest degree of education? ❑ Secondary School

❑ CEGEP

❑ University (undergraduate)

❑ University (graduate)

What is your native language? _____

How fluent are you in English? (Please circle your rating on the scale below)

Not at all fluent 1 2 3 4 5 6 7 Completely fluent

How many years have you been living in Canada? _____

Is your vision normal (or corrected to normal)? ❑ Yes ❑ No

Do you have problems discriminating colors? ❑ Yes ❑ No

Do you suffer from diabetes? ❑ Yes ❑ No

Are you currently on a weight-reduction plan or a restrictive diet of any kind? ❑ Yes ❑ No

Have you recently (within the last month) completed a weight-reduction plan or a restrictive diet of any kind? ❑ Yes ❑ No

Do you suffer from food allergies? ❑ Yes (specify _____) ❑ No

What is your actual height? ____ centimeters or _____feet and _____inches_____

What is your actual weight? ____ kilograms or _____pounds

How do you judge your current body weight?

Too low 1 2 3 4 5 6 7 Too high

How hungry are you presently?

Not at all hungry	1	2	3	4	5	6	7 Very hungry

How thirsty are you presently?

Not at all thirsty	1	2	3	4	5	6	7 Very thirsty

How do you feel at the present time?

Sad	1	2	3	4	5	6	7 Happy
Negative	1	2	3	4	5	6	7 Positive
Unpleasant mood	1	2	3	4	5	6	7 Pleasant mood

Appendix 11

Post-choice questionnaire

Study 1

Subject # _____

Date: _____ Time: _____

Choice: _____Chocolate OR _____Yoghurt

I. Indicate below the basis of your choice between a yoghurt in tube and a chocolate bar by circling the appropriate number for each of the 5 statements.

My final decision about which snack to choose was driven by:

My thoughts	1	2	3	4	5	6	7	**My feelings**
My desire	1	2	3	4	5	6	7	**My willpower**
My prudent self	1	2	3	4	5	6	7	**My impulsive self**
My rational side	1	2	3	4	5	6	7	**My emotional side**
My heart	1	2	3	4	5	6	7	**My head**

II. Indicate below to what extent you are hungry and thirsty at present.

Not at all hungry	1	2	3	4	5	6	7	**Very hungry**
Not at all thirsty	1	2	3	4	5	6	7	**Very thirsty**

III. Indicate how you feel at the present time.

Sad	1	2	3	4	5	6	7	**Happy**
Negative	1	2	3	4	5	6	7	**Positive**
Unpleasant mood	1	2	3	4	5	6	7	**Pleasant mood**

IV. Indicate the extent to which you agree or disagree with each of the statements below by circling the appropriate number.

Chocolate is an appropriate food any time of the day.

Strongly disagree	1	2	3	4	5	6	7 Strongly agree

I just have to have some chocolate on a regular basis.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Dark chocolate is healthier than milk chocolate.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I often experience cravings for sweets.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

My food choices are often motivated by specific cravings.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I most often eat chocolate when I am alone.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Eating chocolate is truly pleasurable.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I most often eat chocolate when I feel depressed.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I eat chocolate because it is a good source of energy.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I would like to eat chocolate more often.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Chocolate is a perfect food when watching movies.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I can't eat just one piece of chocolate.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Food occupies an important place in my life.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

When I experience cravings for sweets, I fulfil them by eating chocolate.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I eat chocolate because it is a convenient snack food.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I consider myself to be a person who eats healthy.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I am concerned about the consequences of what I eat.
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

V. Indicate the extent to which each of the action tendencies below is descriptive of you by circling the appropriate number.

I enjoy solving problems that require hard thinking.
Not at all 1 2 3 4 5 6 7 Very much

I'm not that good at figuring out complicated problems.
Not at all 1 2 3 4 5 6 7 Very much

I enjoy intellectual challenges.
Not at all 1 2 3 4 5 6 7 Very much

I try to avoid situations that require thinking in depth about something.
Not at all 1 2 3 4 5 6 7 Very much

I don't have a very good sense of intuition.
Not at all 1 2 3 4 5 6 7 Very much

I believe in trusting my hunches.
Not at all 1 2 3 4 5 6 7 Very much

I don't like to do a lot of thinking.
Not at all 1 2 3 4 5 6 7 Very much

I like to rely on my intuitive impressions.
Not at all 1 2 3 4 5 6 7 Very much

Using my gut feelings usually works well for me in figuring out problems in my life.
Not at all 1 2 3 4 5 6 7 Very much

Intuition can be a very useful way to solve problems.
Not at all 1 2 3 4 5 6 7 Very much

I often go by my instincts when deciding on a course of action.
Not at all 1 2 3 4 5 6 7 Very much

I am not very good at solving problems that require careful logical analysis.
Not at all 1 2 3 4 5 6 7 Very much

VI. Below is a list of beliefs how one can compensate for potentially unhealthy behaviors such as eating too much or not exercising enough. Most of these beliefs have not been scientifically tested, so it is not yet known to which extent they are true. Please read each statement carefully. Then indicate how much truth you personally think there could be to the belief by placing a ✓ in the box besides the answer.

It is fine to skip breakfast if one eats more during lunch.
No truth at all ❑ A tiny bit of truth ❑ A little bit of truth ❑ Some truth ❑ Quite a bit of truth ❑

Breaking a diet today may be compensated for by starting a new diet tomorrow.
No truth at all ❑ A tiny bit of truth ❑ A little bit of truth ❑ Some truth ❑ Quite a bit of truth ❑

Using artificial sweeteners compensates for extra calories.
No truth at all ❑ A tiny bit of truth ❑ A little bit of truth ❑ Some truth ❑ Quite a bit of truth ❑

Vitamin pills compensate for the bad effects of a poor diet.
No truth at all ❑ A tiny bit of truth ❑ A little bit of truth ❑ Some truth ❑ Quite a bit of truth ❑

Eating sweets once in a while is fine because it reduces stress.
No truth at all ❑ A tiny bit of truth ❑ A little bit of truth ❑ Some truth ❑ Quite a bit of truth ❑

If one exercises one can eat without many restrictions.
No truth at all ❑ A tiny bit of truth ❑ A little bit of truth ❑ Some truth ❑ Quite a bit of truth ❑

Eating junk food once in a while is fine if one exercises regularly.
No truth at all ❑ A tiny bit of truth ❑ A little bit of truth ❑ Some truth ❑ Quite a bit of truth ❑

Eating dessert once in a while is balanced by not sweetening one's coffee or tea.
No truth at all ❑ A tiny bit of truth ❑ A little bit of truth ❑ Some truth ❑ Quite a bit of truth ❑

If one did not eat during the entire day it is fine to eat whatever one wants in the evening.
No truth at all ❑ A tiny bit of truth ❑ A little bit of truth ❑ Some truth ❑ Quite a bit of truth ❑

Eating a piece of cake once in a while is fine as long as one does not eat dessert regularly.
No truth at all ❑ A tiny bit of truth ❑ A little bit of truth ❑ Some truth ❑ Quite a bit of truth ❑

VII. Please answer each question below by placing a ✓ in the box besides the answer that most closely reflects your own dietary habits.

If you have put on weight, how often do you eat less than you usually do?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you try to eat less at mealtimes than you would like to eat?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you refuse food or drinks offered to you because you are concerned about your weight?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you watch exactly what you eat?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you deliberately eat foods that are slimming?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

When you have eaten too much, how often do you eat less than usual the following day?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you deliberately eat less in order not to become heavier?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you try not to eat between meals because you are watching your weight?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

In the evenings, how often do you try not to eat because you are watching your weight?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you take your weight into account with what you eat?

Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you have a desire to eat when you are irritated?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you have a desire to eat when you have nothing to do?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you have a desire to eat when you are depressed or discouraged?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you have a desire to eat when you are feeling lonely?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you have a desire to eat when somebody lets you down?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you have a desire to eat when you are cross?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you have a desire to eat when something unpleasant is about to happen?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you get the desire to eat when you are anxious, worried or tense?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you have a desire to eat when things are going against you or have gone wrong?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you have a desire to eat when you are frightened?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you have a desire to eat when you are disappointed?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you have a desire to eat when you are emotionally upset?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you have a desire to eat when you are bored or restless?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you eat more than usual when the food tastes good to you?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you eat more than usual if the food smells and looks good?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

If you see or smell something delicious, how often do you have a desire to eat it?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

If you have something delicious to eat, how often do you eat it straight away?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you also want to eat when you see others eating?

Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often do you eat more than usual when you see others eating?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often are you inclined to eat something when preparing a meal?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

If you walk past the baker, how often do you have the desire to buy something delicious?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

If you walk past a snackbar or a café, how often do you have the desire to buy something delicious?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

How often can you resist eating delicious food?
Never ❑ Seldom ❑ Sometimes ❑ Often ❑ Very often ❑

APPENDIX 13

Informed Consent Form

The purpose of an informed consent is to ensure that you understand the purpose of the study and the nature of your involvement. The informed consent has to provide sufficient information such that you have the opportunity to determine whether you wish to participate in the study.

Study Title: The influence of mental tasks in food taste perceptions

Study Personnel: Marie-Cécile Cervellon (PhD Candidate, Principal Investigator, tel. 3984000 ext. 00834), m-cecile.cervellon@mail.mcgill.ca
Pr. Laurette Dubé (Faculty of Management Investigator)

If you have any ethical concerns about this study, please contact Ms. Lynda McNeil (514-398-6831), McGill University Research Ethics Officer for Human subjects.

Purpose and task requirement: The purpose of this study is to assess how mental tasks might affect the perception of the taste of food products with low fat or high fat content. The main product under consideration is OREO COOKIES and two varieties, reduced-fat and double crème. First, a series of tasks will be administered on computer. Instructions will be given directly on the computer screen. The tasks require that you go as fast as possible and at the same times make the fewer errors. At the end, you will have a taste session. If you do not want to taste any of the products presented to you, please feel free to tell the experimenter. The whole study should take an hour approximately to complete.
At the end of this first session, you will be given short questionnaires to be filled out during the next 10 days and we will fix an appointment for the second session, which will be shorter (approx. 20 minutes).

Potential risk: As food will be tasted all along the experiment, please do not participate if you have food allergies of any type.

Anonymity and confidentiality: We are not interested in identifying who you are in our database of results. In the computer database, you will be identified with an ID number which will be allocated to you at the end of this informed consent form. The data collected in this study will be kept confidential and used only by the investigator for her personal research purposes and publications.

Right to Withdraw: Your participation in this study is entirely voluntary. At any point during the study you have the right not to complete certain questions. You have also the right to withdraw at any time. Yet, the $25 compensation will only be received upon full completion of the two sessions.

I have read the above description of the study concerning taste perceptions in following mental tasks. My signature indicates that I agree to participate in the study, and this in no way constitutes a waiver of my rights.

Full name (please print): _____
Code allocated: _____
Participant Signature: _____

APPENDIX 14

Pre-test words Reduced fat vs. Double Crème OREO (study 2)

	Word length	Familiarity	Ass-Diss
aspartam	8	1.70	0.40
saccharin	9	1.90	0.15
sweeteners	10	2.35	0.35
restraint	9	1.80	0.75
sugar	5	2.95	-1.05
full	4	2.70	-1.15
rich	4	2.85	-1.55
sweet	5	2.85	-0.95
taste	5	2.75	-1.50
carbohydrate	12	2.35	-0.70
cream	5	2.60	-1.60
treat	5	2.75	-1.25
indulgence	10	2.65	-1.50
Average set 5 double crème	5,8	2.72	-1.48

Difference in familiarity and asso./dissociation btw both word sets:		
Mean Ass-Dissoc	t(19)=0.092	p=0,928
Mean familiarity	t(19)=0,429	p=0,673

APPENDIX 15

Phone Pre-screening questionnaire

Study 2

The consumer behaviour laboratory of McGill University is recruiting FEMALE participants for a study on "THE INFLUENCE OF MENTAL ACTIVITIES ON TASTE PERCEPTION". This study is composed of two sessions. During the first session, participants will complete a series of tasks on a computer and will taste a series of food items. Maximum time for this session is half-an-hour. Afterwards, every day for 10 days, participants will fill out a short one-page questionnaire on their activities during the day. Last, a second session will involve an additional task on a computer and another tasting session for another 30 minutes. All sessions will take place at McGill University, Faculty of Management, Bronfman Building, 3rd floor, in XXXXX **2004**. Participants will receive **$25 compensation** to participate in the two-session study. Participation is voluntary. Your personal identification will only be used to contact you. All information included in this questionnaire will be kept confidential.

Your first and last name: _____

Your phone number: _____ OR your e-mail address: _____

What is your age? _____

What is your occupation? _____

What is your native language? _____

How fluent are you in English? (Please circle your rating on the scale below)

Not at all fluent 1 2 3 4 5 6 7 Completely fluent

How many years have you been living in Canada? _____

Is your vision normal (or corrected to normal)? ❑ Yes ❑ No

Do you suffer from diabetes? ❑ Yes ❑ No

Do you suffer from food allergies? ❑ Yes (please specify _____) ❑ No

What is your actual height? ____ centimeters or _____feet and _____inches

What is your actual weight? ____ kilograms or _____pounds

Do you know the brand of cookies OREO? ❑ Yes ❑ No

Do you know the variety Reduced Fat OREO cookies? ❑ Yes ❑ No

Do you know the variety Double Crème OREO cookies? ❑ Yes ❑ No

How often are you dieting?
0❑ Never 1❑ Rarely 2❑ Sometimes 3❑ Often 4❑ Always

What is the maximum amount of weight that you have ever lost within one month?

about _____ kg or _____ lbs.

0❑ 0-4 lbs 1❑ 5-9 lbs 2❑ 10-14 lbs 3❑ 15-19 lbs 4❑ 20+

What is your maximum weight gain within a week?
about _____ kg or _____ lbs.

0❑ 0-1 lbs 1❑ 1.1-2 lbs 2❑ 2.1-3 lbs 3❑ 3.1-5 lbs 4❑ 5.1+

In a typical week, how much does your weight fluctuate?
about _____ kg or _____ lbs.

0❑ 0-1 lbs 1❑ 1.1-2 lbs 2❑ 2.1-3 lbs 3❑ 3.1-5 lbs 4❑ 5.1+

Would a weight fluctuation of 5lb (or 2.2kg) affect the way you live your life?
0❑ Not at all 1❑ slightly 2❑ moderately 3❑ very much

Do you eat sensibly in front of others and splurge alone?
0❑ Never 1❑ rarely 2❑ often 3❑ always

Do you give too much time and thought to food?
0❑ Never 1❑ rarely 2❑ often 3❑ always

Do you have feelings of guilt after overeating?
0❑ Never 1❑ rarely 2❑ often 3❑ always

How conscious are you of what you are eating?
0❑ Not at all 1❑ slightly 2❑ moderately 3❑ extremely

How many pounds over your desired weight were you at your maximum weight?
about _____ kg or _____ lbs.

0❑ 0-1 lbs 1❑ 2-5 lbs 2❑ 6-10 lbs 3❑ 11-20 lbs 4❑ 21+ lbs

IF ABOVE 16: RESTRAINED GROUP 1
IF 15 AND BELOW: NON RESTRAINED GROUP 2

If possible: no eating for an hour before coming to sessions

APPENDIX 16

Post-choice questionnaire (study 2)

Subject # _____

Date: _____ **Time:** _____

I. YOUR CHOICE OF COOKIES

1. You just made a choice between two varieties of OREO cookies. Please indicate below your choice:

2. Write down everything that came to your mind while you were making your choice:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

3. Indicate below the basis of your choice by circling the appropriate number for each of the 5 items below.

My final decision about which cookies to choose was driven by:

My thoughts	1	2	3	4	5	6	7 My feelings
My desire	1	2	3	4	5	6	7 My willpower
My prudent self	1	2	3	4	5	6	7 My impulsive self
My rational side	1	2	3	4	5	6	7 My emotional side
My heart	1	2	3	4	5	6	7 My head

4. Indicate below to what extent you are hungry and thirsty at present.

Not at all hungry	1	2	3	4	5	6	7	Very hungry
Not at all thirsty	1	2	3	4	5	6	7	Very thirsty

II. COOKIE TASTE RATINGS

1. Taste perception:

In front of you are 2 bowls, each with a different type of cookies. You are asked to evaluate the taste of each type of cookies. Make sure that you taste enough of each type of cookies to be clearly able to evaluate their taste.

Please start by tasting the cookies from the left bowl (A). Make the ratings for this type of cookie, and then proceed to the cookies from the right bowl (B). Please do not change any of your ratings once you have completed the task.

Left bowl, A – _____

Please read each statement carefully and indicate to what extent you think that this type of cookie possesses the following tasting properties by choosing the numbers that best correspond to your answers.

Not at all sweet	1	2	3	4	5	6	7	Very sweet
Not at all rich	1	2	3	4	5	6	7	Very rich
Not at all chewy	1	2	3	4	5	6	7	Very chewy
Not at all flavourful	1	2	3	4	5	6	7	Very flavourful
Not at all fat	1	2	3	4	5	6	7	Very fat
Not at all tasty	1	2	3	4	5	6	7	Very tasty
Not at all bland	1	2	3	4	5	6	7	Very bland

How much did you like this variety of OREO cookies?

Did not like at all	1	2	3	4	5	6	7	Liked very much

To which extent did you experience the following feelings when eating those cookies?

Not at all guilty	1	2	3	4	5	6	7 Very guilty
Not at all at ease	1	2	3	4	5	6	7 Very at ease
Not at all faulty	1	2	3	4	5	6	7 Very faulty
Not at all ashamed	1	2	3	4	5	6	7 Very ashamed

Right bowl, B – _____

Please read each statement carefully and indicate to what extent you think that this type of cookie possesses the following tasting properties by choosing the numbers that best correspond to your answers.

Not at all sweet	1	2	3	4	5	6	7 Very sweet
Not at all rich	1	2	3	4	5	6	7 Very rich
Not at all chewy	1	2	3	4	5	6	7 Very chewy
Not at all flavourful	1	2	3	4	5	6	7 Very flavourful
Not at all fat	1	2	3	4	5	6	7 Very fat
Not at all tasty	1	2	3	4	5	6	7 Very tasty
Not at all bland	1	2	3	4	5	6	7 Very bland

How much did you like this variety of OREO cookies?

Did not like at all	1	2	3	4	5	6	7 Liked very much

To which extent did you experience the following feelings when eating those cookies?

Not at all guilty	1	2	3	4	5	6	7 Very guilty
Not at ease	1	2	3	4	5	6	7 Very at ease

Not at all faulty	1	2	3	4	5	6	7	Very faulty
Not at all ashamed	1	2	3	4	5	6	7	Very ashamed

EXPERIMENTER'S COMMENTS:

XXXXXXXXX Indicate number of cookies left in the bowl XXXXXX

APPENDIX 17

Repeated tasting questionnaire

Study 2

Subject # _____ Date session 1:_____ Appointment session 2:_____
Type of cookies:_____

This questionnaire has to be filled out every day, starting the next day after your 1st session in the laboratory. Please try to eat one of the cookies we gave you, every day at the same time.

Day 1: Today's Date: _____ Time right now: _____

How much did you engage into mental tasks today?

Not at all 1 2 3 4 5 6 7 Very much

How many cookies (all kind) did you eat today in total? _____

How many were OREO cookies? _____

Before eating the cookie, indicate to what extent you are hungry

Not at all hungry 1 2 3 4 5 6 7 Very hungry

AFTER YOU ATE THE COOKIE, PLEASE ANSWER THE FOLLOWING QUESTIONS:

Please read each statement carefully and indicate to what extent you think that this type of cookie possesses the following tasting properties by choosing the numbers that best correspond to your answers.

Not at all fat 1 2 3 4 5 6 7 Very fat
Not at all tasty 1 2 3 4 5 6 7 Very tasty
Not at all bland 1 2 3 4 5 6 7 Very bland

How much did you like this cookie?

Did not like at all 1 2 3 4 5 6 7 Liked very much

To which extent did you experience the following feelings when eating those cookies?

Not at all guilty 1 2 3 4 5 6 7 Very guilty
Not at all at bored 1 2 3 4 5 6 7 Very bored